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Segmentation and Detection of Red Blood Cells in Malaria Diagnostic Smears Using U-Net and Yolo V2

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ABSTRACT

Due to their increased precision and reproducibility as compared to manual segmentation and annotation, computer-assisted procedures have become a mainstay of biomedical applications. We present RBC-YOLONet, a novel pipeline for counting and identifying red blood cells in thin blood smear microscopy pictures. It employs a dual deep learning architecture. Two stages make up the RBC-YOLONet: a U-Net first stage for segmenting cell clusters and a YOLOV2 second stage for locating micro cell objects within connected component clusters. To locate tiny objects or fine-scale morphological traits in very large images, RBCNet employs cell clustering, which is robust to cell fragmentation and incredibly scalable. With greater accuracy than traditional and alternative deep learning techniques, the foreground cell-cluster masks from U-Net adaptively direct the detection step in the novel dual cascade RBC-YOLONet architecture. The RBC-YOLONet pipeline is a crucial step in automating malaria diagnosis.

Keywords :- Red blood cells (RBCs), white blood cells (WBCs), deep learning, YOLOV2, connected components, semantic segmentation, U-Net.

I. INTRODUCTION

In the entire world, MALARIA is the number one killer. Mosquito bites are a simple means of transmitting the parasitic infectious disease, which annually causes over 200 million infections and 400 thousand fatalities, with children under five making up the bulk of all malaria-related deaths globally. Sub-Saharan Africa is the area with the highest risk, although half of all people on earth are at risk. The illness starts out with symptoms similar to a cold, such as fever, headache, and chills; however, if left untreated, these symptoms can develop into more serious complications, including kidney failure, anaemia, pulmonary edoema, abnormal liver function, cerebral malaria, neuro-disability, seizures, and ultimately, death. Every year, microscopists check millions of blood smears for the presence of malaria

parasites to establish whether a person is infected or not. This procedure is divided into several steps, beginning with the collection of blood smears, staining of the samples, and examination of the stained slides to identify different cells and spot infected ones. Manual counting and detection requires a microscopist with specialized training and is time-consuming, expensive, and slow. Automated algorithms based on machine learning and image processing offer the potential to provide quick, affordable, and accurate malaria diagnosis while minimizing false positives that frequently occur with manual assessment. Convolutional neural networks have become quite popular recently for tackling problems in machine learning and computer vision since the model learns and computes various properties from the data without any human involvement.

However, these so-called deep learning approaches (DL) require a lot of annotated data as well as computing capacity to acquire the weights necessary to create a predictive model. Because labelled data requires specialized knowledge, getting it is a bottleneck in the medical industry. Developing precise automatic blood cell detection is particularly difficult when it comes to the screening and diagnosis of malaria. Images of various blood smears can differ in terms of staining, resolution, lighting, cell shape, appearance, color, contrast, and debris. Additionally, cells can cluster, making it more difficult to identify individual cells, and staining artefacts can be problematic for image processing techniques that are sensitive. But a number of methods and algorithms have been created with the aim of displacing manual diagnosis, bringing down costs, and accelerating diagnosis.

II. RELATED WORKS

This is a report [1] by WHO malaria report (2019) based on information received from more than 80 countries and areas with ongoing malaria transmission.

This is submission report (2016) of WHO [2] on the final second version of the Malaria microscopy quality assurance manual which was then reviewed by a core group of reviewers, whose inputs were essential.

This is a paper [3] which studies ImageNet deep convolutional neural networks for better use of techniques for preventing overfitting and to improve their performance, that can collect larger datasets and learn more powerful models

This is a study [4] based on previous researches on application of machine learning and now author going for Neural Networks which have many future deep NNs will also take into account that it costs energy to activate neurons, and to send signals between them. Brains seem to minimize such computational costs during problem solving.

This is a survey [5] which have studied nature Deep convolutional nets have brought about breakthroughs in processing images, video, speech and audio

This is basic research [6] which studied the likely lead to larger test suites on patient level, allowing for more standardized evaluations and extensive field testing.

III. METHODOLOGY

U-Net: The U-Net model offers a number of benefits for segmentation tasks. For example, this model enables the simultaneous use of global location and context. Second, it performs better for segmentation tasks even when there are limited training examples available.

UNet, which developed from the conventional convolutional neural network, was initially created and used to process biological images in 2015. While a conventional convolutional neural network focuses on picture classification, where the input is an image and the output is one label, in biomedical situations, it is necessary to not only determine whether a disease exists but also to pinpoint the location of abnormality. UNet is committed to resolving this issue. It can localise and identify borders since every pixel is

classified, ensuring that the input and output are of same size.

It appears to be in the shape of a "U." The design is symmetrical and is divided into two main sections: the left section is known as the contracting path and is made up of the basic convolutional process; the right section is known as the expansive path and is made up of transposed 2D convolutional layers (you can think it as an upsampling technic for now).

YOLOV2: Yolo is quick and effective for processing in the present. Predictions are generated from a single network, including item locations and classes. can be fully taught to increase accuracy. By hovering over a block in YOLOv2, you can get more information about that block. Except for the final convolution block, each convolution block first undergoes BatchNorm normalization before Leaky Relu activation. YOLO creates an SS grid from the input image. Only one object is predicted by each grid cell. In the yellow grid cell below, for instance, an attempt is made to forecast the "person" item whose center (the blue dot) lies within the grid cell. There is a predetermined number of border boxes predicted for each grid cell. In this illustration, the yellow grid cell determines the person's location using two boundary box predictions (blue boxes). The one-object rule does place a limit on how near detected objects can be.

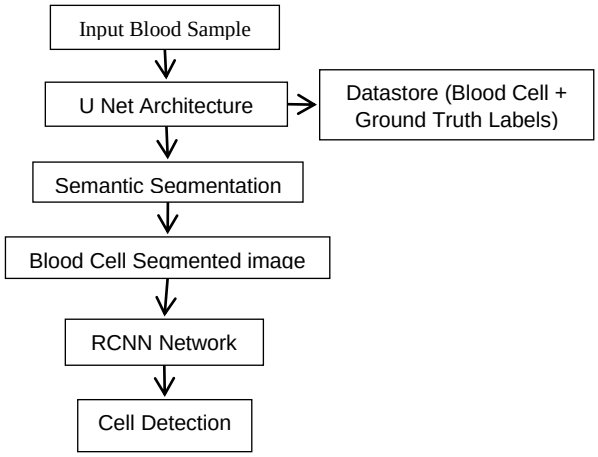

Fig 1: Block Diagram of Proposed Method

For each grid cell,

- Each box has a box confidence score, and it predicts B boundary boxes.
- Regardless of the quantity of boxes B, it only detects one object.
- it detects one object only regardless of the number of boxes B,

It projects probability for the C conditional class (one per class for the likeliness of the object class). Box confidence score is contained in the boundary boxes. The confidence score represents the boundary box's accuracy and the likelihood that the box includes an object (or is objectless). We divide the image's width and height by the bounding box's width and height. The offsets to the relevant cell are x and y. Consequently, all of x, y, w, and h are between 0 and 1. There are 20 conditional class probabilities in each cell. The likelihood that the identified object belongs to a specific class is represented by the conditional class probability (one probability per category for each cell). Each prediction box's class confidence score is calculated as follows:

Class confidence score is equal to box confidence score time's conditional class probability.

It gauges the level of certainty for both the classification and the location (where an object is located). Those score and probability phrases are easy to conflate. For your future reference, listed below are the mathematical definitions

box confidence score $= P_r(object).IoU$

conditional class probability $=$

$\mathrm{P}_r\left(class_i \,|object\right).IoU$

$class\ confidence\ score = P_r(class_i).IoU$

$=$ box confidence score $\times$

conditional class probability

Where $P_r(object)$ is the probability, the box contains an object

IoU is the IoU (intersection over union) between the predicted box and the ground truth.

$P_r\left(class_i \mid object\right)$ is the probability the object belongs to $class_i$ given an object is presence.

$P_r(class_i)$ is the probability the object belongs to $class_i$

Multiple bounding boxes are predicted by YOLO for each grid cell. One of them should be in charge of the object in order to calculate the loss for the real positive. For this, we choose the one that has the highest intersection over union (IoU) with the actual data. The forecasts for the bounding box specialise as a result of this tactic. With each forecast, accuracy in predicting specific sizes and aspect ratios increases.

Sum-squared error between the forecasts and the actual data is used by YOLO to determine loss. Assembled into the loss function are:

- The classification loss.
- The localization loss (errors between the predicted boundary box and the ground truth).
- The confidence loss (the objectness of the box).

Classification loss

The classification loss in each cell, provided an object is found, is equal to the squared error of the class conditional probability for each class:

$$\sum_{i=0}^{s^2} \mathbb{1}_i^{obj} \sum_{c \in classes} \left(p_i(c) - \hat{p}_i(c)\right)^2$$

Where

$\mathbb{1}_i^{obj} = 1$ if an object appears in cell *i*, otherwise 0.

$\hat{p}_i(c)$ denotes the conditional class probability for class *c* in cell *i*.

The projected border box sizes and locations are measured by the localization loss. We only include the box that detects the object in our count.

$$\lambda_{coord} \sum_{i=0}^{s^2} \sum_{j=0}^{B} 1_i^{obj} \left[\left(x_i(c) - \hat{x}_i(c)\right)^2 + \left(y_i(c) - \hat{y}_i(c)\right)^2\right] + \lambda_{coord} \sum_{i=0}^{s^2} \sum_{j=0}^{B} 1_i^{obj} \left[\left(\sqrt{x_i} - \sqrt{\hat{x}_i}\right)^2 + \left(\sqrt{h_i} - \sqrt{\hat{h}_i}\right)^2\right]$$

Where $\mathbb{1}_i^{obj} = 1$ if the j th boundary box in cell i is responsible for detecting the object, otherwise 0.

λ_{coord} increase the weight for the loss in the boundary box coordinates.

Absolute errors in large boxes and tiny boxes should not have the same weight. For example, a 2-pixel mistake in a large box has the same effect as one in a tiny one. Yolo forecasts the square root of the width and height of the bounding box rather than the width and height to partially address issue. Additionally, we double the loss by λcoord to place a greater focus on the border box precision (default: 5).

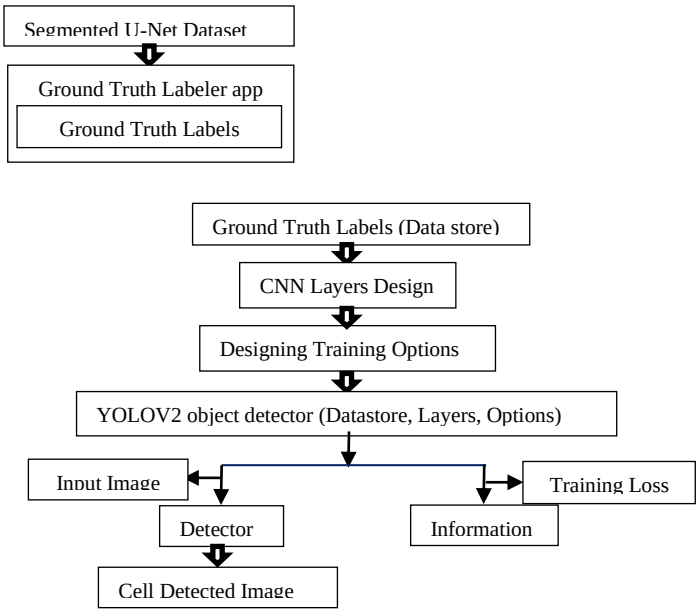

Fig 2: Yolo V2 Architecture

IV. EXPERIMENTAL RESULTS

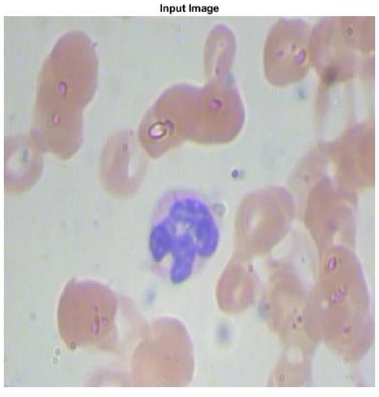

Fig 3: Input Image

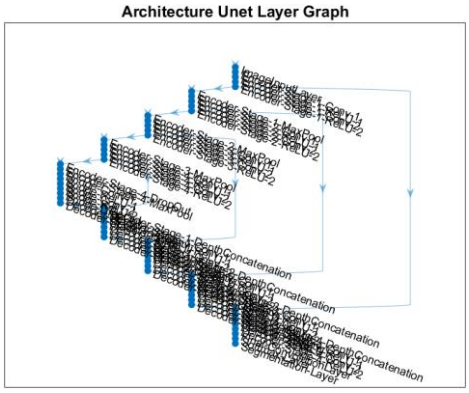

Fig 4: Architecture U Net Layer Graph

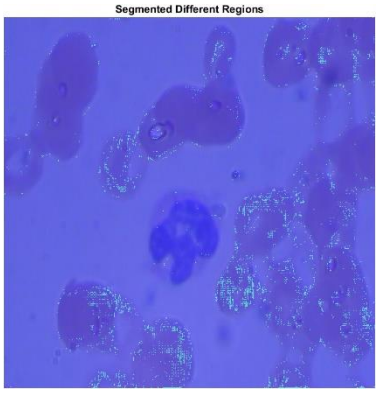

Fig 5: Segmented Different Regions

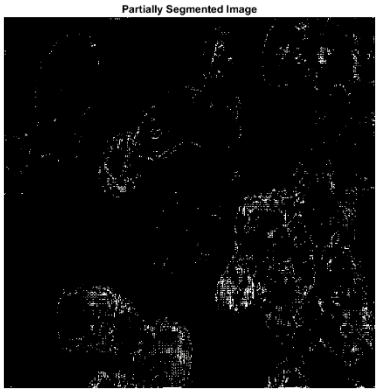

Fig 6: Partially Segmented Image

Fig 7: Final Segmented Image

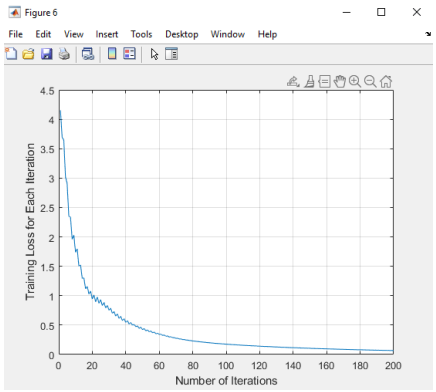

Fig 8: Training Loss

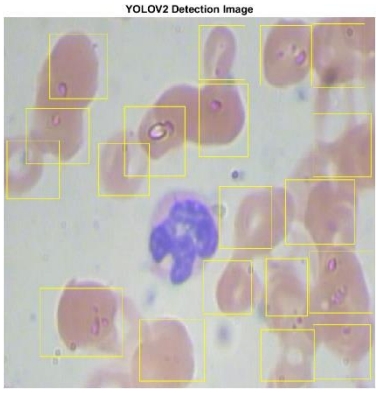

Fig 9: YOLOV2 Detection Image

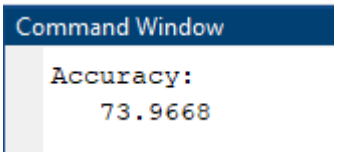

Fig 10: Command window results

S. No	Existing Method	Proposed Method
1	56.51	84.51
2	68.92	97.92
3	75.26	90.26
4	56.25	80.25
5	54.96	73.96

Fig 11: Accuracy Comparison Table

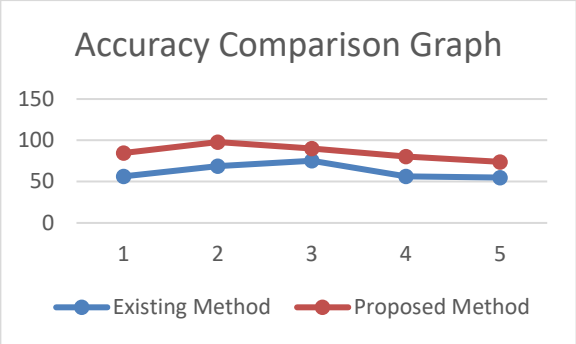

Fig 12: Accuracy Comparison Graph

V. CONCLUSION

The RBC-YOLONet pipeline uses a dual deep learning architecture to identify and count red blood cells in thin blood smear microscopy images. The RBC-YOLONet system consists of two stages: a U-Net first stage for segmenting cell-clusters and a YOLOV2 second stage for finding small cell objects within connected component clusters. RBCNet is highly scalable and resistant to cell fragmentation since it recognizes small items or fine scale morphological traits in very large images using cell clustering rather than region recommendations. An essential stage in automating malaria detection is the RBC-YOLONet pipeline. Other two-stage deep learning object detectors, such as ones that make use of convolutional neural networks (Faster R-CNNs) in some locations, are slower than YOLO v2. In contrast to conventional and other deep learning systems, the ground-breaking dual cascade RBC-YOLONet architecture enables more precise cell detections since the foreground cell-cluster masks from U-Net adaptively direct the identification step.

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Power Efficient and Modified Transmission Technology Based Sram Cell for Core Memories

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ABSTRACT

The suggested circuit in this project is designed for IoT applications employing a modified transmission gate based SRAM cell that eliminates the need for peripheral circuitry during read operations. Biomedical systems that operate in the sub-threshold region with near-perfect efficiency require several kB of embedded memory. SRAMs account for 70% of the die area, which means they consume the most power and consume the most silicon. In the read operation, this topology provides a smaller area, less delay, lower power consumption, and better data stability. The SRAM cell is made of 45nm CMOS and runs at 0.45 V.
Keywords : SRAM, IOT applications, Low power, power gating.

I. INTRODUCTION

The development of a low-power Static Random Access Memory (SRAM) is important for implantable devices and wireless applications where input power or battery life are important [1], [2], and whose operational frequency spans from a few hundreds of Kilohertz to tens of Megahertz [3]. This is due to the SRAMs' significant contribution to System on Chips (SoCs), as they occupy roughly 70% of the die space, which could be expanded in the future [4]. SRAMs have become increasingly power hungry as the number of transistors has increased and the leaking current of these transistors has decreased in scaled down technologies.

In core memory, power consumption is a crucial factor. As a result, we are employing several power reduction approaches in order to minimize the overall circuit's power consumption while also improving its overall performance. Power gating technique, adiabatic, clock gating, GDI, and lector approach are some power strategies that can be used to lower a circuit's average power use to reduce the average amount of energy used We used the power gating strategy in our project's supply voltage as part of the proposed design. Static random access memory's performance, size, and power consumption has a big impact digital integrated systems. Low-power circuits that can function for the aforementioned implanted and wireless applications, long-lasting devices that take up less space without sacrificing performance are necessary, as this is inconvenient and possibly dangerous, especially in the case of implantable devices.

Because the leakage because supply voltage has an exponential and quadratic relationship with power

and active power, reducing the supply voltage is one of the most straightforward and cost-effective methods of increasing energy efficiency [5]. Alternatively, lowering the supply voltage can help, would reduce the circuit's robustness and could wreak havoc on the system As a result, decreasing the supply voltage while maintaining circuit robustness is crucial for power-constrained devices, because data integrity is one of the SRAM cells' core concerns.

As a result of the loss of write ability and read consistency in the near and sub-threshold area, the conventional 6T cell ceases to function [6]. It is preferable to utilize a broad access transistor for a successful write operation, but this may have an impact on read stability. This is a compromise between data stability and write and read performance. Researchers proposed a number of cells based on eliminating the read/write stability tradeoff. These concepts, such as [7] cells, rely on decoupling the read port from the write port by splitting the read and write routes, allowing each process to be improved separately.

They are, however, susceptible to leakage current, need a wide area, or use an approach that minimizes read sensitivity by using a read with only one ending [17] To avoid the drawbacks of a single-ended read approach, numerous techniques [5] have been applied, such as increasing the differential read port by adding extra transistors, albeit at the cost of additional space. Another method devised to improve stability was the use of transmission gates. This brief offers a new 8T SRAM cell based on Transmission gates that is specifically intended for Read operation and enhances Read Noise Margin while consuming less power and time.

It saves space by using fewer transistors and eliminating read-only peripheral circuitry. The following is how the rest of the document is structured: Section-II discusses the fundamental architecture of static random access memory (SRAM), Section-III simulates the operation of standard 6T, 8T, and other existing 10T SRAM cells, and Section-IV describes the proposed SRAM's performance 8T SRAM cell in detail, Section-V compares the proposed cell to the existing ones, and Section-VI concludes the presentation. A block diagram of a typical SRAM design is shown in Figure 1 [19]. Memory Array, Row Decoder, Column Decoder, Precharge circuit, and Sense Amplifier are the most important components of the SRAM chip.

Data will be saved or read in the memory array, which is made up of a number of cells. A single piece of data can be stored in each cell. A row decoder and a column decoder are used to select a specific cell from an array. Bit Lines are pre-charged is started via the precharge circuit. The read function is handled by a Sense amplifier in particular. It detects a cell's content as a slight voltage change between the cell's Bit Lines and generates the data that is stored in that cell.

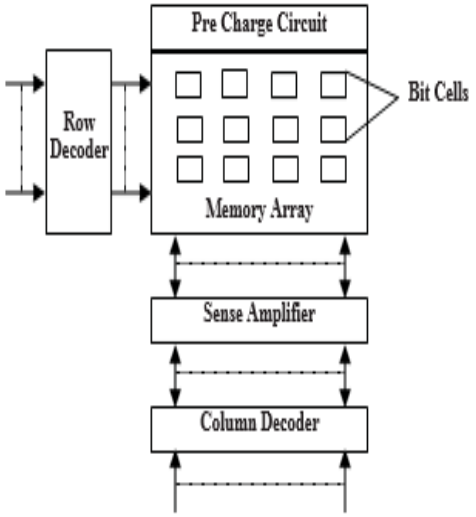

Fig1: Architecture of SRAM

Memory cells are a fundamental component of SRAMs because they take up a large amount of space. The 6T SRAM cell is easy to implement, Figure 2 illustrates this. The cell is made up of two cross-coupled inverters and two pass transistors. The fundamental latch is provided by the two cross-coupled inverters, which can store one bit of data. The two Pass transistors are wired together in a circuit outside world via two complimentary types a Word Line and two Bit Lines (BL and BL Bar) are two types of bit lines (WL).

The three most prevalent states of SRAMs are read, write, and hold. The Word Line is disabled for a Hold operation by disconnecting the link between the cell and the Bit Lines. While the two cross coupling inverters are linked to the power supply, the data will continue to be strengthened. In preparation for a Read operation, the voltages on the two Bit Lines are equalised, and the Word Line is asserted. Bit Lines are a type of data that can be used to create a variety of will now be discharged to the ground, while the other will remain at Vdd, based on the information stored on two nodes of storage For example, let's say the storage node Q has a value of '1' and the storage node QBar has a value of '0.'

The current flows from Vdd to BL via M1 and M5, and BLBar is dumped to ground by M6 and M4. As a result, the two Bit Lines are separated by a small voltage differential, with BL having a greater voltage level than BLBar. The Sense Amplifier receives this little voltage difference and identifies and amplifies the signal, producing the appropriate value on the storage node Q.

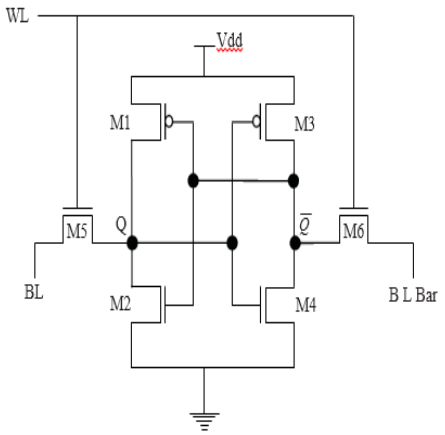

Fig2: 6T SRAM Cell (Traditional)

A conflict between the access transistors compromises the read stability of a traditional 6T SRAM cell and the pull down and pull up To address these challenges, a variety of cells have been developed, beginning with Figure 3 shows the 8T SRAM cell architecture [21]. The cell contains a decoupled read path with two extra nmos transistors to prevent read disturbance.

However, due to the additional transistors dependent on the information contained in the cell, it has a leakage problem. Complex peripheral circuitry, including as a For the traditional 6T, you'll need a precharge circuit, write drivers, and a sensing amplifier and more sophisticated devices listed in this section. The peripheral circuits that encircle the cell region take up a significant amount of space in the total macro cell.

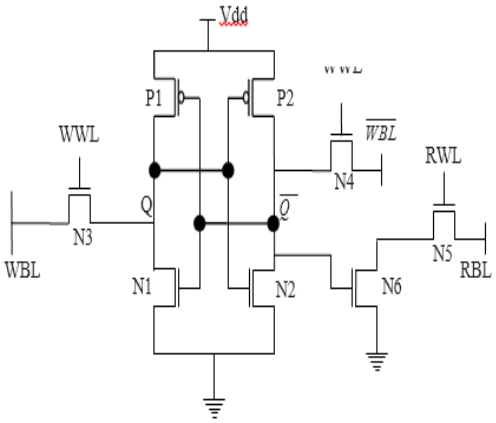

Fig 3:8T SRAM Cell

II. EARLIER WORK

The design of a low-power Static Random Access Memory (SRAM) is important for implantable devices and wireless applications in which input power or battery life are important [1], [2], with operational frequencies ranging from a few hundreds of Kilohertz to tens of Megahertz [3]. This is due to the significant contribution of SRAMs on System on Chips (SoCs), which account for around 70% of the die area and could be enhanced in the future [4]. As SRAMs are becoming more and more power hungry, they have become more expensive.

The number of transistors has increased while leakage current has decreased in scaled-down technologies. Digital integrated systems' performance and power consumption are affected by their performance, size, and static random access memories. Low power circuits that can run for a long time are required for the implanted and wireless applications indicated above while taking up less space without deteriorating performance, as this is inconvenient and potentially

dangerous, especially when contemplating implantable devices.

Because the leakage power and active because power has an exponential and quadratic connection with supply voltage, reducing the supply voltage is one of the most simple and cost effective ways to improve power efficiency [5]. On the other side, lowering the supply voltage, would reduce the circuit's robustness and could resulting in the failure of the system As a result, decreasing the supply voltage while maintaining circuit robustness is crucial for power constrained devices, as data integrity is one of the SRAM cells' core concerns. Each bit is stored using bistable latching circuitry in a 6T static random-access memory. Static RAM is distinguished from dynamic RAM, which needs to be refreshed on a regular basis. SRAM may remember data, but it's still volatile in the traditional sense, meaning that when the memory is turned off, it's still there, data is lost.

SRAM ARCHITECTURE:

The primary components of the SRAM chip include the Memory Array, Row Decoder, Column Decoder, Precharge circuit, and Sense Amplifier. The memory array is made up of a number of cells that will be used to store and read data. One byte of data can be stored in each cell. To choose an individual cell from a group of cells, a row decoder and a column decoder are employed. Precharging of Bit Lines is started via the precharge circuit. The read function is handled by a Sense amplifier in particular. It detects a cell's content as a slight voltage change between the cell's Bit Lines and generates the data that is stored in that cell.

OPERATION OF A 6T SRAM CELL:

1. Standby Mode (the circuit is idle):

Because the word line is not asserted in the 6t cell's pass transistors N3 and N4, which connect the word line to the bit lines, are in standby state (word line=0), are deactivated. The cell can't be contacted, as shown by this message. While As long as two cross coupled inverters are fed back to each other, they will continue to feed back to each other N1-N2 are linked to the supply, the data will be retained in the latch. 2. Read Mode (the data has been requested):

In read mode, the word line is asserted (word line=1). The word line enables the access transistor as well as the bit line connector. The nodes' values are now passed. To the bit lines (nodes a and b). Assume that node a store's 1; the bit line bar will discharge through the driver transistor as a result (N1), and the bit line will be disconnected be pulled up toward VDD through the Load transistors (P1), resulting in a logical 1. Read stability is required in the design of SRAM cells (do not disturb data when reading).

Write Mode (updating the contents) Assume the cell was originally set to store a 1 and that we want to change it to a 0. To do so, lower the bit line to 0V and raise the bit bar to VDD, then raise to choose a cell, change the word line to VDD. Because each inverter is built with PMOS and NMOS matching, the inverter threshold is frequently set to VDD/2. If we want to write 0 at node a, N3 will be saturated. At initially, the source voltage is set to one. N2's drain terminal is originally at 1, which is driven down by N3 since access transistor N3 is stronger than N1. Now that N2 is on and P1 is off, a new value is written, causing the bit line to be lowered to 0V and the bit bar to be set to VDD. To work in write mode, SRAM must have write ability, the minimum bit line voltage necessary to flip a cell's state is defined as.

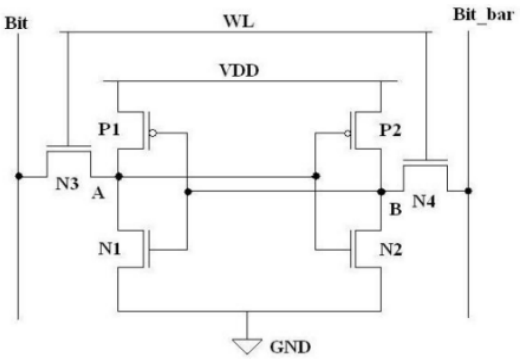

Fig4: Schematic of 6T SRAM Cell

Because of the decrease of write ability and read stability in the near and sub-threshold area, the conventional 6T cell ceases to function [6]. It is preferable to utilise a broad access transistor for a

successful write operation, but this may have an impact on read stability.

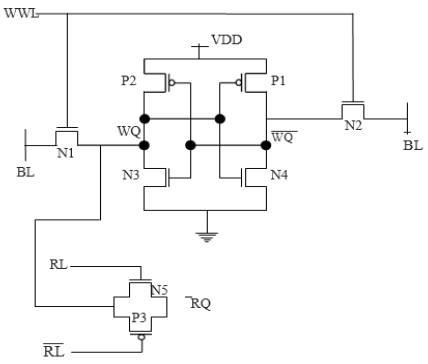

Fig5: 8T SRAM

The read operation is the main focus of the 8T SRAM design, whereas in prior systems, the read operation was limited to peripheral circuits. The Write process is identical in Conventional and other SRAM cells. Writing functions are handled by the Word Line (WWL). The Bit Lines BL and BL Bar receive the content that we want to write. The data from the Bit Lines can now intrude into the memory cell thanks to the enabled Word Line activating the access transistors. Intruded data will be cached in the WQ and WQBar storage nodes. The two complementing Read Lines RL and RLBar regulate the read operation, and they must both be enabled before the read can begin. By using a Transmission gate, the read port is created individually.

III. PROPOSED WORK

The design of a lowpower Static Random Access Memory (SRAM) is important for implantable devices and wireless applications where input power or battery life are important [1], [2], and whose operational frequency spans from a few hundreds of Kilohertz to tens of Megahertz [3] This is owing to SRAMs' substantial contribution to System on Chips (SoCs), since they account for around 70% of die area, which could be enlarged in the future [4]. As the number of SRAMs has grown, they have become more power hungry.

Transistors has increased and the leaking current of these transistors has decreased in scaled down technologies. Many different cells have been constructed in order to tackle the leakage problem. In [22], a circuit known as 10T-E1 was proposed as a recent work. A pmos transistor is included in the read path, which reduces the leaking current through the M6 transistor. However, the design also causes leaky current to pass from the node to the RBL, lowering the sensing margin and making the system data-dependent.

Modifies 10T-E1 by constructing Figures 5 and 6 show SRAM cells with only NMOS read ports (Referred as 10T-E2 and 10T-E3). The reading function is handled by a separate read port made up of four NMOS transistors (R1, R2, R3, and R4). Both designs contain isolated read ports, resulting in a more stable and less destructive read operation. Because the separate read port employs a transistor stack, bit line leakage is reduced.

The existing 10T cell, as well as many other comparable cells, improve read stability at the cost of increased space because they require a greater number of transistors. However, in many applications, such as biomedical and wireless, area occupancy is crucial. When it comes to biomedical implants, less device area occupancy inside the body means less intrusion into the human body. This brief proposes an 8T Transmission gate based SRAM cell in response to such a design challenge with SRAMs. By reducing peripheral circuitry, this design decreases the amount of space needed. Complex peripheral circuitry, including as a For the traditional 6T, you'll need a precharge circuit, write drivers, and a sensing amplifier and more sophisticated devices listed in this section. The peripheral circuits that encircle the cell region take up a significant amount of space in the total macro cell. According to a recent statement [25], the peripheral circuitry should account for roughly 25% of the macro area.

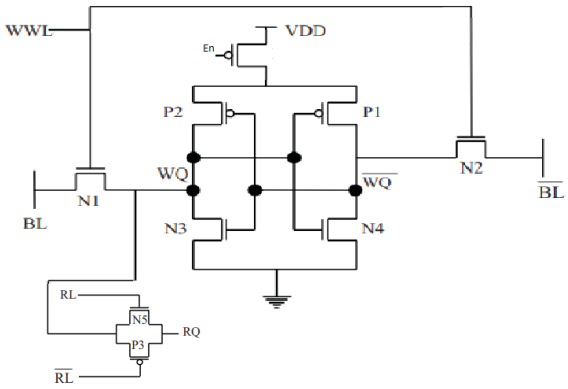

Fig6: proposed modified transmission gate based sram cell

The suggested modified transmission gate based SRAM cell focuses primarily on the read operation, which is now carried out solely by peripheral circuits in conventional designs. The Conventional and other SRAM cells have the same Write operation.

Writing functions are handled based on the word line (WWL). The Bit Lines BL and BL Bar receive the content that we want to write. The data from the Bit Lines can now intrude into the memory cell thanks to the enabled Word Line activating the access transistors. Intruded data will be cached in the WQ and WQBar storage nodes. The two complementing the read operation is governed by Read Lines RL and RLBar, both of which must be enabled before the read can commence.

The read port is protected by a transmission gate created individually. The main goal here is to read data from the WQ storage node. As a result, the data cached in the storage node WQ is sent on to the Transmission gates N5 and P3, which are both turned on because the Read Lines have been enabled. The data is now passed to the Read node RQ through the Transmission gate. Through the data saved in node WQ will appear at node RQ, thanks to the N5 and P3 transistors.

The content of the cell can be programmed without the requirement for complex peripheral circuitry read directly using a Transmission gate. The following is the generalized read energy equation: Where VRBL is the read bitline voltage, and V1 is the read bit line voltage once the read operation is completed. The read energy can be lowered with this design because the sense amplifier and precharge circuit are not used. This design decreases a 15 percent reduction in the number of transistors required to construct peripheral circuits, resulting in a 15 percent reduction in chip area the total quantity of power consumed drops as the number of transistors used lowers. This is because, as we'll see later, the number of transistors used in a design affects the leakage power.

$$P_{total} = P_{dyn} + P_{Leak}$$

$$P_{dyn} = CeV^2 \ f$$

$$P_{Leak} = Vdd \ Ntr \ Kd \ Is$$

Ntr signifies the number of transistors, Kd the device-specific constant, and I the normalised static current for each transistor. The lower the transistor count, the lower the leakage power of the transistors, and thus the lower the overall power dissipation of the circuit. The latency of creating the output, i.e. because the sense amplifier and precharge circuits used for read functionality in conventional designs are deleted in the suggested design, the time it takes to read the data stored in the storage nodes can be lowered as well. As a result, the read operation is carried out quickly with the help of the transmission gate.

This method also provides stability because the read and write ports are separated. A transmission gate's averaging effect two parallelly positioned transistors helps to neutralise the read current, resulting in superior stability than when the read current passes through a single NMOS transistor. By assuming the cell failure probability can be calculated using the Gaussian Distribution for a transistor's Threshold voltage [26] estimated. The formula is as follows:

$$P_{fail} = Prob$$

$$[SNM < V_{th}]$$

$$Where, \ V_{th} = kT/q$$

$$kT = 26 \ mV \ at \ 300K$$

Because the design is solely designed to perform the read process, the comparison of the suggested design is done for the read operation itself. The performance

findings are also homogeneous, as the Write and Hold actions are similar to the previous designs.

As a result, in the study offered here, the read status is taken into account. Power consumption, latency, stability, and cell area occupancy are common measures used to assess SRAM performance. The team's performance Conventional 6T (C6T), several current approaches (8T, 10T-E1, 10T-E2, and 10T-E3), and the Proposed 6T (P6T) in CMOS 45-nm Technology at 0.45V at room temperature methodology (8T-P) are compared.

IV. EXPERIMENTAL RESULTS

The comparison of the proposed design is done for the read operation itself since the design is intended to perform the read process only. Since the Write and Hold operations are similar to the existing designs, the performance results are also homogeneous. Therefore the results discussed here considers the read state. Generally, the performance analysis of SRAMs is based on certain parameters such as Power Consumption, Delay, and Stability and Area occupancy of the cell. The performance comparison of the Conventional 6T (C6T), other existing techniques (8T, 10T-E1, 10T-E2 and 10T-E3, 8T-P) and the Proposed power gating technique based modified 8T transmission gate is done in CMOS 45-nm Technology at 0.45V at room temperature.

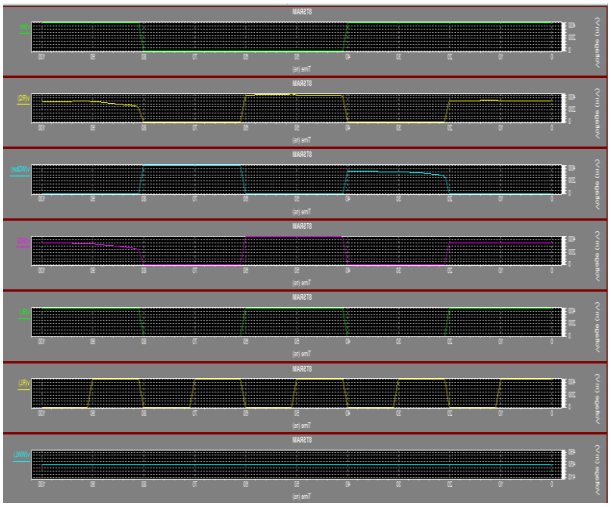

Fig 7: output simulation results of proposed SRAM

V. CONCLUSION

Transmission with a change For IoT applications, a gate-based SRAM design was used. The read action is not required in this configuration because the read port is decoupled. Power consumption, latency, stability, and area are all improved as a result of such a design. Furthermore, the reduced transistor count can cut power usage by up to 99 percent when compared to conventional 6T and other ways. When compared to the conventional 6T, 8T, 10TE1, 10T-E2, and 10T-E3, eliminating peripheral circuitry during the read operation and doing it directly with transmission gates results in a latency optimization. When the cell stores 'zero' and 'one,' the suggested cell uses the least amount of power compared to conventional 6T, 8T, 10TE1, 10T-E2, and 10T-E3 cells.

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Teacher Instructional Communication on Biology Learning During a Pandemic at SMA Negeri 10 Depok

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ABSTRACT

The purpose of this research is to find out the teachers' instructional communication in biology learning during the Covid-19 pandemic at SMA Negeri 10 Depok. This research uses qualitative approach with constructivist paradigm. The subjects of this research are 3 (three) Biology teachers, 1 (one) vice principal, and 3 (three) active students at SMA Negeri 10 Depok. Data collection techniques use interviews, observations, and document studies. The results shows that the implementation of learning at SMA Negeri 10 Depok is carried out in a face to face mode and online structured assignments by using the google suite for education platform. Instructional communication conducted by biology teachers during the pandemic at SMA Negeri 10 Depok was effective this is indicated by the evaluation results which show the achievement of student competencies above the minimum competencies determined by the school and has implemented the steps of instructional communication well including determining content and objectives specifications, measuring initial behavior, determining strategies, organizing instructional units, and feedback.

Keywords: Biology, Instructional Communication, Learning, Pandemic, Teacher.

I. INTRODUCTION

Effective communication is required to transmit messages to others. So that there is comprehension, enjoyment, effect on attitudes, harmonious relationships, and behavioral changes. The most important condition for effective communication is a strong character founded on a solid foundation of personal integrity. (Mufid, 2015) Individuals and groups may comprehend one other via communication.

Communication is essential in many facets of life, including the field of education. Because communication works as a mechanism in the process of conveying information from a communicator to communicants, the educational process cannot be isolated from communication activities. (2018) Kurniawan

Educational communication is communication that aims to improve the quality of education and learning as well as to solve various educational and learning challenges.(Nofrion, 2019). Communication in education is a method used by educators to transmit topic knowledge to students during the learning process. Communication in the context of learning is instructive. Communication in the educational or learning sector. To ensure that instructional communication activities operate well, a communicator must be present as a teacher, communicant, and medium. Teachers, instructors, or instructors or trainers are the primary sources in providing lessons, techniques, explaining, and presenting content to students who function as communicants in instructional communication. (Amalia, 2019)

With these varied occurrences in mind, instructors creativity and expertise in planning and executing instructional communication patterns in learning are required to attain the desired learning results.

This study aims to add to knowledge by investigating the role of biology teacher instructional communication on learning during the pandemic at SMAN 10 Depok. This study attempts to investigate and present an overview of how instructional communication implementation is applied in learning during the pandemic, so that schools may assess and improve linked to instructional communication implementation utilized in communication in schools.

II. METHODS AND MATERIAL

A qualitative technique is used in this investigation. Qualitative research is study that tries to understand what events are experienced by research participants, particularly behavior, perceptions, motives, actions, and others, in general, and via descriptions in the form of words and language, in a unique and natural setting. using various scientific methodologies (Thadi, 2019)

A paradigm, according to Baker, is a collection of principles that establish or define limits and describe how something must be done within those parameters in order to be effective. Muslim (2018) The constructivist paradigm is used in this study because the researcher aims to gain the development of the application of understanding that assists the process of interpreting an event. Researchers seek to investigate how the process of instructional communication occurs between biology professors and students at SMA Negeri 10 Depok, in line with the school environment's structure.

This study was carried out at SMA Negeri 10 Depok, Curug Village, Bojongsari District, Depok City, West Java Province, Indonesia because the school was established in 2014 and is a developing school, and it would be interesting to see how the instructional communication efforts in this school are aligned with another school that was first established in Depok City, particularly during the pandemic.

Because not all samples fit the requirements for the phenomena under research, informants were chosen using a purposive sampling approach. Purposive sampling, according to Sugiyono, is a method of obtaining samples as a data source while taking specific aspects into account. 2014 (Asyiah Gabena Siregar & Primasari) Using this method, we hope to discover how teacher instructional communication affects the biology learning process at SMAN 10 Depok during the covid-19 epidemic. This study had seven informants and lasted from April 21, 2022 to June 21, 2022.

III.RESULTS AND DISCUSSION

This research is an effort to model the online instructional communication process in biology learning. Symbolic interactionism research advances how the interchange of symbols occurs in the interactions that occur between instructors as communicators and students as communicants during the educational process. The findings of this study are

to see how the process of instructional communication in biology learning at SMAN 10 Depok through direct observation and interviews with several research informants, so that the facts obtained in the field regarding instructional communication, considering that the learning model during the pandemic is somewhat different from the learning model in the past, can be applied. During regular times, teachers must be creative while dealing with pupils. As a result, instructional communication is required.

The instructional communication process in learning is the good or bad situation of the teacher's teaching approach, personality, curriculum, learning infrastructure, classrooms, and so on to enhance outcomes attainment. Some instructional procedures are often dependent on how the instructor creates learning communication programs so that the messages sent may be comprehended by students with a wide range of characteristics.

Instructional communication management is required for the deployment of instructional communication during the epidemic at SMAN 10 Depok to function well. Communication planning, communication organization, communication execution, and communication assessment are some of the primary activities of instructional communication management. Yusuf and Ridwan (2018)

A. Instructional Communication Planning

The management of information in planning is a critical feature in both organizations and education. We can optimize the utilization of natural resources, human resources, and other development financing sources with careful planning.

The learning implementation plan document includes communication planning in the context of learning in schools. The instructor and school design excellent learning plans. Planning is done in the curriculum part by dividing the duties of teaching teachers, creating lesson plans, selecting learning apps, and learning modalities utilized in learning throughout the epidemic. Meanwhile, the teacher, including the biology teacher, prepares all of the lesson plan components, specifically a syllabus and lesson plan. Annual and semester programs are available. planning Academic refers to the educational calendar that is used every semester by modifying the effective date.

The preparation of the learning implementation plan during the pandemic that resulted in distance learning being carried out online is the same as the preparation of direct learning with a face-to-face pattern, the components and steps of learning activities are the same, the difference is in the learning strategy that was initially face-to-face directly to online.

Before implementing learning, the teacher also prepares the material to be delivered to students; in instructional communication, the material is the content of the message conveyed to students. The scope of material and competencies that must be achieved or mastered by students in a unit teaching at certain levels and types of education are built into standards content each subject.

The teacher's plans include educational objectives that must be met following learning activities, models and techniques for delivering learning materials, and guidelines for measuring the effectiveness of communication through learning achievement carried out with evaluation activities as the foundation for deciding feedback and actions. what is required of the teacher next. After learning activities, learning objectives must be met in order to demonstrate proficiency in accordance with the relevant curriculum.

Different biological learning strategies are employed during the epidemic, these types include direct learning, project-based learning, and inquiry-based learning. Although discussions, assignments, and games are occasionally employed by teachers, lectures still predominate the learning process. As of now, the models and techniques are thought to be the most suitable for usage in the current online environment.

Because the teacher considers the peculiarities of the subject matter, the characteristics of the participants, the allotment of time, and the learning media utilized during a session while choosing the learning model and technique, there are differences between them.

B. Implementation of Instructional Communication

Learning during the epidemic begins with the teacher entering the formed virtual class, greeting the students who are already present, and greeting the students again before learning ever begins. The teacher then gets the students ready to learn by recording the students who are already present. The teacher can also motivate students by using words of encouragement. To grab students' attention and get them excited and focused on participating in the lesson, the movie was shown at the start of the lesson along with questions about the prior subject. Additionally, the teacher communicates the goals and skills that students must master after engaging in learning.

Teachers use a variety of strategies during the pandemic's fundamental learning activities. Some employ direct learning, problem-based learning, or project learning. The lecture approach predominates, but the teacher also incorporates other methods like the discussion method and the game method. As for learning resources, teachers use textbooks from schools, powerpoint presentations, and the internet. The choice of models, methods, media, and learning resources used by biology teachers is adjusted to the characteristics of students and the characteristics of the material. Learning conditions during the pandemic are also done in accordance with the requirements of the curriculum. The core activities employ learning models, methods, media, and resources that are tailored to the characteristics of students and subjects.

The teacher concludes the learning outcomes with students, asks students for input on the learning process, provides reinforcement, conveys the next learning agenda, and then closes the lesson by saying greetings and asking permission to leave the meeting room on the Google Suite foreducation, while the children remain in the meeting room because they must follow the next lesson.

C. Evaluation of Instructional Communication

Following communication planning and implementation, the teacher must conduct communication evaluation. The evaluation will inform the teacher about the effectiveness of the communication. Student learning outcomes in the form of knowledge, skills, and attitudes competencies indicate the success of teacher instructional communication. Students demonstrating competence indicate that the content of the message conveyed, as well as the models and methods used, are as expected.

Teachers evaluate competency achievement after learning one basic competency through daily assessments, assignments, and assessments at the end of the semester. The evaluation is intended to determine the level of student absorption in the material being taught, as well as to obtain evaluation scores, so that the level of student progress in each of the basic competencies taught can be seen, as well as the follow-up that the teacher must do after seeing the evaluation results. The Google Quiz feature, Quiziz, or a computer-based test application owned by SMAN 10 Depok are used for evaluation purposes.

It is critical to follow up on problems that arise during the implementation of instructional communication. The assessment results can be used by the teacher to improve learning later on. These efforts are a follow-up to the instructional communication process that was completed.

IV. CONCLUSION

Instructional communication was carried out in biology learning at SMA Negeri 10 Depok during the pandemic by following good instructional

communication steps such as determining content and objective specifications, measuring initial behavior, determining strategies, organizing instructional units, and providing feedback. The communication process that occurs in biology learning is effective, as evidenced by students' learning outcomes in accordance with the school's minimum completeness criteria, demonstrating that the message conveyed is well received by the students.

Suggestions for future research to conduct a broader study on how the process of instructional communication affects the learning process of other subjects. It is also possible to conduct research on the variables that influence the implementation of instructional communication in learning.

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A Comparative Study of Montelukast and Salbutamol in Bronchial Asthma

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ABSTRACT

Current asthma drug therapy is highly effective, having evolved from naturally occurring substances via logical pharmaceutical developments. Pharmacology has played an important role in the development of asthma drugs, and several key experimental findings have been published in this journal. Understanding the pharmacology of effective drug therapies has also taught us a lot about the mechanisms underlying asthma. 2-Adrenoceptor agonists, which evolved from catecholamines in the adrenal medulla, are the most effective bronchodilators, whereas corticosteroids, which evolved from catecholamines in the adrenal cortex, are by far the most effective controllers of the underlying inflammatory process in the airways. A combination inhaler containing a long-acting 2-agonist and a corticosteroid - an improved form of adrenal gland extract - is the current "gold standard" of asthma therapy.

Theophylline, a dietary methyl xanthine, and chromoglycate, a plant-derived substance, have both been widely utilized in the treatment of asthma, but their molecular mechanisms are still unknown. Pharmacology has been crucial in enhancing natural products to create effective, long-lasting, and secure asthma medications, but it has faced difficulties in developing new classes of anti-asthma treatments. Leukotriene antagonists, the only brand-new type of anti-asthma therapy established in the previous 30 years, are less efficient than currently available medications. Corticosteroids are less successful than new, more focused medicines that target particular cytokines, but more focused medications run the risk of having side effects that may not be tolerable. Pharmacology, not molecular genetics, appears to be the most likely direction for future advancements in asthma treatment.

Keywords : Bronchial Asthma, Bronchodilator, Muscarinic antagonist, Theophylline , Corticosteroids.

I. INTRODUCTION

Chronic inflammatory and obstructive lung diseases known as bronchial asthma are varied, complex, and characterized by increased mucus production, airway, and bronchial hyperactivity, and, over time, structural and functional alterations in lung tissue. A third of the population is currently believed to suffer from asthma. On the planet, there are thought to be 235 million humans. Recurrent episodes of acute shortness of breath, which typically happen at night or in the early morning, are the primary symptom of bronchial asthma. A constriction in the chest as well as other symptoms like coughing and wheezing are also present. Asthma symptoms can appear often following demanding exertion.[1,2]

With the aid of asthma guidelines, the majority of asthmatics are under good control. But only a small proportion of asthma sufferers (5–10%) have severe asthma that is unresponsive to high doses of inhaled corticosteroids. For the management of severe asthma, phosphodiesterase inhibitors, long-acting 2 agonists (LABA) inhibitors, and/or anti-cholinergics with an extended half-life (LAMA) are also recommended, along with steroid injections and a second controller in case things get out of hand. In 2004, there were 2141 deaths attributed to asthma, according to the Statistisches Bundesamt in Germany. According to the World Health Organization (WHO), asthma is responsible for 15 million DALYs (disability-adjusted life years) lost annually, or 1% of all DALYs lost globally as a result of illness. This assessment serves as a diagnosis.[2,3]

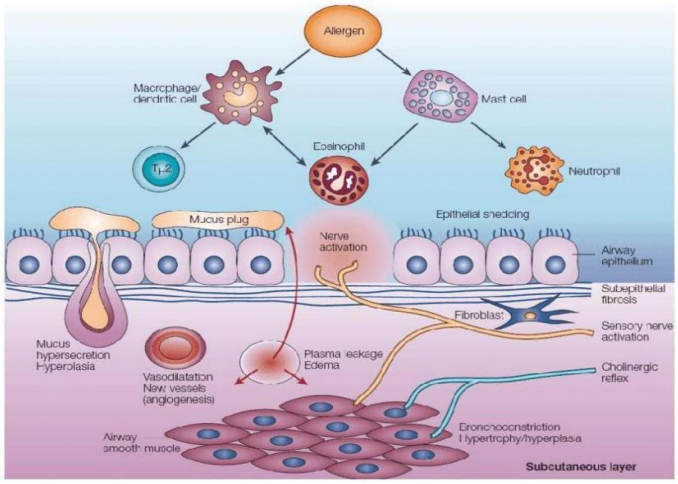
Physiology of Bronchial Asthma:

Asthma symptoms are known to be exacerbated by cold air, intense emotional arousal, physical activity, aspirin, and other NSAIDs, beta-blockers, indoor allergens (such as pet dander and house dust mites in bedding, carpets, and stuffed furniture), outdoor allergens (particularly molds and pollen), tobacco smoke, chemical irritants in the workplace, and air pollution. In several published research, severe asthma phenotypes have been linked to genetic factors, age of onset, duration of the disease, flare-ups, concurrent si1nus disease, and inflammatory characteristics. Broncho alveolar lavage and endobronchial biopsies were used in the first evaluation of asthma patients and identified various inflammatory subtypes. According to the idea of molecular phenotyping, molecular pathways have been linked to clinical and physiological characteristics of the disease.[4,5]

Pathophysiology of Bronchial Asthma:

Some people with asthma experience chronic respiratory impairment. Others experience an intermittent disease with episodic symptoms that can be brought on by a variety of factors, such as exercise, airborne allergens, and upper respiratory infections.[6,7]

An asthma attack is an acute exacerbation of the condition. Shortness of breath and wheezing, rapid breathing, prolonged expiration, a quick heartbeat, rhonchus lung sounds, and overinflation of the chest are the clinical signs. The accessory muscles of breathing are implicated in a severe asthma episode.People with severe asthma episodes may lose consciousness or become blue from a lack of oxygen. They may also have chest pain. Respiratory arrest and mortality may result from severe asthma attacks. Seven different types of stimuli are available: Asthma-inducing substances include aspirin and beta-adrenergic antagonists, common household insect waste, ozone, nitrogen dioxide, sulfur dioxide, industrial compounds, and other chemicals, particularly sulfide. Chlorinated swimming pools also produce chloramines, including monochloramine, dichloramine, and trichloramine, which are known to cause asthma.Infections in the early years of life, particularly respiratory virus infections. Exercise, which has considerably different impacts than the other triggers, is number six.[8,9]



During an asthma attack, inflamed airways react to environmental triggers like smoke, dust, or pollen.[10,11]

Due to the excess mucus that the inflamed airways produce, breathing can be difficult. In addition, asthma is the result of an abdominal immunological reaction to a bronchial immune reaction. The airways become hypersensitive to specific triggers, also known as stimuli. Asthma attacks are brought on by these factors narrowing the bronchial passages. Soon after, there is inflammation, which narrows the airways even more and causes an abundance of mucus to be produced, leading to coughing and other breathing issues.[12,13]

It is preferable to understand the mechanisms underlying allergic asthma, or asthma brought on by an immunological reaction to inhaled allergens, from the causes of asthma. Both asthmatic and non-asthmatic individuals who are exposed to allergens inhale them through the inner airway channel. Antigen-presenting cells then present the allergen to other immune system cells, which cause them to change into TH2 cells. The resulting TH2 cells stimulate the humoral immune system, which will create antibodies against the allergen breathed.[14,15]

In a later stage, when an asthmatic inhales the same allergen, these antibodies recognize it and trigger an inflammatory reaction that leads to inflammation, which releases chemicals that restrict the airways and release more mucus, as well as activating the cell-mediated immune system. The clinical presentation of an asthma episode is brought on by the inflammatory response.[16,17]

HISTORY OF ANTI-ASTHMATIC DRUGS

Asthma mortality and hospital admissions have significantly decreased as a result of the development of extremely effective medications for its therapy. Thanks to the use of drugs with almost no side effects, the majority of asthma sufferers may today live a normal life.[18,19]

It's interesting to note how many of our excellent asthma treatments have their roots in organic compounds. Numerous substances, including atropine, dietary xanthine compounds like theophylline, and chromones from a Mediterranean medicinal herb, were identified from plants as a result of the development of herbal treatments.[20,21]

MUSCARINIC RECEPTOR ANTAGONIST:

These treatments were readily available until late in the 20th century but were no longer used after the development of more potent bronchodilators made of adrenaline. The development of quaternary ammonium derivatives, which did not cross the blood-brain barrier and were, therefore, free of the central side effects, such as hallucinations, of naturally occurring atropine-like compounds, was a significant advancement in the use of muscarinic receptor antagonists for asthma. Ipratropium bromide, a synthetic quaternary anti-muscarinic chemical, is still utilized as a bronchodilator in patients with severe asthma even though these quaternary derivatives are not absorbed from the gastrointestinal tract.However, cholinergic bronchoconstriction only makes up a minor portion of the bronchoconstriction in asthma compared to the direct bronchoconstrictor action of other inflammatory mediators in the majority of patients, making it less efficient than a -agonist. But in the case of chronic obstructive

pulmonary disease (COPD), where the main modifiable factor appears to be cholinergic tone in the airways, antimuscarinic drugs have emerged as the preferred bronchodilators.The most recent development is the arrival of Boehringer Ingelheim's long-acting antimuscarinic, tiotropium, which causes bronchodilatation lasting for many days.

has a unique function and distribution, and has been a significant advancement in muscarinic pharmacology. The discovery that M3 receptors mediate the bronchoconstrictor action of cholinergic tone whereas M2 receptors served as feedback inhibitory receptors (autoreceptors) in animal parasympathetic nerves was a significant advancement in the field of lung pharmacology.This was subsequently verified in the airways of humans. The therapeutic implication is that nonselective muscarinic antagonists, such as atropine and ipratropium, stimulate acetylcholine synthesis from cholinergic nerves by inhibiting the M2 auto receptors and may thus overcome the blockage of the M3 receptors on airway smooth muscle cells. [22,23]This gave rise to the hypothesis that M3-selective antagonists would be superior bronchodilators. Tiotropium does, in fact, have a kinetic preference for M3 receptors since it separates from M3 receptors considerably more slowly than it does from M2 receptors. The lengthy duration of action is a more significant benefit, and it has not been conclusively demonstrated that M3 receptor selectivity has any significant clinical advantage.More long-acting muscarinic antagonists are now being developed, and they will be used both alone and in conjunction with long-acting 2-agonists, primarily for patients with COPD but also for those with asthma. Intriguingly, it has recently been discovered that the antimuscarinic drug glycopyrrolate, which has been used for many years by anesthesiologists to dry upper airway secretions, has similar pharmacology to tiotropium, with kinetic selectivity for M3 receptors and a prolonged half-life when administered via inhalation.

β–ADRENERGIC RECEPTOR AGONIST

Ephedrine, which is derived from the plant Ephedra and is also referred to as Ma Huang in Chinese medicine, has been used to treat respiratory illnesses for more than 5000 years. Thus, the earliest known anti-asthma medication is ephedrine. By releasing endogenous catecholamines, it has an indirect effect that causes bronchodilation. Dale demonstrated its efficacy through inhalation as early as 1910.German chemists first created isoprenaline in the 1940s. It was later shown to have fewer cardiovascular adverse effects than adrenaline, and for about 20 years it was the most used inhaled asthma medication. Because the bronchial response to isoprenaline and noradrenaline differs, Ahlquist was able to discriminate between - and -adrenergic receptors thanks to its production in 1948. It showed that -receptors may be further classified into 1-receptors in the heart and 2-receptors in the airways using the rank order of potency of natural and synthesized sympathomimetic amines.In humans, verified by Lands' discovery that isoetharine is a highly selective agonist at beta-2 adrenoceptors. Due to the catechol ring's quick metabolism, isoetharine's effects were brief, just as those of isoprenaline. The discovery of the first 2-selective agonist with a longer duration of action than isoprenaline by the team at Glaxo led by David Jack represented a significant advance, and Cullum concisely detailed its pharmacology in the British Journal of Pharmacology (later Alabaster). Salbutamol is still the most often prescribed asthma medication in the world today.Salmeterol, the first long-acting 2-agonist with a bronchodilator action of over 12 hours, was discovered by Brittain and Jack as a result of the next logical development, which was to increase the duration of action of salbutamol by substitution in the side chain. In 1990, inhaled salbutamol, which had been shown to have an extended duration of effect in asthma patients, was introduced into clinical use. Salbutamol, another long-acting 2-agonist, was first utilized as tablets in Japan, where there was no

indication of a lengthy duration of action. This wasn't known until after inhaled salbutamol was administered to asthmatic patients and found to have a comparable half-life to salbutamol.[24,25]

CORTICOSTEROIDS

It has been demonstrated that corticosteroids are the most effective asthma controllers, and it will be incredibly challenging to develop any other medication that even comes close to offering an equal therapeutic advantage. Given that adrenaline would be significantly metabolized upon absorption from the gastrointestinal system, it seems likely that the health advantages of the orally taken adrenal extract recorded by Solis-Cohen in 1900 were in fact brought on by the steroid content rather than any adrenaline present. This instantly suggested the necessity for inhaling corticosteroids to reduce systemic adverse effects, although doing so turned out to be of little use for cortisone and dexamethasone. Interestingly, Brown noted that the patients who fared the best had high eosinophil counts in their sputum, a finding that has been supported by a large number of later research. The main factor contributing to the recent decline in asthma mortality and morbidity is the widespread use of inhaled corticosteroids in treating asthma. With the development of budesonide, fluticasone propionate, and most recently ciclesonide, a prodrug that is activated by esterases in the lower airways, there is currently a quest for inhaled corticosteroids with superior therapeutic ratios and less systemic side effects.The molecular processes underlying the anti-inflammatory actions of corticosteroids in asthma have lately undergone a significant improvement, with a focus on how corticosteroids affect chromatin remodelling by increasing the recruitment of histone deacetylase-2 to activated inflammatory genes. Future research may lead to the development of selective glucocorticoid receptor agonists or dissociated steroids that have enhanced anti-inflammatory effects by suppressing activated inflammatory genes and reducing the binding of glucocorticoid receptors to DNA, which is thought to be a key mediator of side effects (see also Buckingham, this issue). It's interesting to note that the topically active corticosteroids now found in asthma inhalers already exhibit some degree of dissociation.[26,27]

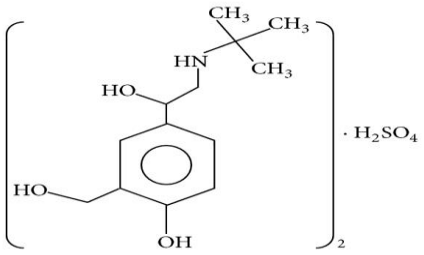
MECHANISM OF ACTION

When compared to isoproterenol, salbutamol has a preferential action on beta2-adrenergic receptors, according to in vitro and in vivo pharmacologic investigations. Beta2-adrenoceptors in the human heart make up 10% to 50% of all beta-adrenoceptors, despite beta1 adrenoceptors being the major receptors in the heart and beta2 adrenoceptors being the predominant receptors in bronchial smooth muscle. Although the precise role of these receptors is unknown, their presence suggests that even selective beta2-agonists could have cardiac effects.

Adenyl cyclase is activated by the activation of beta2-adrenergic receptors on airway smooth muscle, and the intracellular concentration of cyclic-3′,5′-adenosine monophosphate rises as a result (cyclic AMP). As a result of this rise in cyclic AMP, protein kinase A is activated, which prevents myosin from being phosphorylated and decreases intracellular calcium concentrations, causing the muscle to relax. All airways, from the trachea to the terminal bronchioles, have smooth muscles that can be relaxed by salbutamol. Regardless of the spasmogenic agent involved, salbutamol functions as a functional antagonist to relax the airway, defending against all bronchoconstrictor assaults. Increased levels of cyclic AMP are also linked to a reduction in the release of mediators from mast cells into the airway.

In the majority of controlled clinical trials, salbutamol was found to relax bronchial smooth muscles more than isoproterenol did at equivalent doses, while having less adverse cardiovascular effects. Inhaled salbutamol, like other beta-adrenergic agonist medications, has been demonstrated in controlled clinical research and other clinical experience to

induce a significant cardiovascular effect in some patients as determined by pulse rate, blood pressure, symptoms, and/or electrocardiographic changes.[28]



ADVERSE DRUG REACTIONS:

It's possible to have anxiety, vertigo, shaking (tremor), headache, nausea, mouth/throat dryness or irritation, or strange tastes. Inform your doctor or pharmacist as soon as possible if any of these side effects persist or get worse. Keep in mind that your doctor has recommended this medication because they believe it will benefit you more than it will harm you. Many users of this medicine report no significant negative effects.If you have any really significant side effects, including as chest pain, an irregular heartbeat, rapid breathing, or confusion, seek medical attention right once.

Precautions

Before taking salbuterol, let your doctor or pharmacist know if you have any allergies to it, any related medications, or any other conditions. To learn more, speak with your pharmacist. (such salmeterol, levalbuterol, or metaproterenol); or if you experience any additional allergies. This product may include inactive components that can cause allergic responses, like lactose and milk proteins.Tell your doctor or pharmacist about all of your medical conditions before using this drug, especially any that may affect your heart (such as an irregular heartbeat, angina, or a history of heart attacks), high blood pressure, or seizures.You can feel lightheaded after using this medication. You may feel more lightheaded after consuming alcohol or cannabis. Till you can do it safely, avoid operating machinery, driving, or doing anything else that requires alertness. Limit your alcohol consumption.

Interactions

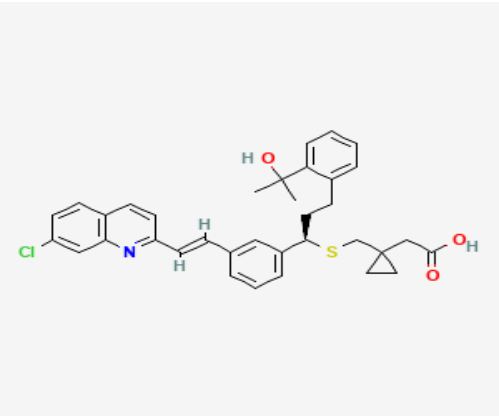
Drug interactions could alter how your medications function or raise the possibility of major negative side effects.Not all medication interactions are included in this document. Keep a list of everything you use, including herbal products, prescription, and over-the-counter medications, and provide it to your doctor and pharmacist. Without your doctor's approval, never start, stop, or change the dosage of any medications.When using salbutamol, avoid taking drugs that include levalbuterol.[29]

Uses

1. Wheezing and shortness of breath brought on by breathing difficulties are prevented and treated with salbutamol (such as asthma, and chronic obstructive pulmonary disease).
2. It is also used to stop exercise-induced asthma. It is a drug for fast relief. Salbutamol is a member of the bronchodilator drug class

Mechanism of Action

When such CysLT bind to associated CysLT receptors, such as CysLT type-1 receptors found on respiratory airway smooth muscle cells, airway macrophages, and on various pro-inflammatory cells like eosinophils and some particular myeloid stem cells, activities that facilitate the pathophysiology of airway bronchoconstriction, occluding mucous secretion, vascular permeability, and eosinophil recruitment are all types of



As opposed to this, in allergic rhinitis, CysLTs are released by the nasal mucosa when exposed to

allergens during both early and late phase reactions and help to cause symptoms of allergic rhinitis such a stuffy nose and congested airways.

As a result, montelukast is a leukotriene receptor antagonist that binds to the CysLT type 1 receptor with high affinity and selectivity. This helps to block any physiological activities of CysLTs like LTC4, LTD4, and LTE4 at the receptor that might support asthma.

Interaction

- Drug interactions could alter how your medications function or raise the possibility of major negative side effects. All probable medication interactions are not included in this document.
- Keep a list of everything you use, including prescription and over-the-counter medications as well as herbal remedies, and provide it to your doctor and pharmacist.
- Without your doctor's approval, never start, stop, or change the dosage of any medications.

Precautions

- Tell your doctor or pharmacist if you are allergic to montelukast or if you have any other allergies before taking the medication. Inactive chemicals in this product have the potential to trigger allergic reactions or other issues. To learn more, speak with your pharmacist.
- Inform your doctor or pharmacist about your medical history before using this medication, especially if you have liver disease or mental/mood issues (such as anxiety, depression, or thoughts of suicide).
- Aspartame could be present in chewable tablets. Ask your doctor or pharmacist about using this medication safely if you have phenylketonuria (PKU) or any other condition that requires you to limit or avoid aspartame (or phenylalanine) in your diet.

Uses:

- Asthma symptoms are managed and prevented with the use of the drug montelukast (such as wheezing and shortness of breath). It is also taken prior to exercise to avoid respiratory issues when exercising (bronchospasm).
- The frequency with which you need to use your rapid relief inhaler may be reduced with the aid of this medicine. Sneezing, stuffy/runny/itchy nose, and other allergic rhinitis symptoms can be treated with montelukast.
- This medicine should only be used for this condition when other allergy medications cannot be used or do not work effectively, as there are other allergy medications that may be safer (see also the Warning section).
- To be successful, this drug needs to be used on a daily basis. Since it takes time to start working, it shouldn't be used to treat sudden asthma attacks or breathing issues. Use your quick-relief inhaler as directed if you experience an asthma attack or abrupt shortness of breath.
- Leukotrienes, which may cause or aggravate allergies and asthma, are blocked by this medication. By lowering swelling (inflammation) in the airways, it facilitates breathing.[30]

CONCLUSION

A significant, multicenter study found that over the course of eight years, a greater percentage of participants reported using asthma drugs. Symptomatic asthma has increased in the study population at the same time. In order to maintain and regulate asthma symptoms, controller drugs are crucial. To treat acute asthma symptoms, all patients require a "quick-relief" 2 adrenergic agonist drug as well as leukotriene modifiers. The goal of drug therapy for long-term asthma control is to reduce and eventually stop airway inflammation. After conducting this market research, we have come to the conclusion that salbutamol is not as widely utilized as

montelukast, a leukotriene modulator. Montelukast has shown to be very helpful in treating asthma brought on by exercise and asthma linked with allergic rhinitis. Asthma in obese people, asthma in smokers, aspirin-induced asthma, and virally produced wheezing episodes are other phenotypes where montelukast is helpful.

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रायगढ़ जिले के ग्रामीण क्षेत्र में छात्राओं की उच्च शिक्षा और महिला अधिकारिता पर एक अध्ययन

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सार

छात्राओं के सशक्तिकरण का विषय पिछले कुछ दशकों से छत्तीसगढ़ सहित पूरी दुनिया में एक ज्वलंत मुद्दा बनता जा रहा है। लड़कियों और महिलाओं को अब समानता के लिए और इंतजार नहीं किया जा सकता है। चूंकि उच्च शिक्षा हमारे समाज को सुधारने में मदद करती है, इसलिए उच्च शिक्षा प्राप्त करने वाली लड़कियों को महिला सशक्तिकरण के मुद्दे के साथ-साथ ध्यान में रखा जाना चाहिए। इसलिए, वर्तमान पेपर में रायगढ़ जिले के ग्रामीण क्षेत्रों में उच्च शिक्षा में छात्राओं के महिला सशक्तिकरण के स्तर का अध्ययन करने का प्रस्ताव है। प्रस्तुत अध्ययन का मुख्य उद्देश्य उच्च शिक्षा में निर्णय लेने के संबंध में छात्राओं के सशक्तिकरण के स्तर का पता लगाना था।

कीवर्ड :उच्च शिक्षा, छात्राएं, महिला सशक्तिकरण और ग्रामीण क्षेत्र

अधिकारिता का अर्थ:

लगभग हर समाज में और जीवन के हर क्षेत्र में महिलाओं को असमान स्थिति और स्थिति का सामना करना पड़ता है; इस प्रकार समान अवसर प्रदान करके उन्हें सशक्त बनाने की आवश्यकता है। सशक्तिकरण शब्द एक बहुआयामी सामाजिक प्रक्रिया है और यह लोगों को अपने जीवन पर नियंत्रण पाने में मदद करती है। इसके अलावा, इसे एक ऐसी प्रक्रिया के रूप में कहा जा सकता है जो लोगों को अपने जीवन, अपने समुदायों और अपने समाज में उपयोग करने के लिए उन मुद्दों पर कार्य करके शक्ति को बढ़ावा देती है, जिन्हें वे महत्वपूर्ण समझते हैं। समाज के सर्वांगीण विकास के लिए लड़कियों का सशक्तिकरण महत्वपूर्ण है। सशक्तिकरण शब्द का अलग-अलग संदर्भ में अलग-अलग अर्थ है। सशक्तिकरण शब्द में आत्म-शक्ति, आत्म-निर्णय, स्वतंत्रता, आत्म-शक्ति, आत्म-नियंत्रण, आत्मनिर्भरता, अपने अधिकारों के लिए लड़ना आदि शामिल हैं। एक महिला परिवार का मूल है और मानव समाज का आधा हिस्सा है। वह भावनात्मक रूप से हर जगह परिवार के लिए एक बाध्यकारी शक्ति है। वह सभी धार्मिक समारोहों और सामाजिक कार्यों में पुरुषों के साथ समान रूप से हिस्सा लेती हैं। भारत में महिलाओं को समान शिक्षा, समान रोजगार, समान वेतन और पुरुषों के समान दर्जा, स्वाभिमान, गौरव और स्वाभिमान से वंचित किया गया है। वे खुद को कैदी के रूप में देखते हैं जो आज्ञाकारिता और अनुरूपता के लिए आशाहीन हैं, केवल मृत्यु में मुक्ति और स्वतंत्रता पाने के लिए। फिर भी, राष्ट्रीय विकास में महिलाओं का योगदान महत्वपूर्ण है, और राष्ट्र के आर्थिक विकास और सामाजिक प्रगति के लिए उनकी मुक्ति आवश्यक है। महिलाओं को विकास प्रक्रिया में एक शक्ति के रूप में पहचाना जाना चाहिए और इसमें सक्रिय रूप से शामिल होना चाहिए।

वर्तमान अध्ययन निर्णय लेने, उच्च शिक्षा में भागीदारी और सामाजिक, राजनीतिक और कानूनी जागरूकता के संबंध में छात्राओं के सशक्तिकरण के स्तर का आकलन करने के लिए किया गया है, जिसके माध्यम से हम उनकी स्थिति से परिचित हो सकते हैं। यह सम्मान।

संबंधित साहित्य की समीक्षा करें

भदौरिया और मृदुला, (2005) ने अपने लेख" उच्च शिक्षा तक महिलाओं की पहुंच "में विश्लेषण किया है। परिणामों से पता चला कि महिलाओं की उच्च शिक्षा के बारे में पुनर्विचार करने की आवश्यकता है।38 .84% महिलाएं उच्च शिक्षा प्राप्त करती हैं, उच्च शिक्षा की गुणवत्ता सुनिश्चित नहीं करती हैं। तकनीकी विषयों जैसे। इंजीनियरिंग, चिकित्सा, पशु चिकित्सा विज्ञान और कानून को बिना गुणवत्ता के छोटे शहरों और कस्बों के कॉलेजों में इन विषयों के माध्यम से महिलाओं की पहुंच के लिए बढ़ाया जाना चाहिए। महिलाओं के लिए लघु अवधि के विविध पाठ्यक्रम शुरू किए जाने चाहिए जो बड़े असंगठित और संगठित क्षेत्र को पूरा कर सकें। उपरोक्त कदमों के अलावा सामाजिक जागरूकता, सामाजिक वातावरण और महिलाओं के पक्ष में सामाजिक सुरक्षा ऐसे बुनियादी बिंदु हैं जिन पर ध्यान दिया जाना चाहिए। धमीजा और पांडा 2006ने "शिक्षा के माध्यम से महिला सशक्तिकरण :विश्वविद्यालयों की भूमिका "पर अध्ययन किया। अध्ययन से पता चला कि महिलाओं को शिक्षित करने से पूरे समाज को लाभ होता है और इस शिक्षा के आधार पर वे हमारे समाज में अपनी स्थिति का आनंद लेते हैं। पुरुषों की शिक्षा की तुलना में इसका गरीबी और विकास पर अधिक महत्वपूर्ण प्रभाव पड़ता है। यह बाल स्वास्थ्य में सुधार और शिशु मृत्यु दर को कम करने में सबसे प्रभावशाली कारकों में से एक है। खान, जे .2020 ने" महिला सशक्तिकरण और रोजगार लिंग अध्ययन पृष्ठभूमि अध्ययन "शीर्षक से एक लेख प्रकाशित किया है। लेख मुख्य रूप से घरेलू स्तर पर निर्णय लेने के अधिकार के माध्यम से महिला सशक्तिकरण और रोजगार पर केंद्रित है। इस अध्ययन का मुख्य उद्देश्य घरेलू स्तर पर निर्णय लेने की शक्ति के माध्यम से महिला सशक्तिकरण और रोजगार की जांच करना था। ने पाया है कि घरेलू स्तर पर महिला सशक्तिकरण, रोजगार और निर्णय लेने की शक्ति के बीच सकारात्मक संबंध है।

अध्ययन का उद्देश्य

अध्ययन के निम्नलिखित उद्देश्य थे:

1. अपने इलाके के संबंध में किशोरियों के सशक्तिकरण में अंतर का पता लगाना
2. निर्णय के संबंध में ग्रामीण और शहरी किशोर छात्राओं के बीच अंतर का अध्ययन करना बनाना।

अध्ययन की परिकल्पना

अध्ययन के उद्देश्यों के आधार पर निम्नलिखित परिकल्पनाएँ तैयार की गईं:

Ho: किशोर लड़कियों के सशक्तिकरण में कोई महत्वपूर्ण स्थानीय अंतर नहीं होगा

Ho: ग्रामीण और शहरी किशोर छात्राओं के बीच कोई महत्वपूर्ण अंतर मौजूद नहीं है निर्णय लेने के संबंध में

जनसंख्या :वर्तमान अध्ययन के लिए शहरी छात्र वे हैं जो नगरपालिका सीमा के भीतर आते हैं और ग्रामीण छात्र वे हैं जो नगर सीमा से परे आते हैं। जनसंख्या वर्तमान जांच में, सरकार की किशोर लड़कियां। रायगढ़ जिले के उच्च माध्यमिक विद्यालयों ने जनसंख्या का गठन किया।

उपकरण :डॉ .देवेंद्र सिंह सिसोदिया और डॉ .अल्पना सिंह द्वारा टूल यूज़्ड एडोलसेंट गर्ल्स एम्पावरमेंट स्केल) 2009(

विश्लेषण

तालिका1 : किशोर लड़कियों के उनके सशक्तिकरण के औसत स्कोर का महत्वपूर्ण अनुपात दिखा रहा है।

S.No.	Variables	N	M	σ	C.R.	स्तर का महत्व
1	किशोरियों का सशक्तिकरण	85	201.36	18.55	3.56	0. 01स्तर पर महत्वपूर्ण
2		85	190.34	11.21		

तालिका2 : ग्रामीण और शहरी किशोर छात्राओं के बीच अंतर दिखा रहा है

	निर्णय लेना						
क्षेत्र	N	Mean	Std. Deviation	Mean Difference	t	Df	Sig. (2- tailed)
ग्रामीण	85	22.29	4.911	-2.798	-3.140	193	.000
शहरी	85	25.15	4.685				

निष्कर्ष :अध्ययन के निष्कर्षों के अनुसार यह पता चला है कि ग्रामीण और शहरी क्षेत्र की किशोर लड़कियों के सशक्तिकरण में महत्वपूर्ण अंतर हैं और औसत स्कोर की तुलना करने पर हमें पता चलता है कि ग्रामीण क्षेत्र से संबंधित लड़कियों का औसत स्कोर शहरी समकक्षों की तुलना में अधिक है। शैक्षिक निहितार्थ अध्ययन के निष्कर्षों के आधार पर निम्नलिखित निहितार्थ निकाले गए:

1. शिक्षा व्यक्ति के जीवन में बहुत महत्वपूर्ण भूमिका निभाती है। एक लड़की शिक्षित होगी तो पूरा परिवार शिक्षित होगा। शिक्षा लड़कियों को सशक्त बनाने में मदद करती है।

2. अध्ययन के निष्कर्षों से पता चला कि लड़कियों के सशक्तिकरण पर इलाके का महत्वपूर्ण प्रभाव है। यह स्पष्ट रूप से दर्शाता है कि लड़कियों के लिए कुछ जागरूकता कार्यक्रमों की व्यवस्था करने के लिए एक स्कूल या संस्थानों की तत्काल आवश्यकता होनी चाहिए कि वे अपने समाज के प्रति अपनी भूमिका जिम्मेदारियों को समझें।

3. "निर्णय लेने के संबंध में ग्रामीण और शहरी किशोर छात्राओं के बीच कोई महत्वपूर्ण अंतर मौजूद नहीं है "को खारिज कर दिया जाता है। निष्कर्ष बताते हैं कि निर्णय लेने के मामले में ग्रामीण किशोर लड़कियां शहरी किशोर लड़कियों में अपने समकक्षों की तुलना में कम सशक्त हैं। इसके अलावा, औसत मूल्यों में अंतर काफी महत्वपूर्ण है, इस प्रकार शहरी और ग्रामीण कॉलेजों में किशोर लड़कियों के पास निर्णय लेने के संबंध में अलग-अलग जागरूकता स्तर हैं। शहरी किशोरियों के माध्य का अधिक महत्व दर्शाता है कि वहां की लड़कियों में संबंधित आयाम के संबंध में अधिक जागरूकता है। ग्रामीण क्षेत्र में पारिवारिक वातावरण और पालन-पोषण शैली में सुधार की आवश्यकता है। अन्य शोधों से पता चला है कि पारिवारिक वातावरण व्यक्तिगत स्वायत्तता के अवसर प्रदान करता है और परिवार के निर्णय लेने में शुरुआती किशोरों की भूमिका को प्रोत्साहित करता है जो सकारात्मक परिणामों से जुड़े होते हैं जैसे आत्म सम्मान, आत्मनिर्भरता, किशोर और छात्र शिक्षक संबंधों से संतुष्टि, सकारात्मक समायोजन और उन्नत नैतिक तर्क.

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Performance Analysis of VLC System for NRZ And Rz-Ook Modulation Technique by Using Mach-Zehnder Modulator

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ABSTRACT

With the radio frequency spectrum becoming crowded, an alternative means to wireless communication is necessary to accommodate the exponentially increasing wireless traffic demand. By employing light from LEDs as the communication channel, visible light communication systems provide an alternative to the present norms of wireless information transport. The optical transmitter in these systems blinks quickly enough that the human eye will not notice the change in light intensity, but an optical receiver can detect the on-off behaviour and decipher the information contained within. In this paper we have analyzed the performance of visible light communication using mach zhender modulator for RZ-OOK and NRZ-OOK modulation formats. We have implemented WDM (Wavelength Division Multiplexing) channel for various streams of data. The Quality Factor and log of BER values for various data rates and link distances are used to evaluate the communication system. With a maximum Q factor of 46, this system can provide 2 Gbps data throughput across a connection distance of up to 2500 m. The communication is conducted via an optical transmitter, and NRZ-OOK and RZOOK modulation studies are conducted.

Keywords : Zhender Modulator , NRZ-OOK, RZ-OOK,

I. INTRODUCTION

A wireless technique called visible light communication (VLC) allows for the rapid transport of data using visible light. Modulating the intensity of light emitted by a light source allows for the transmission of this data (or any optical transmitter). An optical receiver, such as a photodiode, receives the signal and converts it into legible and easily consumable forms for end users. This often refers to the full electromagnetic spectrum, which ranges from gamma rays to radio waves, when discussing light. The term "visible light" refers to that fraction of the electromagnetic spectrum that is

Visible to the human eye. When compared to systems that employ radio frequency, the use of visible light for data transfer has a number of major advantages. Its

major benefit is that the visible light spectrum is 10,000 times bigger than the radio spectrum, which is likewise overused and overcrowded and has a smaller bandwidth. The huge expanse of the visible light spectrum, which provides 300 THz of license free bandwidth carried on visible wavelengths, makes VLC a realistic choice, especially given that mobile traffic is predicted to expand sevenfold by the year 2021. In addition to the visible light spectrum's vastness, light travels at a speed of 186,000 miles per second, which is far quicker than radio waves' airborne speed of 344 metres per second. When compared to systems that employ radio frequency, the use of visible light for data transfer has a number of major advantages. Its major benefit is that the visible light spectrum is 10,000 times bigger than the radio spectrum, which is likewise overused and overcrowded and has a smaller bandwidth. The huge expanse of the visible light spectrum, which provides 300 THz of license free bandwidth carried on visible wavelengths, makes VLC a realistic choice, especially given that mobile traffic is predicted to expand sevenfold by the year 2021. In addition to the visible light spectrum's vastness, light travels at a speed of 186,000 miles per second, which is far quicker than radio waves' airborne speed of 344 metres per second.

HISTORY OF VLC

The development of the picture phone, which sent voice over several hundred metres of modulated sunlight, by Scottish-born scientist Alexander Graham Bell in the 1880s in Washington, D.C., marks the beginning of visible light communications (VLC). This was done before radio speech transmission. At Keio University in Japan's Nakagawa Laboratory, more recent work utilising LEDs to transfer data using visible light started in 2003. Since then, there have been a lot of VLC-related research projects. In order to enable broadband connectivity for indoor applications, researchers from CICTR at Penn State suggested combining white light LED with power line communication (PLC) in 2006 [1]. According to this study, VLC may someday be used as the ideal last mile option. In January 2010, a group of researchers from Siemens and the Fraunhofer Institute for Telecommunications at the Heinrich Hertz Institute in Berlin showed that a white LED can transmit data at 500 Mbit/s over a 5-meter (16-foot) distance and at 100 Mbit/s over a longer distance [2]. The IEEE 802.15.7 working group is responsible for conducting the VLC standardization process. 2010 December St. Cloud, Minnesota, the first commercial application of this technology, inked a deal with LVX Minnesota. TED Global hosted a talk in July 2011. Gave a live demonstration of HD video being communicated via a regular LED light source and suggested the moniker "Li-Fi" to describe a subset of VLC technology. Indoor positioning systems based on VLC have gained popularity recently. According to ABI research, it may hold the key to opening up the $5 billion "interior location market." Nakagawa Laboratory has been publishing articles, while Byte Light has filed a patent. On an LED digital pulse identification light placement system in March 2012[4] [5]. Researchers from COWA at Penn State [6] and other institutions worldwide [7] [8]. Due to its cheap cost and complexity implementation, which only needs one microcontroller and one LED as the optical front-end, toys are another new application [9]. Security can be offered by VLCs [10] [11]. They are particularly helpful in personal area networks and body sensor networks. Recently, VLC communication lines up to 10 Mb/s have been built using Organic LEDs (OLED) as optical transceivers [12]. Axrtek released the MOMO commercial bidirectional RGB LED VLC system in October 2014; it has a range of 25 feet and transmits down and up at a speed of 300 Mb/s. At order to provide VLC location-based services to customers' smartphones in a hypermarket in Lille, France, Philips teamed up with the grocery chain Carrefour in May 2015 [13]. Two Chinese businesses, Kuang-Chi and Ping a Bank, joined together in June 2015 to launch a payment card that transmits data using a special visible light [14Philips launched the

first VLC location-based services for customers' cellphones in Germany in March 2017. The piece was shown at Düsseldorf's Euro Shop. The technology is being used by an Edeka supermarket in Düsseldorf-Bilk as the first supermarket in Germany. It can reach positioning precision of 30 cm, which fits the unique requirements in the food retail industry. VLC-based indoor positioning systems may be used to find people and steer indoor robotic vehicles in settings including hospitals, nursing homes, warehouses, and big, open workspaces. Indoor positioning systems based on VLC have gained popularity recently. According to ABI research, it may hold the key to opening up the $5 billion "interior location market Nakagawa Laboratory has begun releasing publications, and Byte Light has applied for a patent. On an LED digital pulse identification light placement system in March 2012[4] [5]. COWA at Penn State [6], as well as other scientists worldwide [7] [8]. Due to its cheap cost and complexity implementation, which only needs one microcontroller and one LED as the optical front-end, toys are another new application [9]. Security can be offered by VLCs [10] [11]. They are particularly helpful in personal area networks and body sensor networks. Recently, VLC communication lines up to 10 Mb/s have been built using Organic LEDs (OLED) as optical transceivers [12]. Axrtek released the MOMO commercial bidirectional RGB LED VLC system in October 2014; it has a range of 25 feet and transmits down and up at a speed of 300 Mb/s. At order to provide VLC location-based services to customers' smartphones in a hypermarket in Lille, France, Philips teamed up with the grocery chain Carrefour in May 2015 [13]. Two Chinese businesses, Kuang-Chi and Ping and Bank, teamed up to launch a payment card in June 2015 that transmits data via a special visible light [14]. The first VLC location-based services were launched by Philips in Germany in March 2017. The piece was shown in Düsseldorf's EuroShop. The technology is being used by an Edeka supermarket in Düsseldorf-Bilk as the first supermarket in Germany. It can reach positioning precision of 30 cm, which fits the unique requirements in the food retail industry. VLC-based indoor positioning systems may be used to identify people and manage indoor robots in settings like hospitals, nursing homes, warehouses, and big, open workspaces.

SYSTEM MODEL

2.1 MODULATION FORMAT

We have used two modulation technique: RZ-OOK modulation and NRZOOK modulation. 2.1.1 NRZ-OOK modulation the transmitter section of our system is shown in Figure: 1(a) and Figure: 1(b). In this section, we have four sub-system. Each of these subsystem contains Continuous Wave (CW) LASER, NRZ pulse generator, MZ modulator and some measurement tools to measure various parameters to analyze the results. In each subsystem Continuous wave (CW) laser that generates a continuous wave optical signal, Mach Zehnder Modulator which controls the amplitude of the optical wave and converts the binary input into an optical signal, PRBS (Pseudo Random Bit Sequence generator) which generates a random bit stream of data, NRZ pulse generator which maps the binary signal to be transmitted as logic 1 to a high level and logic 0 to a low level and an optical amplifier to improve the quality of the signal being transmitted. A fork is connected to the output of WDM multiplexer which is used to duplicate the input beam. The multiple laser beams from the fork are then combined using a power combiner and the output from the power combiner is propagated through the transmission channel of FSO. An optical adder is used to sum up two optical signals which add the amplitude of the two input signal.

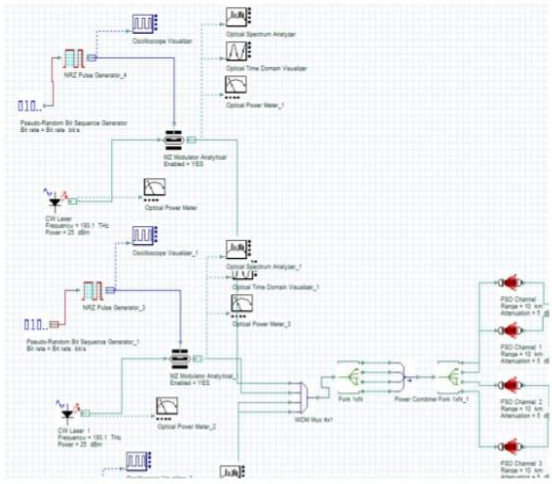

Figure:1(a)

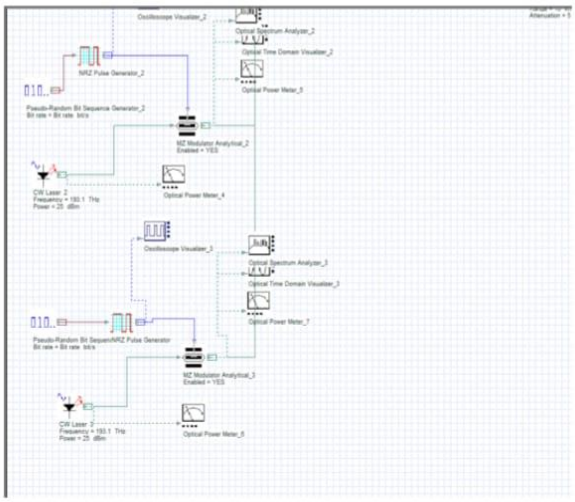

Figure:1(b)

The receiver section is shown in figure: 1(c) and figure: 1(d) consists of a WDM DE multiplexer that has the similar specifications as that of the WDM multiplexer used. DE multiplexer is used to divide the signal corresponding to its wavelength. A subsystem is used at every port of DE multiplexer in the receiver end which comprises of components such as detector, filter, 3R Regenerator and a BER analyzer. Then a detector (optical receiver) is used which is one of the basic component in the receiver section that converts the optical signal to an electrical signal. A 3R Regenerator is then used which performs operations such as reshaping, retiming and amplification of the data pulse. A low pass Bessel filter is used which allows only the signals at a particular range of frequencies. Finally, an analyzer named BER analyzer is used to measure the parameters like minimum BER, maximum quality factor, eye height and threshold value.

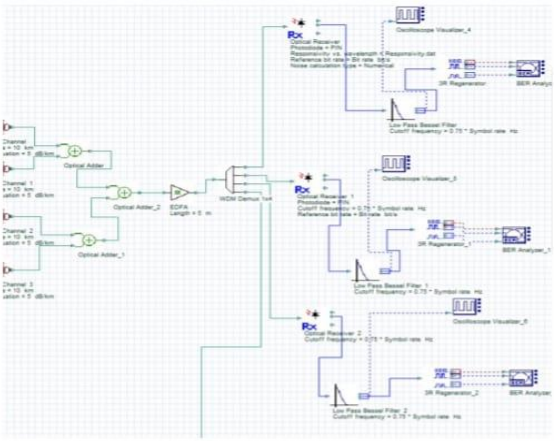

Figure:1(c)

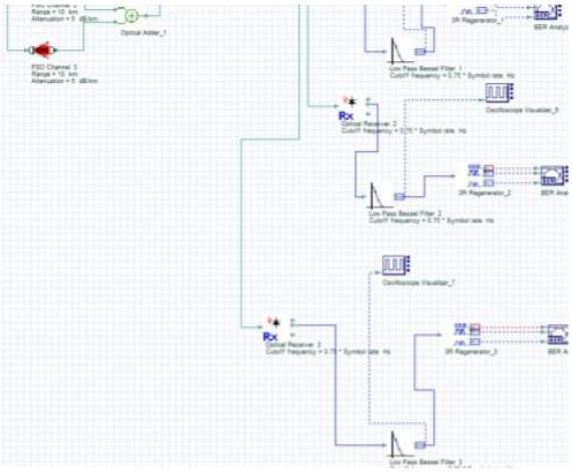

Figure:1(d)

2.1.1 RZ-OOK

Modulation The transmitter section of our system is shown in Figure: 2(a) and 2(b). In this section, we have four sub-system. Each of these subsystem contains Continuous Wave (CW) LASER, RZ pulse generator, MZ modulator and some measurement tools to measure various parameters to analyse the results. In each subsystem Continuous wave (CW) laser that generates a continuous wave optical signal, Mach Zehnder Modulator which controls the amplitude of the optical wave and converts the binary input into an optical signal, PRBS (Pseudo Random Bit Sequence generator) which generates a random bit stream of data, RZ pulse generator which maps the binary signal to be transmitted . A fork is connected

to the output of WDM multiplexer which is used to duplicate the input beam. The multiple laser beams from the fork are then combined using a power combiner and the output from the power combiner is propagated through the transmission channel of FSO.

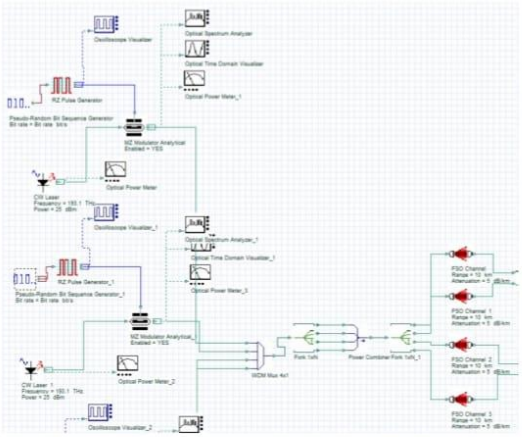

Figure:2(a)

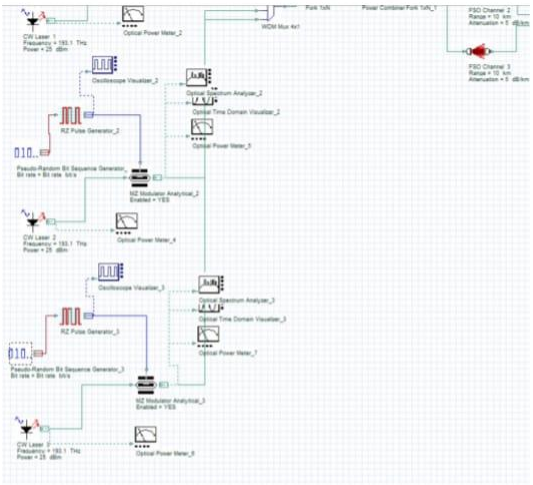

Figure:2(b)

RESULT AND DISCUSSION

3.1 NRZ-OOK MODULATED SIGNAL ANALYSIS

For the deigned VLC system the white LED having the bandwidth of 300 nm at centre frequency of 550 nm. The designed system is analysed for different bitrates along with different link distance in meter. Here, initially the NRZOOK modulated signal is taken for analysis. Figure: 3(i) depicts the Q factor of the detected signals for the bitrate variation from 400 Mbps to 2 Gbps with respect to the link distance up to 2500 m. From results, it has been found that our simulated VLC system could support 2 Gbps with an optimum Q factor 42 at link range 2500 m, beyond which the received signals tend to become degraded. At the bit rate of 400 Mbps, our designed system provides the superior performance of about Q factor whose value of 257 for the link range below 1000 m. And for the same bit rate, maximum transferable distance is obtained as 3000 m with Q factor 20.1. Figure: 3(ii) also confirms that our VLC systems could support 2 Gbps up to the link distance of 2500 m, and found log of BER -3.11.

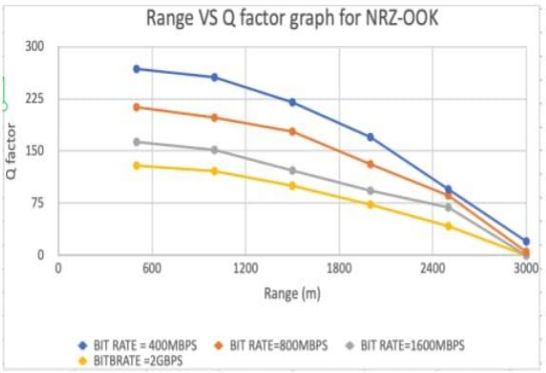

Figure:3(i)

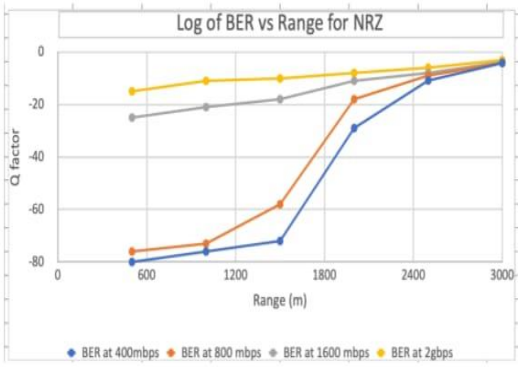

Figure:3(ii)

3.2 RZ-OOK MODULATED SIGNAL ANALYSIS

In our designed VLC system there is a very little difference in results of RZOOK modulation and NRZ-OOK modulation. RZ-OOK modulated signal shows slightly better result than NRZ-OOK modulated signal. Figure: 3(iii) depicts the Q factor of the detected signals for the bitrate variation from 400 Mbps to 2 Gbps with respect to the link distance up to 2500 m. From results, it has been found that our simulated VLC system could support 2 Gbps with an optimum Q factor 46 at link range 2500 m, beyond

which the received signals tend to become degraded. At the bit rate of 400 Mbps, our designed system provides the superior performance of about Q factor whose value of 260 for the link range below 1000 m. And for the same bit rate, maximum transferable distance is obtained as 3000 m with Q factor 21. Figure: 3(iv) also confirms that our VLC systems could support 2 Gbps up to the link distance of 2500 m, and found log of BER -6.9.

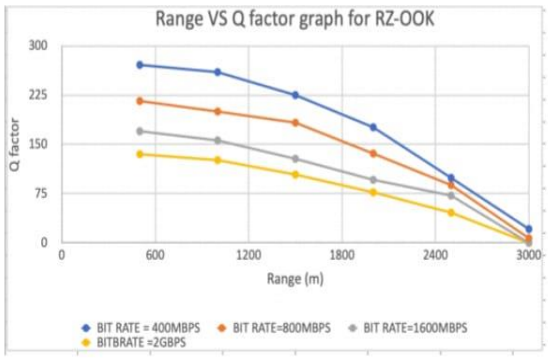

Figure:3(iii)

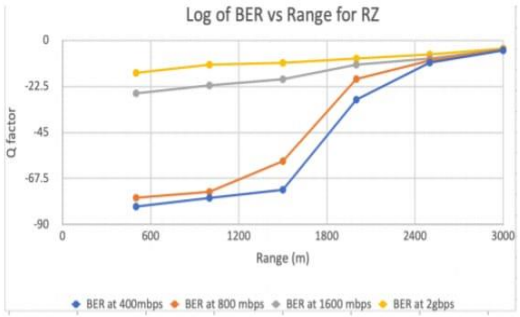

Figure:3(iv)

Figure: 4(a) and figure: 4(b) represent the eye diagrams of one BER Analyzer of each NRZ-OOK modulation format and RZ-OOK modulation format respectively. These eye diagrams are at bit rate of 2 Gbps at link range of 2000 m. Although there is a difference in the results of RZ and NRZ modulation, but the difference in the result are very less, that is why the eye diagram for both the modulation format almost look similar (there is a very little difference in the eye heights).It clearly depicts that at bitrate of 2gbps the signal can reach up to 2000 meter link distance with good eye

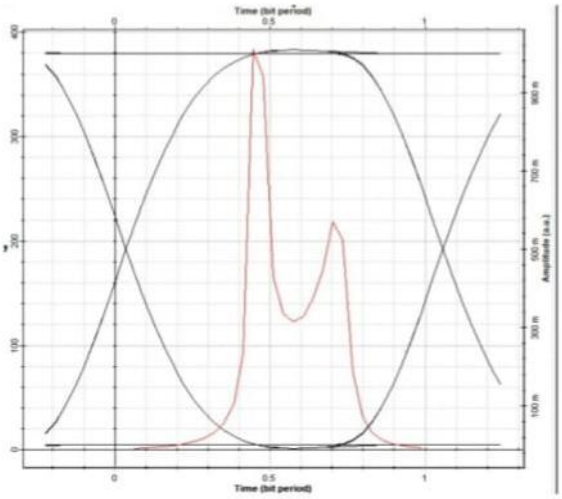

Figure :4(a) BER Analyzer for NRZ-OOK modulation

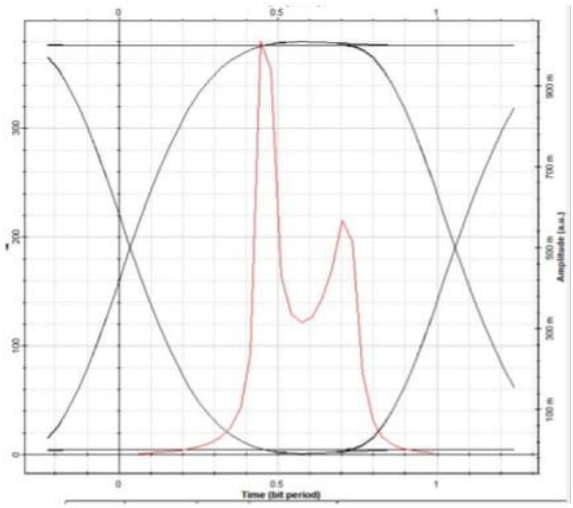

Figure:4(b) BER Analyzer for RZ-OOK modulation

CONCLUSION

We have proposed a study of Visible Light communication for LASER with MZ modulator in WDM (4*4) and practically measured channel characteristics using numerical tool. The proposed system support maximum bit rate of 2 Gbps upto the link range of 2500 m with obtained maximum Q factor value of 46 and value of log of BER is -6.9 for RZ-OOK modulation. In our designed system RZ-OOK provide slightly better result than NRZOOK. The proposed system support maximum bit rate of 2 Gbps upto the link range of 2500 m with obtained

maximum Q factor value of 42 and value of log of BER value is -3.11 for NRZ-OOK modulation.

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A Comparative Study on Skin Cancer Detection Using Transfer Learning Models and CNN

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ABSTRACT

Dermatological diseases are the most common diseases in the world. Despite its prevalence, diagnosis is extremely difficult and necessitates extensive experience in the field. In this project, we present a method for detecting various types of these diseases. Computer vision and machine learning are two stages that we used to accurately identify diseases. The project's goal is to easily and accurately detect the type of skin disease and recommend the best treatment. The skin disease is subjected to various types of pre-processing techniques in the first stage of the image, followed by feature extraction. The second stage involves using machine learning algorithms to identify diseases based on skin analysis and observation. The proposed system is especially useful in rural areas where dermatologists are scarce. For the experimental results of this proposed system, we use a Pycharm-based Python script. Skin diseases are the most common around the world, as people get skin diseases due to genetics and environmental factors. In many cases, people ignore the early signs of skin disease. In the current system, skin diseases are identified through a biopsy process, which is then analyzed and medications are prescribed manually by physicians. We propose a hybrid approach combining computer vision and machine learning techniques to overcome this manual inspection and provide promising results in a short period of time. The input images for this would be microscopic images, such as histopathological images, from which features such as colour, shape, and texture would be extracted and fed into a convolutional neural network (CNN) for classification and disease identification. The project's goal is to easily detect the type of skin disease and recommend the best and most comprehensive medical recommendations. Skin disease much more rapidly and precisely. However, the cost of such a diagnosis is still limited and prohibitively expensive. Thus, image processing techniques aid in the development of an automated screening system for dermatology at an early stage. The extraction of features is critical in the classification of skin diseases. In a variety of techniques, computer vision plays a role in the detection of skin diseases. Skin diseases are common in Saudi Arabia due to the deserts and hot weather. This work advances the study of skin disease detection. We proposed a method for detecting skin diseases based on image processing.

Keywords : Ham10000, image processing, CNN, ResNet50, Xception, Skin Disease Classification.

I. INTRODUCTION

Skin diseases are more common than other types of illnesses. Skin diseases can be caused by a fungal infection, bacteria, allergies, or viruses, among other things. A skin disease can cause changes in the texture or colour of the skin. Skin diseases are generally chronic, infectious, and can sometimes progress to skin cancer. As a result, skin diseases must be detected early in order to limit their progression and spread. Skin disease diagnosis and treatment take longer and incur financial and physical costs for the patient. In general, most people are unaware of the type and stage of a skin disease. Some skin diseases manifest symptoms months later, causing the disease to develop and spread. This is because of a lack of medical knowledge in the public. A dermatologist (skin specialist doctor) may also struggle to diagnose the skin disease and may require costly laboratory tests to correctly identify the type and stage of the skin disease. The advancement of laser and photonics-based medical technology has allowed for much faster and more accurate diagnosis of skin diseases. However, the cost of such a diagnosis is still limited and prohibitively expensive. As a result, we propose an image processing-based approach to skin disease diagnosis. This method uses image analysis to identify the type of disease by taking a digital image of the diseased skin area. Our proposed method is simple, quick, and requires no expensive equipment other than a camera and a computer.

Skin is the largest organ of the human body, composed of epidermis, dermis, and subcutaneous tissues, and contains blood vessels, lymphatic vessels, nerves, and muscles that can perspire, sense external temperature, and protect the body. The skin, which covers the entire body, can protect multiple tissues and organs from external invasions such as artificial skin damage, chemical damage, adventitious viruses, and individuals' immune systems. Furthermore, skin can avoid the loss of lipids and water within the epidermis and dermis, allowing the skin barrier function to be stabilized. Skin is not indestructible, despite its defence and barrier function, because it is constantly influenced by a variety of external and genetic factors. There are currently three types of skin diseases that appear in the human body: viral skin diseases, fungal skin diseases, and allergic skin diseases. Despite the fact that these types of skin diseases are currently curable, they have caused patients' lives to be disrupted. Nowadays, the majority of conclusions on patients' existing symptoms are based primarily on doctors' years of experience or their own subjective judgments, which can lead to errors and, as a result, delay treatment of these patients. As a result, it is both theoretically and practically significant to investigate how to extract symptoms of various skin diseases using modern science and technology. Under these conditions, it is possible to identify the types of skin diseases and prescribe treatment based on the symptoms of the patients. The image processing technique has advanced rapidly in medicine over the last few years. Some digital image technology-based equipment, such as computed tomography (CT), digital subtraction angiography (DSA), and magnetic resonance imaging (MRI), has also been widely used in people's daily lives (MRI). Scholars from all over the world have conducted additional research in this area. Oyola and Arroyo, for example, detected the skin disease varicella using image processing techniques such as colour transformation, equalisation, and edge detection, and the image of varicella was eventually collected and classified using the Hough transform. +e final empirical results showed that a better diagnosis was received in terms of varicella detection, and preliminary tests on varicella and

herpes zoster were also conducted on that basis. Chung and Sapiro proposed a method for detecting the image of skin lesions using a partial differential equation (PDE), with which a contour model of skin lesions was extracted based on its morphological filtering via PDE.

Humans are prone to skin diseases. They are usually caused by factors such as different cells in the organism, a different diet, and internal and external factors such as the hierarchical genetic group of cells, hormones, and immune system of conditions. These factors may act together or sequentially to cause skin disease. Chronic and incurable diseases such as eczema and psoriasis exist alongside malignant diseases such as malignant melanoma. Recent research has discovered that if these diseases are detected in their early stages, cures are available. Atopic dermatitis, also known as eczema, is a chronic skin disease characterized by dry and itchy skin, rashes on the face, inside the elbows, behind the knees, and on the hands and feet. Melanoma is a severe and potentially fatal form of skin cancer. Asymmetry, Border, Color, and Diameter are the "ABCD's" of skin moles. Asymmetry means that the shape of one half does not match the shape of the other half. Border indicates that the mole's edges are ragged, blurred, or irregular. The colour is uneven and may include black, brown, and tan shades. The diameter of a mole indicates a size change.

II. RELATED WORKS

Yasir, R., Rahman, M. A., & Ahmed, N. Skin diseases are among the most common health issues in the world. In this article, we proposed a method for detecting dermatological skin diseases using computer vision techniques. For feature extraction, we used a variety of image processing algorithms, as well as a feed forward artificial neural network for training and testing. The system operates in two stages: first, it pre-processes colour skin images to extract significant features, and then it identifies diseases. With a 90% accuracy rate, the system detects 9 different types of dermatological skin diseases. Dermatology is the branch of medicine that deals with hair, nails, and skin diseases. It is a specialty that encompasses both medical and surgical aspects. A dermatologist treats diseases in their broadest sense, as well as some cosmetic issues with the skin, scalp, hair, and nails. Due to the complexity of jaggedness, tone, hair presence, and other mitigating features, human skin is one of the most unpredictable and difficult terrains to automatically synthesise and analyse. Going to a dermatologist for skin disease treatment is prohibitively expensive in a developing country like Bangladesh. Every year, a large number of people in developing countries such as Bangladesh suffer from various types of skin diseases. As a result, having an automated skin disease detection system is critical for both patients and dermatologists, especially in developing countries. Several studies have been conducted to detect dermatological skin diseases using computer vision-based techniques, but almost all of them only worked for 2-3 diseases. We have worked to detect 9 different types of skin diseases in our work. Eczema, Acne, Leprosy, Psoriasis, Scabies, Foot Ulcer, Vitiligo, Tinea Corporis, and Pityriasis Rosea are among them. For image preprocessing, we used eight different types of algorithms (YCbCr, grey image, sharpening filter, median filter, smooth filter, binary mask, and histogram and sobel operator).

ALKolifi ALEnezi, N. S.: Skin diseases are more common than other types of illnesses. Skin diseases can be caused by a fungal infection, bacteria, allergies, or viruses, among other things. The advancement of laser and photonics-based medical technology has allowed for much faster and more accurate diagnosis of skin diseases. However, the cost of such a diagnosis is still limited and prohibitively expensive. Thus, image processing techniques aid in the development of an automated screening system for dermatology at an early stage. The extraction of features is critical in the classification of skin diseases. In a variety of

techniques, computer vision plays a role in the detection of skin diseases. Skin diseases are common in Saudi Arabia due to the deserts and hot weather. This work advances the study of skin disease detection. We proposed a method for detecting skin diseases based on image processing. This method uses image analysis to identify the type of disease by taking a digital image of the diseased skin area. Our proposed method is simple, quick, and requires no expensive equipment other than a camera and a computer. The method is applied to colour image inputs. The image is then resized to extract features using a pretrained convolutional neural network. The feature was then classified using Multiclass SVM. Finally, the user is shown the results, which include the type of disease, its spread, and severity. With a 100% accuracy rate, the system detects three different types of skin diseasesIn general, most people are unaware of the type and stage of a skin disease. Some skin diseases manifest symptoms months later, causing the disease to develop and spread. This is due to the general public's lack of medical knowledge. A dermatologist (skin specialist doctor) may also struggle to diagnose the skin disease and may require costly laboratory tests to correctly identify the type and stage of the skin disease. The advancement of laser and photonics-based medical technology has allowed for much faster and more accurate diagnosis of skin diseases. However, the cost of such a diagnosis is still limited and prohibitively expensive. As a result, we propose an image processing-based approach to skin disease diagnosis. This method uses image analysis to identify the type of disease by taking a digital image of the diseased skin area. Our proposed method is simple, quick, and requires no expensive equipment other than a camera and a computer.

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T. Swapna1, D.A. Vineela, M. Navyasree, N. Sushmtha, P. Bhavana: Skin disease among humans has been a common disease, millions of people are suffering from various kinds of skin diseases. Usually, these diseases have hidden dangers which lead to not only lack of self-confidence and psychological depression but also lead to a risk of skin cancer. Medical experts and high-level instruments are needed to diagnosis these skin diseases due to non-availability of visual resolution in skin disease images.

The proposed framework includes deep learning techniques such as CNN architecture and three predefined models called Alex Net, ResNet, InceptionV3. A Dataset of images with seven diseases has been taken for the Classification of Skin diseases. They include diseases like Melanoma, Nevus, Seborrheic Keratosis etc. The dataset was extended by adding images having cuts and burns, which were classified as skin disease by most of the existing systems. The usage of Deep Learning algorithms has reduced the need for human labor, such as manual feature extraction and data reconstruction for classification purposes. Skin is one in every of the most important and quickest developing tissues of the human body. The burden of skin disease is regarded as a multidimensional concept that comprehends psychological, social and economic significance of the skin disease at the sufferers and their households and on society. It is a contamination that takes place in humans of all ages. Skin is regularly broken due to the fact it's far a touchy a part of the body. There are more than 3000 skin diseases. A cosmetically look spoiler disease will have a big effect and might reason extensive ache and everlasting injury. Most of the chronic skin conditions, along with atopic eczema, psoriasis, vitiligo and leg ulcers, aren't right now deadly, they may be diagnosed as an extensive problem on fitness popularity which include physical, emotional and economic outcome. On the other hand, skin cancers are potentially lethal and their trouble is associated with the temporality that they carry.

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III. Methodology

Proposed system:

In purposed method we are performing the classification of either the Skin Disease identification using Convolution Neural Network (CNN) of deep learning along with the transfer learning methods. As image analysis based approaches for skin disease classification. Hence, proper classification is important for the proper nutrition that which will be possible by using our proposed method. Block diagram of proposed method is shown below.

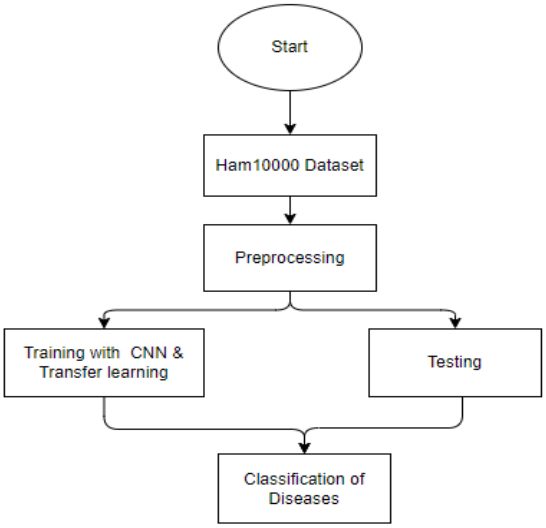


Figure 1: Block diagram

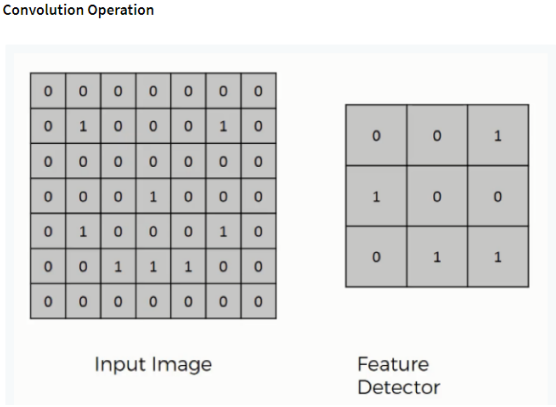
3. Implementation:

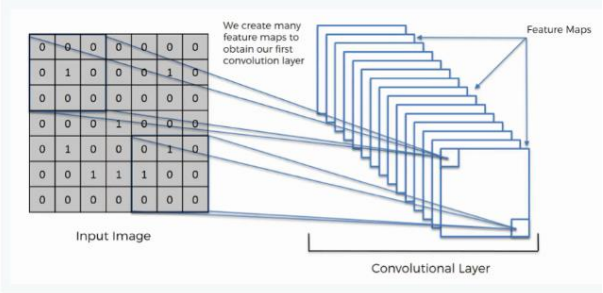
The algorithms listed below were used to complete the project.

1. Convolutional Neural Network

Step1: convolutional operation

The first building block in our plan of attack is convolution operation. In this step, we will touch on feature detectors, which basically serve as the neural network's filters. We will also discuss feature maps, learning the parameters of such maps, how patterns are detected, the layers of detection, and how the findings are mapped out.



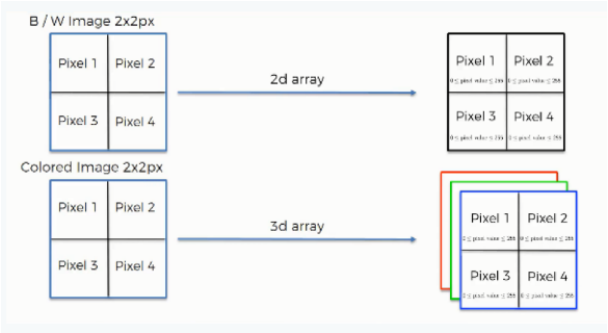


Step (1b): ReLU Layer

The second part of this step will involve the Rectified Linear Unit or Relook. We will cover Relook layers and explore how linearity functions in the context of Convolutional Neural Networks.

Not necessary for understanding CNN's, but there's no harm in a quick lesson to improve your skills.

Convolutional Neural Networks Scan Images



Step 2: Conv2D

Keras Conv2D is 2D Convolution Layer; this layer creates a convolution kernel that is wind with layers input which helps produce a tensor of outputs.

Kernel: In image processing kernel is a convolution matrix or masks which can be used for blurring, sharpening, embossing, edge detection, and more by doing a convolution between a kernel and an image.

Step 3: Flattening

This will be a brief breakdown of the flattening process and how we move from pooled to flattened layers when working with Convolutional Neural Networks.

Step 4: Full Connection

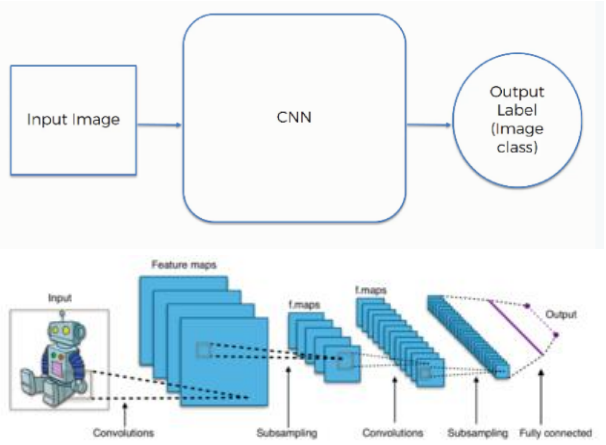
In this part, everything that we covered throughout the section will be merged together. By learning this, you'll get to envision a fuller picture of how Convolutional Neural Networks operate and how the "neurons" that are finally produced learn the classification of images.

Summary

In the end, we'll wrap everything up and give a quick recap of the concept covered in the section. If you feel like it will do you any benefit (and it probably will), you should check out the extra tutorial in which Softmax and Cross-Entropy are covered. It's not mandatory for the course, but you will likely come across these concepts when working with Convolutional Neural Networks and it will do you a lot of good to be familiar with them.

Convolutional neural network (CNN):

An input layer, hidden layers, and an output layer comprise a convolutional neural network. Any middle layers in a feed-forward neural network are referred to as hidden because their inputs and outputs are masked by the activation function and final convolution.



ResNet50:

ResNet50 is a convolutional neural network which has a depth of 50 layers. It was build and trained by Kaiming He, Xiangyu Zhang, Shaoqing Ren, and Jian Sun in their 2015 and you can access the model performance results on their paper, titled Deep Residual Learning for Image Recognition. This model is also trained on more than 1 million images from the

ImageNet database. Just like VGG-19, it can classify up to 1000 objects and the network was trained on 224x224 pixels colored images. Here is brief info about its size and performance.

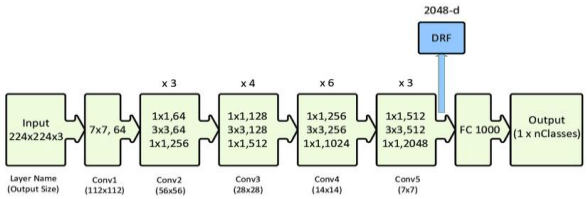


Fig. ResNet50 Architecture

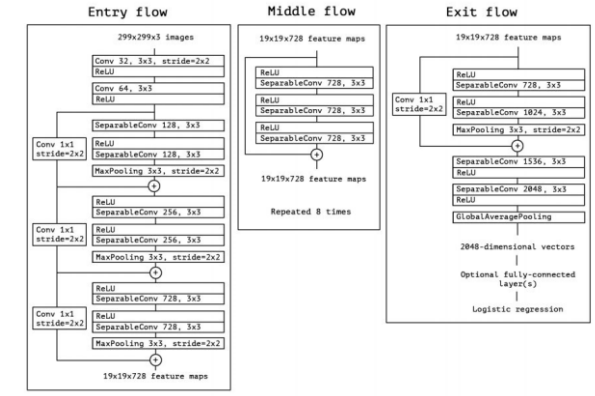
To sum up, residual network or ResNet was a major innovation that has changed the training of deep convolutional neural networks for tasks related to computer vision. While the original ResNet had 34 layers and used 2-layer blocks, other advanced variants such as the Resnet50 made the use of 3-layer bottleneck blocks to ensure improved accuracy and lesser training time. Keras is a deep learning API that is popular due to the simplicity of building models using it. Keras comes with several pre-trained models, including Resnet50 that anyone can use for their experiments. Therefore, building a residual network in Keras for computer vision tasks like image classification is relatively simple. You only need to follow a few simple steps.

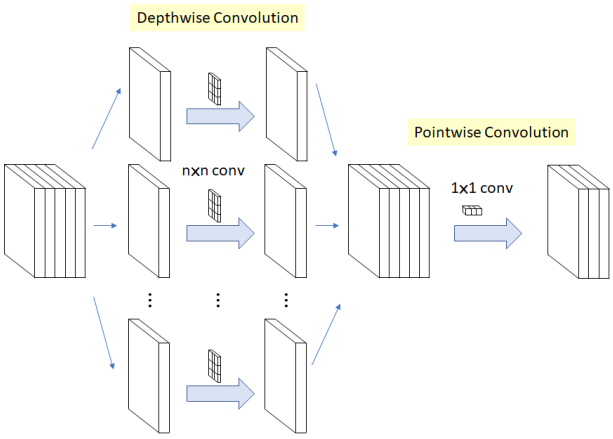
Xception Architecture

Xception is a deep convolutional neural network architecture with Depth wise Separable Convolutions. This observation inspires them to propose a new deep convolutional neural network architecture inspired by Inception, in which Inception modules are replaced with depth wise separable convolutions.

Xception is a deep convolutional neural network architecture with Depth wise Separable Convolutions. It was created by Google scientists. Inception modules in convolutional neural networks were interpreted by Google as an intermediate step between regular convolution and the depth wise separable convolution operation (a depth wise convolution followed by a point wise convolution). In this context, a depth wise separable convolution can be thought of as an Inception module with an infinite number of towers.

This observation inspires them to propose a new deep convolutional neural network architecture inspired by Inception, in which Inception modules are replaced with depth wise separable convolutions.

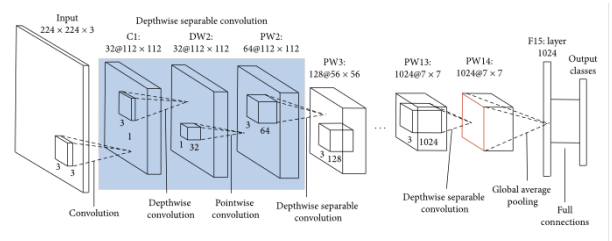




3. MobileNet:

As the name applied, the MobileNet model is designed to be used in mobile applications, and it is TensorFlow's first mobile computer vision model.

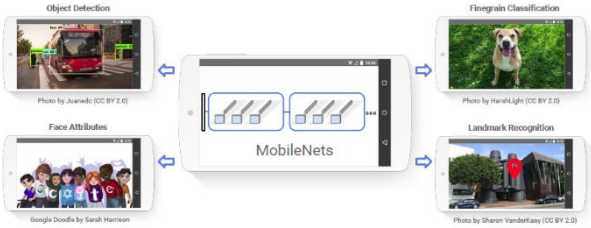
MobileNet uses **depthwise separable convolutions.** It significantly **reduces the number of parameters** when compared to the network with regular convolutions with the same depth in the nets. This results in lightweight deep neural networks.



A depthwise separable convolution is made from two operations.

1. **Depthwise convolution.**
2. **Pointwise convolution**.

MobileNet is a class of CNN that was open-sourced by Google, and therefore, this gives us an excellent starting point for training our classifiers that are insanely small and insanely fast.



Depthwise Separable Convolution

This convolution originated from the idea that a filter's depth and spatial dimension can be separated- thus, the name separable. Let us take the example of Sobel filter, used in image processing to detect edges.

-1	0	+1
-2	0	+2
-1	0	+1

Gx

+1	+2	+1
0	0	0
-1	-2	-1

Gy

Sobel Filter. Gx for the vertical edge, Gy for horizontal edge detection

You can separate the height and width dimensions of these filters. Gx filter can be viewed as a matrix product of [1 2 1] transpose with [-1 0 1].

We notice that the filter had disguised itself. It shows it had nine parameters, but it has 6. This has been possible because of the separation of its height and width dimensions.

The same idea applied to separate depth dimension from horizontal (width*height) gives us depth-wise separable convolution whare we perform depth-wise convolution. After that, we use a 1*1 filter to cover the depth dimension.

One thing to notice is how much parameters are reduced by this convolution to output the same no. of channels. To produce one channel, we need 3*3*3 parameters to perform depth-wise convolution and 1*3 parameters to perform further convolution in-depth dimension.

But If we need three output channels, we only need 31*3 depth filter, giving us a total of 36 (= 27 +9) parameters while for the same no. of output channels in regular convolution, we need 33*3*3 filters giving us a total of 81 parameters.

Depthwise separable convolution is **a depthwise convolution followed by a pointwise convolution** as follows:

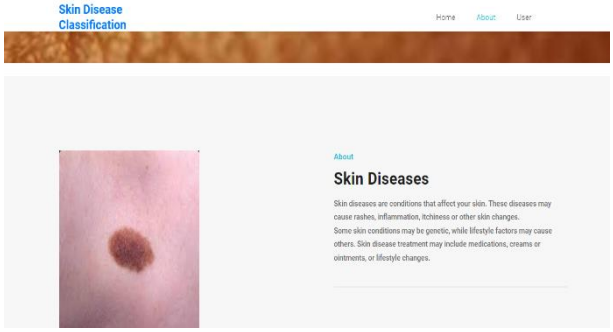
1. **Depthwise convolution** is the **channel-wise DK×DK spatial convolution**. Suppose in the figure above, and we have five channels; then, we will have 5 DK×DK spatial convolutions.
2. **Pointwise convolution** is the **1×1 convolution** to change the dimension.
3. **Depthwise convolution.**

4. Results and Discussion:

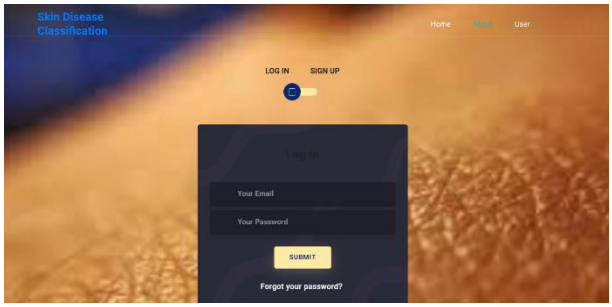
The following screenshots are depicted the flow and working process of project.

Home Page: In our project, we are classifying the presence of Skin Disease Classification, with the help of CNN and Transfer learning.

About Project: Here the user will get a breif idea about the project.

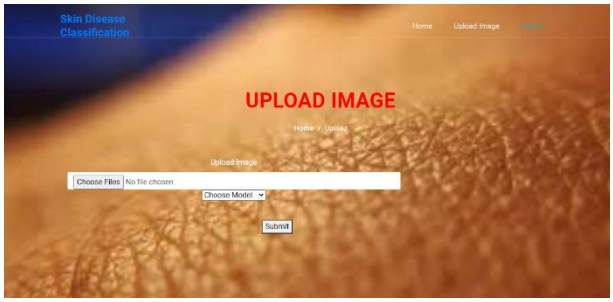


Login page: This is the page where user can get login with registered credentials.



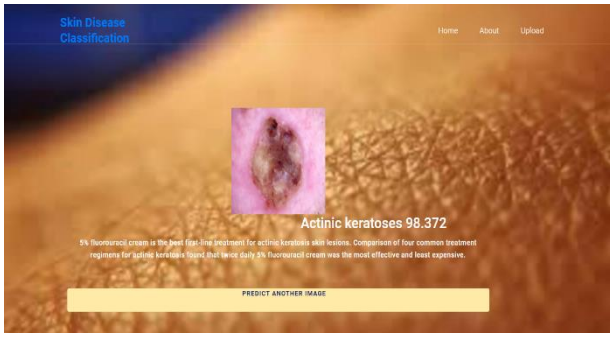
User Home: Once after successful login user can view the home page.

Image Upload Page: Here the user can upload the image of skin which is having the disease. To know the disease name.

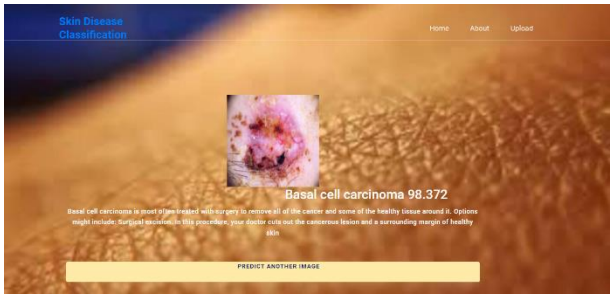


Once after user uploaded the skin image model prediction will be done and the user will get the classified disease for his/her uploaded image. The classification of the skin disease are as follows.

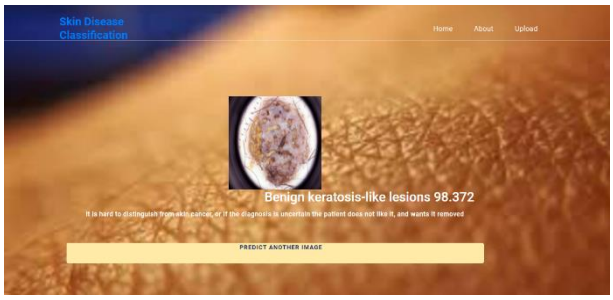
Actinic keratosis Image:



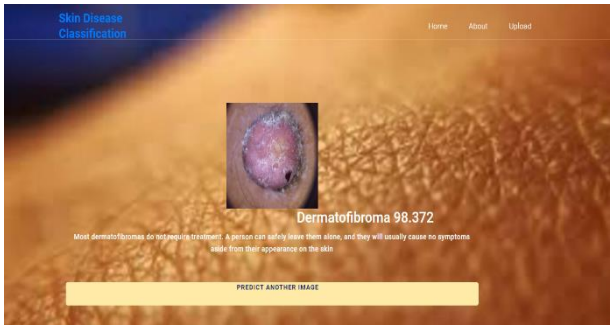
Basal cell carcinoma:



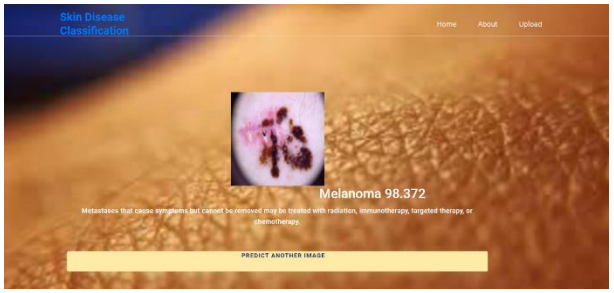
Benign keratosis-like lesions:



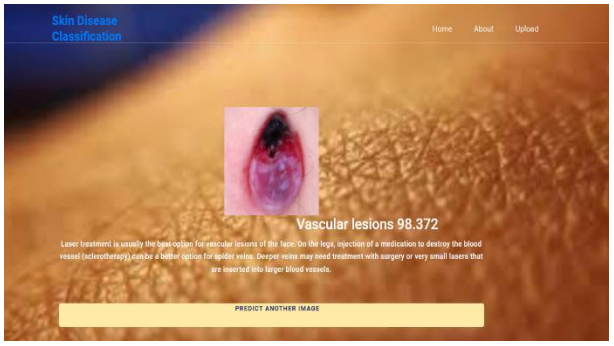
Dermatofibroma:



Melanoma:



Vascular lesions:



IV. CONCLUSION

In this project we have successfully classified the images of Identification of Skin Diseases, are affected with the using the deep learning and Transfer learning. Here, we have considered the dataset of ham10000 images which will be of different types Diseases and trained using CNN along with some ResNet50 transfer learning method. After the training we have tested by uploading the image and classified it.

V. REFERENCES

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Development of A Novel Block Design Based Key Agreement Protocol for Cloud Environment to Improve Efficient Performance and Security

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ABSTRACT

Cloud computing is one of the recent emerging technologies. Heavy data sharing among multiple users is an open issue. Data sharing in cloud computing enables multiple participants to freely share the group data, which improves the efficiency of work in cooperative environments and has widespread potential applications. However, how to ensure the security of data sharing within a group and how to efficiently share the outsourced data in a group manner are formidable challenges. In this paper we focused on security issues with the help of key agreement protocols to perform efficient data sharing in cloud environment. We proposed a novel block design based key agreement method in support of symmetric balanced incomplete block design (SBIBD). The main objective of this method is to supports multiple participants, which can flexibly extend the number of participants in a cloud environment according to the structure of the block design. Based on the proposed group data sharing model, we present general formulas for generating the common conference key K for multiple participants. In addition, the fault tolerance property of our protocol enables the group data sharing in cloud computing to withstand different key attacks, which is similar to Yi's protocol.

Keywords : Key agreement protocol, symmetric balanced incomplete block design (SBIBD), data sharing, cloud computing.

I. INTRODUCTION

Cloud computing and cloud storage have become hot topics in recent decades. Both are changing the way we live and greatly improving production efficiency in some areas. At present, due to limited storage resources and the requirement for convenient access, we prefer to store all types of data in cloud servers, which is also a good option for companies and organizations to avoid the overhead of deploying and maintaining equipment when data are stored locally. The cloud server provides an open and convenient

storage platform for individuals and organizations, ut it also introduces security problems. For instance, a cloud system may be subjected to attacks from both malicious users and cloud providers. In these scenarios, it is important to ensure the security of the stored data in the cloud. In [1], several schemes were proposed to preserve the privacy of the outsourced data. The above schemes only considered security problems of a single data owner. However, in some applications, multiple data owners would like to securely share their data in a group manner. Therefore, a protocol that supports secure group data sharing under cloud computing is needed. A key agreement protocol is used to generate a common conference key for multiple participants to ensure the security of their later communications, and this protocol can be

applied in cloud computing to support secure and efficient data sharing. Since it was introduced by Diffie-Hellman in their seminal paper [4], the key agreement protocol has become one of the fundamental cryptographic primitives. The basic version of the Diffie-Hellman protocol provides an efficient solution to the problem of creating a common secret key between two participants. In cryptography, a key agreement protocol is a protocol in which two or more parties can agree on a key in such a way that both influence the outcome. By employing the key agreement protocol, the conferees can securely send and receive messages from each other using the common conference key that they agree upon in advance. Specifically, a secure key agreement protocol ensures that the adversary cannot obtain the generated key by implementing malicious attacks, such as eavesdropping. Thus, the key agreement protocol can be widely used in interactive communication

environments with high security requirements (e.g., remote board meetings, teleconferences, collaborative workspaces, radio frequency identification [5], cloud computing and so on).

The Diffie-Hellman key agreement [4] provides a way to generate keys. However, it does not provide an authentication service, which makes it vulnerable to man-in-the-middle attacks. This situation can be addressed by adding some forms of authentication mechanisms to the protocol, as proposed by Law et al. in [6]. In addition, the Diffie-Hellman key agreement can only support two participants. Subsequently, to solve the different key attacks from malicious conferees, who attempt to deliberately delay or destroy the conference, Yi proposed an identity-based fault-tolerant conference key agreement in [7]. Currently, many researches have been devoted to improving the security and communication efficiency of the key agreement protocol, which is covered in the literature [8] Note that in Chung and Bae's paper [12] and Lee et al.'s paper [13], block design is utilized in the design of an efficient load balance algorithm to maintain load balancing in a distributed system. Inspired by [12] and [13], we introduce the symmetric balanced incomplete block design (SBIBD) in designing the key agreement protocol to reduce the complexity of communication and computation. As far as we know, the work to design the key agreement protocol with respect to the SBIBD is novel and original.

II. MAIN CONTRIBUTIONS

In this paper, we present an efficient and secure block design-based key agreement protocol by extending the structure of the SBIBD to support multiple participants, which enables multiple data owners to freely share the outsourced data with high security and efficiency. Note that the SBIBD is constructed as the group data sharing model to support group data sharing in cloud computing. Moreover, the protocol can provide authentication services and a fault tolerance property. The main contributions of this paper are summarized as follows.

1. Model of group data sharing according to the structure of the SBIBD is constructed. In this paper, a group data sharing model is established based on the definition of the SBIBD, which can be used to determine the way of communication among the participants. Regarding mathematical descriptions of the structure of the SBIBD, general formulas for computing the common conference key for multiple participants are derived.

2. Fault detection and fault tolerance can be provided in the protocol. The presented protocol can perform fault detection to ensure that a common conference key is established among all participants without failure.

Moreover, in the fault detection phase, a volunteer will be used to replace a malicious participant to support the fault tolerance property. The volunteer enables the protocol to resist different key attacks [7], which makes the group data sharing in cloud computing more secure.

3. Secure group data sharing in cloud computing can be supported by the protocol. According to the data sharing model applying the SBIBD, multiple participants can form a group to efficiently share the outsourced data.

Subsequently, each group member performs the key agreement to derive a common conference key to ensure the security of the outsourced group data. Note that the common conference key is only produced by group members. Attackers or the semi-trusted cloud server has no access to the generated key. Thus, they cannot access the original outsourced data (i.e., they only obtain some unintelligible data). Therefore, the proposed key agreement protocol can support secure and efficient group data sharing in cloud computing. Notably, the above contributions substantially widen the field of applications of the key agreement protocol by applying an SBIBD with high security and flexibility. Moreover, the communication complexity is reduced without introducing
extra computational complexity.

III. LITERATURE SURVEY

F. Chen, T. Xiang, Y. Yang, and S. S. M. Chow [2] had designed a general construction of secure cloud storage protocol based on any secure network coding protocol. However, it is not known if a secure network coding protocol can be constructed from a secure cloud storage protocol. It is an interesting future work to consider under what condition this can be done.

D. He, S. Zeadally , and L. Wu[3] had discussed Cloud-assisted WBANs, which are the integration of a cloud computing platform and WBANs, could bring major benefits (as we discussed earlier) over traditional WBANs. One of the major challenges of a cloud-assisted WBAN is to ensure the integrity of the medical data stored at a cloud server. The auditing technique is an efficient tool for checking the integrity of the data stored remotely. However, previous auditing schemes suffer from key management and key escrow problems. To address these challenges, they proposed a new CLPA scheme. Compared with previously proposed schemes, our CLPA scheme not only can address the security problems in TPKC-based public auditing schemes and ID-based public auditing schemes but also yields better performance. In addition, their proposed CLPA scheme is provably secure in a strong security model, making CLPA very suitable for use in cloud-assisted WBANs.

L. Law, A. Menezes, M. Qu, J. Solinas, and S. Vanstone, [6] shows the comparison includes the basic two-pass protocols. The computational requirements are indicated by counting the number of exponentiations computed by each principal in protocol run and this is the complexity. Also

H.Elkamchouchi, M.Eldefrawy works by computing and exchanging two vectors but the new one works and exchanges one value.

In [14] and [15], based on symmetric-key cryptography, several schemes were proposed to enable efficient encryption of the outsourced data. However, encryption keys should be transmitted in a secure channel, which is not possible in practice, particularly in the open cloud environment.

In [16], it was introduced that resistance to compromised keys has been taken into consideration, which an important issue in the context of cloud is computing.

Cloud storage auditing with verifiable outsourcing of key updates paradigm was proposed by Yu et al. in [17] to achieve resistance to compromised keys. In this paradigm, the third party auditor (TPA) takes responsibility for the cloud storage auditing and key updates. In particular, the TPA is responsible for the selection and distribution of the key. The key downloaded from the TPA can be used by the client to encrypt files that he will upload to the cloud. In contrast, the generation and distribution of the key is based on a centralized model in [17], which not only imparts a burden to the TPA but also introduces some security problems.

In [18], a key agreement algorithm was exploited by De Capitani di Vimercati et al. to achieve data access when data are controlled by multiple owners. Therefore, the key agreement protocol can be applied in group data sharing to solve related security problems in cloud computing. Following the first pioneering work for key agreement [4], many works have attempted to provide authentication services in the key agreement protocol.
In [19], a public key infrastructure (PKI) is used to circumvent man-in-the-middle attacks. However, these protocols are not suitable for resource-constrained environments since they require executions of time-consuming modular exponentiation operations.

Key agreement protocols that use elliptic curve cryptography (ECC) have been proposed in [20]. These protocols are more efficient than the protocols that resort to the PKI because point additions or multiplications in elliptic curves are more efficient compared with the modular exponentiation. Moreover, based on the difficulty of solving the elliptic curve discrete logarithm problem (ECDLP), protocols that use ECC are more secure.

To avoid the requirement of the public key certificate, in 1984, identity-based cryptography (IBC) was proposed by Shamir. However, it was not until 2001 that the first practical IBC scheme was proposed by Boneh and Franklin. Due to the strict security proof and high efficiency, this scheme has received widespread recognition in academic fields.

Motivated by the above observation, the key agreement protocol is applicable to support data sharing in cloud computing for the following reasons.

1. The generation of a common conference key is performed in a public channel, which is suitable for cloud computing environments.

2. The key agreement protocol can support and provide secure data sharing for multiple data owners within a group, where the data sharing follows a many-to-many pattern. Compared with the one-to-many pattern, the many-to-many pattern in group data sharing provides higher efficiency in the environment of cooperative storage.

3. The key agreement protocol is based on a decentralized model, where a trusted third party is not required. This means that every data owner in a group fairly contributes and determines the common

conference key such that the outsourced data are controlled by all the data owners within a group.

Therefore, this research design a block design-based key agreement protocol for data sharing in cloud computing. First, proposed an algorithm to construct the (v, k + 1, 1)-design. Then, with respect to the mathematical description of the structure of the (v, k+1, 1)-design, general formulas for generating the common conference key K for multiple participants are derived. Namely, the proposed protocol supports multiple participants

IV. RELATED WORKS

It is well known that data sharing in cloud computing can provide scalable and unlimited storage and computational resources to individuals and enterprises. However, cloud computing also leads to many security and privacy concerns, such as data integrity, confidentiality, reliability, fault tolerance and so on. Note that the key agreement protocol is one of the fundamental cryptographic primitives, which can provide secure communication among multiple participants in cloud environments. In [14] and [15], based on symmetric-key cryptography, several schemes were proposed to enable efficient encryption of the outsourced data.

However, encryption keys should be transmitted in a secure channel, which is not possible in practice, particularly in the open cloud environment. Since it was introduced in [16], resistance to compromised keys has been taken into consideration, which is an important issue in the context of cloud computing. Note that cloud storage auditing with verifiable outsourcing of key updates paradigm was proposed by Yu et al. in [17] to achieve resistance to compromised keys. In this paradigm, the third party auditor (TPA) takes responsibility for the cloud storage auditing and key updates. In particular, the TPA is responsible for the selection and distribution of the key.

The key downloaded from the TPA can be used by the client to encrypt files that he will upload to the cloud. In contrast, the generation and distribution of the key is based on a centralized model in [17], which not only imparts a burden to the TPA but also introduces some security problems.

In [18], a key agreement algorithm was exploited by De Capitani di Vimercati et al. to achieve data access when data are controlled by multiple owners. Therefore, the key agreement protocol can be applied in group data sharing to solve related security problems in cloud computing. Following the first pioneering work for key agreement [4], many works have attempted to provide authentication services in the key agreement protocol. In [19], a public key infrastructure (PKI) is used to circumvent man-in-the-middle attacks. However, these protocols are not suitable for resource-constrained environments since they require executions of time-consuming modular exponentiation operations. Key agreement protocols that use elliptic curve cryptography (ECC) have been proposed in[21].

These protocols are more efficient than the protocols that resort to the PKI because point additions or multiplications in elliptic curves are more efficient compared with the modular exponentiation. Moreover, based on the difficulty of solving the elliptic curve discrete logarithm problem (ECDLP), protocols that use ECC are more secure. To avoid the requirement of the public key certificate, in 1984, identity-based cryptography (IBC) was proposed by Shamir. However, it was not until 2001 that the first practical IBC scheme [10] was proposed by Boneh and Franklin. Due to the strict security proof and high efficiency, this scheme has received widespread recognition in academic fields. In the same year, a popular proof model for group key establishment was proposed by Bresson et al. [23].

In this protocol, to manage the complexity of definitions and proofs for the authenticated group Diffie-Hellman key exchange, a formal model was presented, where two security goals of the group Diffie-Hellman key exchange were addressed. However, some security properties are missing in [23], which are essential for preventing malicious protocol participants.

Note that all the above protocols have been proven and analyzed for security, but some of them can only be applied to the key agreement between two entities and need a large amount of resources to perform calculations. Recently, an identity-based authenticated key agreement protocol was proposed by Shen et al. in [9], which improves the efficiency of the conference key agreement and provides entity authentication services. However, there are some obstacles in Shen et al.'s protocol in real applications. One is that the protocol only discusses a specific situation when the number of conferees is exactly 7. The other is that the protocol does not discuss the general situation and does not provide the key agreement process for multiple participants, which makes the protocol lack flexibility and practicability. Motivated by the above observation, the key agreement protocol is applicable to support data sharing in cloud computing for the following reasons.

1. The generation of a common conference key is performed in a public channel, which is suitable for cloud computing environments.

2. The key agreement protocol can support and provide secure data sharing for multiple data owners within a group, where the data sharing follows a many-to-many pattern. Compared with the one-to many patterns, the many-to-many pattern in group data sharing provides higher efficiency in the environment of cooperative storage.

3. The key agreement protocol is based on a decentralized model, where a trusted third party is not
required. This means that every data owner in a group fairly contributes and determines the common conference key such that the outsourced data are controlled by all the data owners within a group.

It is widely known that data sharing in cloud computing can offer scalable and limitless storage and computational sources to people and enterprises. However, cloud computing additionally ends in many protections and privateers' concerns, together with records integrity, confidentiality, reliability, fault tolerance and so on. Note that the key agreement protocol is one of the essential cryptographic primitives, which could offer stable communication amongst a couple of members in cloud environments.

V. GROUP DATA SHARING

Cloud computing is said to be the service-oriented computing technology, which are affordable and flexible over the internet. In past few years the cloud has become more matured and provided many services, one of the primary services is data sharing in Group, where the data can be easily shared from one member to another. However, while sharing the data security is one of the primary concerns. In past several methodologies have been proposed. However, these methods lacked from the feasibility. Hence, in this paper we have propose methodology is based on the selection scheme. Here General Group Key is generated and moreover General Key agreement protocol is decentralized based model where the data are controlled by the owner within the same group. Moreover, the proposed methodology is evaluated by analyzing the comparative analysis based on the various number of parameter. Result Analysis suggest that our methodology simply outperforms the existing one.

In recent decades as the concept of cloud computing rises, cloud storage is said to be the one of the hotspots of the storage of information. It basically refers to a model, which refers to the model that provides the data storage. Here, CSP (cloud service provider) is directly responsible for making data available as well as accessible according to the requirement of use. Storage capacity is either bought or leased from provider to store the data by the individual or organization. This service can easily be accessed through the API or the application, which utilizes the API such as cloud storage gateway. Moreover, in the past few years, it has been observed that the demand of cloud storage has been phenomenal in accordance with the use of personal as well as business purpose, since it is highly based on the virtualized infrastructure and much more flexible in terms of multi-tenancy, scalability and availability.

They are typically knows as object storage such as Microsoft azure, amazon s3 and oracle cloud storage [4]. Since the cloud, computing gives us the feature of pay as you go service, the organization wants to pay only for the service they use, and cloud service provides exactly the same. Business using the CS can actually reduce up to 70% of energy consumption. CSP is totally responsible for the maintenance of the data and as well as the other tasks such as buying the additional storage capacity. Since the backup of the data are located in several places in the globe, it can also be applicable as the proof backup of natural disaster. Meanwhile, cloud storage is one service, which is not referred to the physical device, but it is the aggregation of many server and storage for its users.

The dynamic broadcast encryption technique allows data owners to securely share their data files with other users within the group including newly joined users. Unfortunately, each user has to compute revocation parameters to protect the confidentiality from the revoked users in the dynamic broadcast encryption scheme such that revoked users cannot access the data after their revocation
from the group. This results in both computations overhead of the encryption and the size of the cipher-text increases with the number of revoked users. Thus, the heavy overhead and large cipher-text size may hinder the adoption of the broadcast encryption to the limited users. The group manager is allowed to compute the revocation parameters, which includes the list of revoked users and make this revocation list available to public by migrating them into the cloud. Each time when users request for the data cloud service provider verifies the revocation list and provide access to data only to active users in the group. Such a design can significantly reduce the computation overhead of users to encrypt files and the cipher-text size.

VI. SYSTEM MODEL

The system model of our group data sharing scheme in cloud computing is illustrated. A TPA, cloud and users are involved in the model, where the TPA is responsible for cloud storage auditing, fault detection and generating the system parameters. The cloud, who is a semi-trusted party, provides users with data storage services and download services. Users can be individuals or staff in a company. To work together, they form a group, upload data to the cloud server and share the outsourced data with the group members. In practice, users can be mobile Android devices, mobile phones, laptops, nodes in underwater sensor networks and so forth.

Moreover, the group data sharing model is based on the SBIBD, where a trusted third party is not required. With respect to this model, all the participants exchange messages from intended entities according to the structure of the SBIBD to determine a common conference key. In addition to participants, volunteers and adversaries are also included in the presented protocol, and all of them run as a

probabilistic polynomial time Turing machine. Two types of adversaries may be involved in the protocol: passive adversaries and active adversaries. A passive adversary is a person who attempts to learn information about the conference key by eavesdropping on the multicast channel, whereas an active adversary is a person who attempts to impersonate a participant or disrupt a conference. Note that the generation and update of the key are accomplished by the participants.

Moreover, with the fault tolerance property of our protocol, the participants are able to ascertain the correctness of the common conference key. Since the storage auditing can follow the state of the art auditing protocols, we only focus on the design of group data sharing scheme in cloud computing in the paper. The adversary model determines the capabilities and possible

actions of the attacker. Similar to [12], the adversary model is defined as follows.

The adversary reveals a long-term secret key of a participant in a conference and then impersonates others to this participant.

1. The adversary reveals some previous session keys and then learns the information about the session key of a fresh participant. Consequently, the adversary can impersonate the fresh participant with the session key to others.

2. The adversary reveals the long-term keys of one or more participants in the current run. Then, the adversary attempts to learn the previous session key.

3. A malicious participant chooses different sub keys, generates different signatures and broadcasts the messages to the corresponding participants, which makes the conference key derived by different participants distinct.

VII. METHODS

The construction of the group data sharing model to support a group data sharing scheme for multiple participants applying an SBIBD, we design an algorithm to construct the (v, k + 1, 1)-design. Moreover, the constructed (v, k + 1, 1)-design requires some transformations to establish the group data sharing model such that v participants can perform the key agreement protocol. 4.1 Construct the (v, k + 1, 1)-design in our group data sharing model, the parameters of the SBIBD have some specific meanings. In a (v, k+1, 1)-design, v denotes the number of participants and the number of blocks. Every block embraces k + 1 participant, and every participant appear k + 1 times in these v blocks. Furthermore, every two participants appear simultaneously in exactly one of the v blocks. Following papers [12] and [13], Algorithm 1 is designed to construct the structure of a (v, k + 1, 1)-design. First, a prime number k is selected. Then, the number of participants is determined by the value of k, which is computed as v = k 2 + k + 1†. Finally, according to Definition 3, V = {0, 1, 2... v − 1} represents the set of v participants, whereas B = {B0, B1, B2... Bv−1} implies v blocks constituted by these v participants. Note that the block is defined as Bi = {Bi,0, Bi,1, Bi,2, ..., Bi,k}, which means each block embraces k + 1 participants, and Bi,j denotes which participant is contained in the j th column of the i th block.

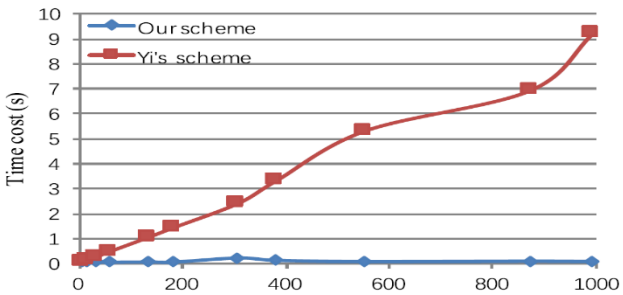

Fig 1. Efficiency comparison at initial phase

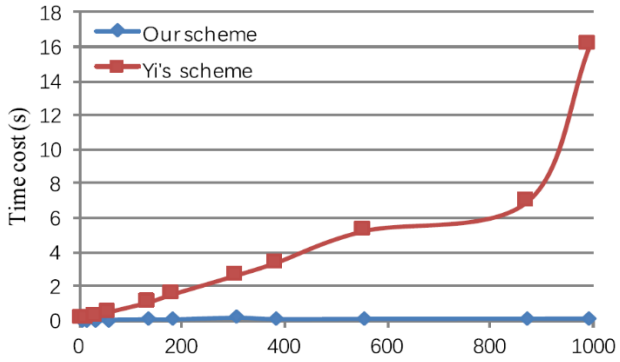

Fig 2. Efficiency comparison at key agreement phase

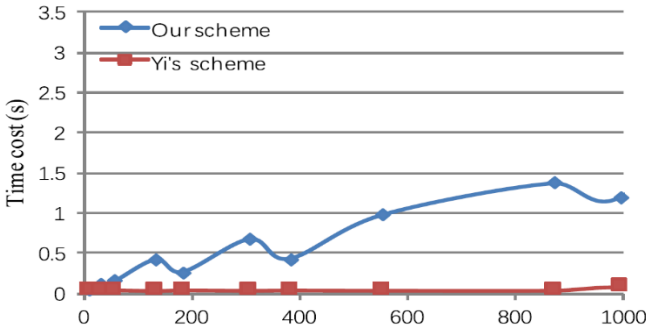

Fig 3. Efficiency comparison at authentication phase

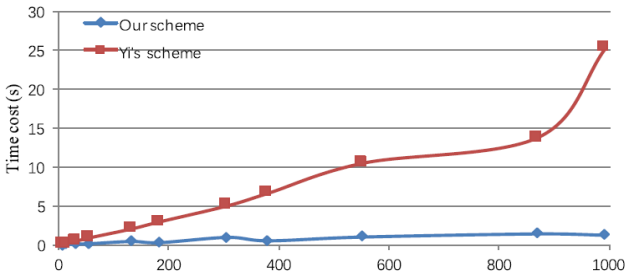

Fig 4. Efficiency comparison for multiple users

Sometimes we will consider blocks organized as a matrix in which column j is composed by elements Bi, j for i = 0, 1, 2... K and row i is composed by elements Bi, j for j = 0, 1, 2... k. The structure of the (v, k + 1, 1)-design is constructed by Algorithm 1, which outputs numbers Bi, j for i = 0, 1, ..., k2 + k and j = 0, 1, ..., k. In Algorithm 1, the notation MODk represents the modular operation that takes the class residue as an integer in the range 0, 1, 2... K – 1. Based on Algorithm 1, we can create the structure of a (v, k + 1, 1)-design that involves v participants. Moreover, Algorithm 1 can directly determine which participant should be involved in each block. For example, taking the (13, 4, 1)-design into consideration, where 13 participants are involved in this structure, we can decide which participant should be contained in the 3 rd column of the 8 th block by computing B7,2 = jk + 1 + MODk(i – j + (j – 1) b(i – 1)/kc) = 2 · 3 + 1 + MOD3(7 – 2 + (2 – 1) b(7 – 1)/3c) = 7 + MOD3(5 + 1 · 2) = 7 + 1 = 8. Therefore, from the above calculation, it is concluded that participant 8 is contained in the 3 rd column of the 8th block. Here, participant represents the I th participant.

Algorithm: Generation of a(v, k+1, 1)-design

for i = 0; i ≤ k; i + + do
for j = 0; j ≤ k; j + + do
if j == 0 then
Bi,j = 0;
Else
Bi, j = ik + j;
end if
end for
end for
for i = k + 1; i ≤ k 2 + k; i + + do
for j = 0; j ≤ k; j + + do
if j == 0 then
Bi, j = b(i – 1) /kc;
else Bi,
j = jk + 1 +MODk (i–j + (j –1) b (i – 1)/kc);
end if
end for
end for

Algorithm is an optimization of the algorithm in [12] and the proof of the correctness follows the same lines than the proof in [12] and [13]. The structure created by Algorithm 1 can be proven to satisfy the conditions of the (v, k + 1, 1)-design, which means that each participant of V appears exactly k + 1 times in B and that each pair of participants of V appears exactly once in B. These properties can be utilized to design the group data sharing model, which can diminish the communication cost of the proposed protocol.

VIII. CONCLUSION

As a development in the technology of the Internet and cryptography, group data sharing in cloud computing has opened up a new area of usefulness to computer networks. With the help of the conference key agreement protocol, the security and efficiency of group data sharing in cloud computing can be greatly improved. Specifically, the outsourced data of the data owners encrypted by the common conference key are protected from the attacks of adversaries. Compared with conference key distribution, the conference key agreement has qualities of higher safety and reliability. However, the conference key agreement asks for a large amount of information interaction in the system and more computational cost. To combat the problems in the conference key agreement, the SBIBD is employed in the protocol design. In this paper, we present a novel block design-based key agreement protocol that supports group data sharing in cloud computing. Due to the definition and the mathematical descriptions of the structure of a ðv; k þ 1; 1Þ-design,

multiple participants can be involved in the protocol and general formulas of the common conference key for participants are derived. Moreover, the introduction of volunteers enables the presented protocol to support the fault tolerance property, thereby making the protocol more practical and secure. In our future work, we would like to extend our protocol to provide more properties (e.g., anonymity, traceability, and so on) to make it appliable for a variety of environments.

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Study of Fabry-Perot Cavity Design and Radiation Features of The Antenna

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ABSTRACT
In this present paper we studied about the Fabry Perot cavity design and radiation features of the antenna.

Keywords: Antenna, Metal Strip Grating, Fabry-Perot Cavity, Microstripline.

I. INTRODUCTION

In this paper we present the model is based on the use of a transverse equivalent network (TEN) to represent the fields in the FPC structure. This is useful to derive and explain the peculiar features of the analyzed structure. For periodic leaky-wave antennas that radiate from a higher-order space harmonic [1-3] the period is not small relative to a wavelength and such a homogenization is not possible.

II. METHODS AND MATERIAL

2.1. FABRY-PEROT CAVITY DESIGN

An FPC antenna can generally be regarded as a leaky parallel-plate waveguide excited by a finite source. The upper plate, either in the form of a dielectric screen or of a patch or slot array, allows radiation to leak out of the region between the parallel plates. To achieve a wide effective antenna aperture, and hence a directive radiation pattern, the leakage rate should be small; this is the case if, the upper plate has a low transmission coefficient. This happens when the equivalent susceptance of the upper FPC screen is much larger than the characteristic admittance. Assuming that the susceptance tends to infinity, an approximate design equation for the antenna thickness can be derived in order to achieve directive radiation at a given angle [1-5]

$$\frac{h}{\lambda_0} = \frac{0.5}{\sqrt{\varepsilon_r - \sin^2\theta_p}} = \frac{0.5}{\cos\theta_p} \quad (1)$$

Here the last expression holds for the case considered here in which, the relative dielectric constant of the medium filling the parallel-plate region, is equal to one. A more refined analysis, which takes into

account the finite value shows that in the planes the following relation holds:

$$\cot(k_{z0}h) \simeq \frac{B_{\mathrm{S}}}{Y_{\mathrm{c0}}} \tag{2}$$

Where the characteristic admittance refers to the equivalent transmission lines associated to the polarizations [6]; in the plane. The particular spatial dispersion of the MSG is such that the dependence of and on the wavenumber is the same; hence, the right-hand side in equation (1) has the same value in the principal planes. This crucial fact implies that a unique antenna thickness can be found that produces a scanned beam at the same angle in the principal planes. A high degree of azimuthal omnidirectionality of the resulting radiation pattern can then be expected. Interesting correlations exist between the problem of radiation from the considered MSG FPC antenna and the behavior of the same structure under plane-wave incidence. It can be verified that the condition of zero phase for the plane-wave reflection coefficient at the MSG plane is exactly given by (1); therefore, by the above-mentioned symmetry, the MSG above a ground plane behaves as a high-impedance surface at the same frequency in both principal planes, for both inductive and capacitive Far-Field Pattern. The component of the electric far field is written as:

$$E_p^{\mathrm{ff}}(\theta,\phi) = E_x^{\mathrm{pw}}(0,0,z_{\mathrm{s}}) \quad \text{----------} \quad 3$$

$$E_{\mathrm{co}}^{\mathrm{ff}} = f(\theta)\left(\cos\theta\cos^2\phi + \sin^2\phi\right) \quad \text{----------} \quad 4$$

$$E_{\mathrm{cross}}^{\mathrm{ff}} = f(\theta)\left(\cos\theta - 1\right)\sin\phi\cos\phi. \quad \text{----------} \quad -5$$

At any elevation angle, the cross-polarized component is identically zero in the principal plane. Since these are symmetry planes. At any aspect ratio, the co-to-cross polarization ratio, defined as:

$$R = \left|\frac{E_{\mathrm{co}}^{\mathrm{ff}}}{E_{\mathrm{cross}}^{\mathrm{ff}}}\right| \quad \text{----------} \quad 6$$

can be calculated from (6) in closed form as a function of the spherical angles

$$R = \left|\frac{\cos\theta\cos^2\phi + \sin^2\phi}{(\cos\theta - 1)\sin\phi\cos\phi}\right| . \quad \text{----------} \quad 7$$

The factor in (4) cancels out in (7), hence we get the remarkable result that the co-to-cross polarization ratio of the considered antenna does not depend on frequency nor on any of the physical parameters of the structure and it coincides with that of an elemental dipole in free space. The fact that there is cross polarization for an elemental dipole in free space is a consequence of the definition employed. If we had used Ludwigs second definition instead [7], the cross polarization would be zero. The third definition corresponds to that which is more commonly measured in practice. The angular range for where is larger than a prescribed value can then be determined in each elevation plane.

$$\cos\theta > \frac{R_{\min}\sin\phi\cos\phi - \sin^2\phi}{\cos^2\phi + R_{\min}\sin\phi\cos\phi} . \quad \text{----------} \quad 8$$

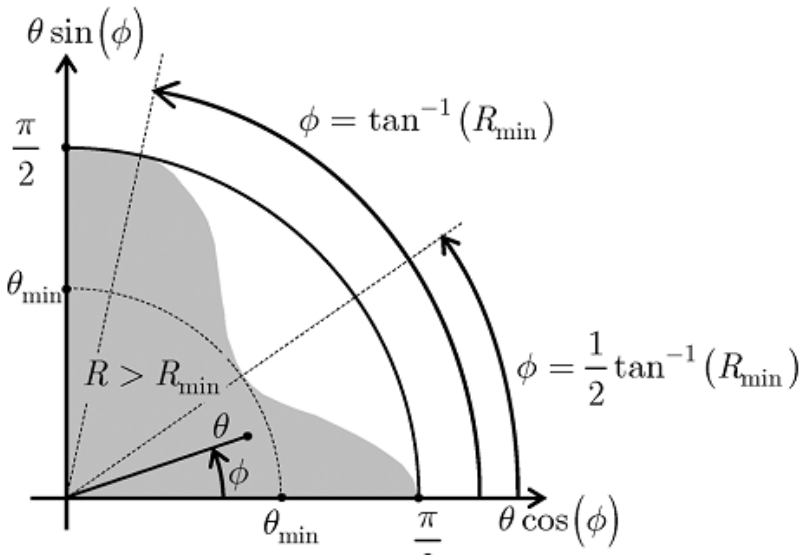

Fig. 1. Illustration of the angular region in the quadrant where the co-to-cross polarization ratio is larger than (shaded area).

A straightforward analysis of (8) shows that is larger than for all angles in the angular region, whereas for it gives.

$$\theta < \cos^{-1}\left(\frac{R_{\min}\sin\phi\cos\phi - \sin^2\phi}{\cos^2\phi + R_{\min}\sin\phi\cos\phi}\right). \quad \text{---------- 9}$$

From (8) it is found that the minimum value for is achieved in the elevation plane .

$$\theta_{\min} = \cos^{-1}\left(\frac{\sqrt{R_{\min}^2+1}-1}{\sqrt{R_{\min}^2+1}+1}\right). \quad \text{---------- 10}$$

2.2. R ADIATION FROM A HORIZONTAL ELECTRIC DIPOLE

The radiation features of the antenna shown in Fig. 1 are illustrated by providing numerical results for a specific structure with parameters. The value of the thickness has been determined by maximizing at this frequency the power density radiated at broadside. To assess quantitatively the accuracy of the approximate homogenized model of the antenna, a comparison is presented between results obtained with the TEN representations based on the temporally and spatially dispersive susceptance and full-wave results obtained with the MOM in the spatial domain. Here we have assumed an infinitesimal horizontal electric dipole source in the middle of the cavity. The far field is calculated again via reciprocity by letting a plane wave impinge on the structure. The Floquet-periodicity of the field allows for a restriction of the analysis domain to a single spatial period (unit cell of the structure); the MOM Comparison at two different frequencies between the homogenized model (TEN) and the method of moments (MOM). Parameters: Legend: plane: solid lines (MOM), circles (TEN); plane: dashed lines (MoM), squares (TEN); plane: dotted lines (MoM), diamonds (TEN). then uses a periodic Greens function to enforce the electric field integral equation on the strip conductor inside the unit cell. Entire-domain basis functions of Chebyshev type with the proper edge-singularity factor have been employed and the periodic Greens function has been accelerated by using the Ewald method [8-9].

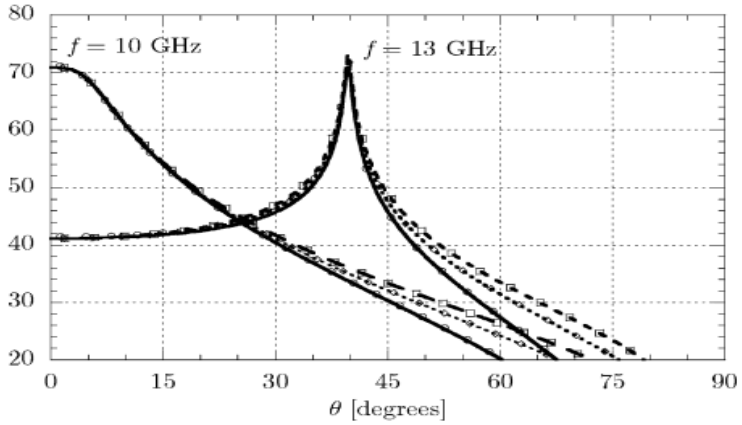

Fig. 2. Radiation patterns of the antenna in Fig. 1.

Moreover, in the MOM code the cylindrical symmetry of the structure along the strip axis is exploited to reduce the problem of plane-wave incidence from an arbitrary direction to a problem of incidence in the plane. Azimuthally Omnidirectional Radiation and Frequency Scanning Properties. In Fig. 3, far-field radiation patterns in the planes are shown for a structure as in Fig. 3. The radiated beam is seen to be scanned in elevation by varying frequency; in fact, starting from and increasing frequency, the beam opens up becoming conical in shape, with an angle of maximum radiation that covers the range from 0 to 75 in the frequency band from 10 to 35 GHz. At 30 GHz. The maximum directivity of the beams radiated at the considered frequencies are: 24.3 dBi at 10 GHz, 20.9 dBi at 11 GHz, 20.7 dBi at 13 GHz, 19.8 dBi at 20 GHz, 16.8 dBi at 30 GHz, and 14.1 dBi at 35 GHz. A s it is shown in figure 4.

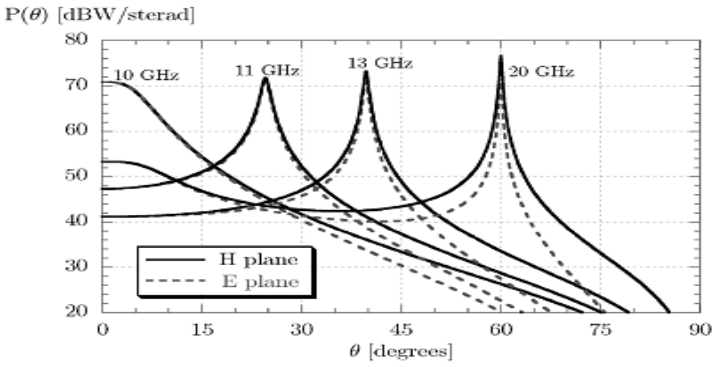

Figure 3. The directivity of the beam at different frequency

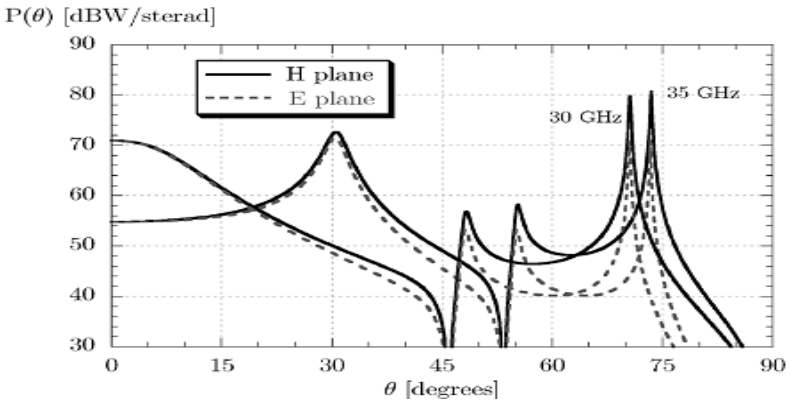

Fig. 4. Frequency scanning of the beam radiated in the planes for an MSG FPC antenna

It can be observed that, at each of the considered frequencies, the direction of maximum radiation is the same in the planes. The degree of azimuthal omnidirectionality of the radiation pattern can be appreciated from the exact values over the entire radiation sphere.

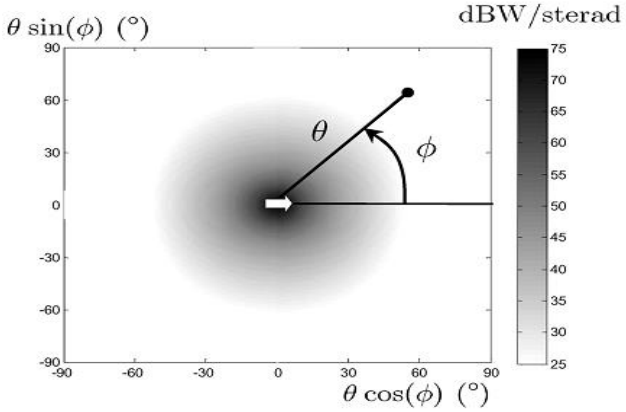

Figure 5.
Gray scale representation of the radiation pattern of an MSG –FPC Antenna
F= 10 GHZ Broad side beam θp=0

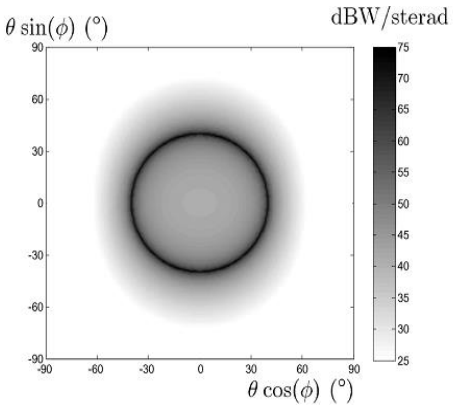

Figure 6.
Gray scale representation of the radiation pattern of an MSG –FPC Antenna
F= 13 GHZ Broad side beam, $\boldsymbol{\theta p = 39.7}$

The two properties (circular conical beam shape and constant beam width) are peculiar features of the MSG geometry, and it is not possessed by other designs of FPCs based on FSS-like PRSs. As concerns the peak intensity, in the plane it remains con-As concerns the peak intensity, in the plane it remains constant as the frequency is increased [10].

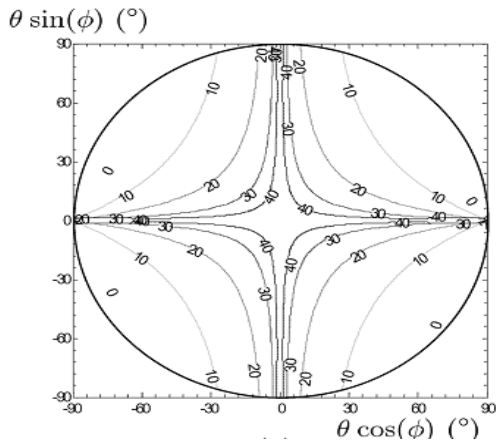

Figure 7.

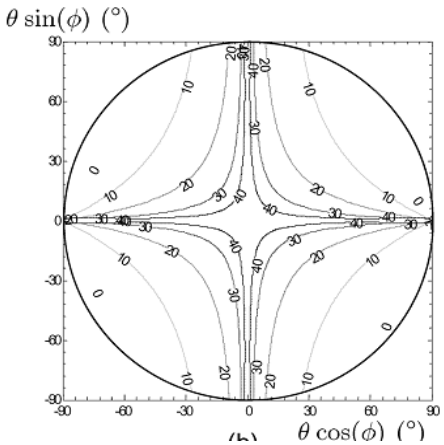

Figure 8.

2.3. POLARIZATION PROPERTIES

The polarization features of the considered FPC antenna are illustrated by adopting the same polar scale as in Fig. 6 and displaying contour plots of the co-to-cross polarization ratio (in dB), defined in (10), calculated with the MoM approach. In Fig. 7, the case of a broadside beam is considered, at; in Fig. 7, the case of a scanned beam is considered, at (corresponding to a scan angle). A very good polarization purity of the far field can be observed. Remarkably, Fig. 7 and 8 are indistinguishable: in fact, as expected from the analysis. the cross-polarization performance of the considered antenna is independent of frequency, and hence is the same for broadside and scanned beams, and is the same as that

exhibited by a horizontal elemental dipole radiating either in free space or above a ground plane [11].

III. CONCLUSIONS

A Fabry-Perot cavity antenna comprised of an MSG above a ground plane excited by a horizontal electric dipole has been studied by means of rigorous full-wave simulations. Remarkable omnidirectionality and polarization purity of the directive radiation patterns have been studied. due to the excitation of a single leaky mode along the antenna aperture that propagates omnidirectionally and has current flow only in the direction. This makes the considered MSG unique among the class of partially-reflecting surfaces employed in this type of antenna. An accurate equivalent network has also been adopted to model the antenna, based on the representation of the grating through an equivalent homogenized admittance that is both temporally and spatially dispersive. The particular dependence of such admittance on the spatial wavenumbers is shown to be the key element in establishing the peculiar observed radiation properties. From a mathematical point of view, such a dependence is related to the underlying geometric properties of the grating, which is uniform along the -direction, whereas it is periodic along the orthogonal -direction. These symmetries are shared with the wire-medium slab considered which shows similar radiation properties. The continuous translational symmetry of the structure is responsible for the occurrence of spatial dispersion, which manifests itself in a special dependence of the relevant homogenized parameters on the wavenumber. From a physical point of view, the continuous translational symmetry of the MSG, together with the gaps between the strips, allows the MSG to act as a linearly-polarized phased current sheet.

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Applications of Data Science in Respective Engineering Domains

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ABSTRACT

Data Science is answerable to the every field of technology domain even it is Electronics and Communication Engineering, Electrical Engineering, Mechanical Engineering or Civil Engineering. For example in Civil Engineering following applications like Advance Predictions in construction works, Project risk Analysis, availability of water resources, Traffic forecasting and many more similarly we have many applications from Engineering Domain. Data Science approaches has adopted many technical techniques within the Engineering domain ranging from data analysis to neural network to deep learning and it has very vast variety of particular engineering domain solutions. Data scientists today draw largely from extensions of the "analyst" of years past trained in traditional disciplines. As data science becomes an integral part of many industries and enriches research and development, there will be an increased demand for more holistic and more nuanced data science roles.

Keywords : Data Science, Data Analysis, Data Wrangling, Data Visualization, IDEs, Python Libraries.

I. INTRODUCTION

As per Today's Scenario Data Science is widely used in various fields of Engineering as well as Business and Financial Analysis. Data science requires some tools and programming languages like Python, R, etc. There are many IDEs used for to work on these languages. Python is most popular and very strong language for the data analysis, the reason is Python has very huge set of Libraries.

Data Science Algorithms plays a most important role to map solutions of given problems like Risk Analysis, Sales Analysis, Financial Analysis and many more. To get expertise in data science one should know Supervised Learning and Unsupervised Learning. These algorithms categorized in other languages based on type of problem.

The most common libraries for Data analysis are Numpy, Pandas, Matplotlib, and Seaborn. Basically Data Science profile is just like a story telling job but its require a very vast knowledge of Data Science Tools and Data Wrangling along with strong knowledge of Mathematics(Statistics and Probability). For Data visualization data correction and elimination of corrupt data is also important. A critical task in the education of future data scientists is to instill data acumen. This requires exposure to key concepts in data science, real-world data and problems that can

reinforce the limitations of tools, and ethical considerations that permeate many applications. Key concepts involved in developing data acumen include the following:

Mathematical foundations,
Computational foundations,
Statistical foundations,
Data management and curation,
Data description and visualization,
Data modeling and assessment,
Workflow and reproducibility,
Communication and teamwork,
Domain-specific considerations, and
Ethical problem solving.

II. Data Science Algorithms

In Data Science we used specialy Supervised Learning and Unsupervised Learning algorithms along with many other algorithms for different types of problems.

- **Supervised Learning:**

1) In Supervised Learning used a model which is trained with labeled data for example using a historical data to check the CIBIL score for loan application of a candidate to grant permission or not.

   Types of Supervised Learning

2) **K-Nearest Neighbors:**

   K-nearest neighbors (KNN) is one of the simplest and powerful Supervised Learning algorithm where the classification is done based on k nearest data points. The idea behind KNN is that similar points are grouped together (clustered) by measuring the nearest data point's properties, we can classify a test data point.
   For example, we solve a standard classification problem where we want to predict a data point belongs to class X or class Y. Let k=3; now we will test 3 nearest data point of the test data point, if two of them belongs to class X, we will declare the test data point as class X otherwise class Y. The right value of K is found through cross-validation. It has a linear time complexity hence cannot be used for low latency applications.

3) **Linear Regression**:

   Linear regression is a supervised data science algorithm. The objective is to find a Linear Space (hyper plane) where the maximum number of points lies in the hyper plane. For example, predicting rain is a standard regression problem where linear regression can be used. Linear regression assumes that the relation between the independent and dependent variables is linear, and there is very little or no multi co-linearity.

4) **Logistic Regression**

   The geometric intuition is that we can separate different Class labels using a linear decision boundary. The output variable of logistic regression is categorical. In logistic regression, our main motto was to find a separating linear surface.

5) **Support Vector Machine**

   We can consider the Support vector machine as an extension of this idea to find a hyperplane that maximizes the margin.

6) **Decision Tree**

   Decision Tree is a nested If-Else based classifier that uses a tree-like graph structure to make the decision. Decision Trees are trendy and one of the most used supervised machine learning algorithms in the whole area of data science. It provides better stability and accuracy in most cases than other supervised algorithms and robust to outliers. The decision tree's output variable is usually categorical, but it also can be used to solve regression problems.

- **Unsupervised Algorithms**

Unsupervised algorithms are used for the tasks where the data is unlabelled. The most popular use case of unsupervised algorithms is clustering.

Clustering is the task of grouping together similar data points without manual intervention. Let's discuss some of the popular unsupervised algorithms here

- **K Means**

  K Means is a randomized unsupervised algorithm used for clustering. K Means follows the below steps

1. Initialize K points randomly (c1,c2..ck)
2. For each point (Xi) in the data set Select nearest Ci {i=1,2,3..k} Add Xi to Ci
3. Recomputed the centric using proper metrics (i.e. intracluster distance)
4. Repeat step (2)(3) until converges

2) **K-Means++**

The initialization step in K means is purely random, and based on the initialization, the clustering changes drastically. K means++ solves this problem by initializing k in a probabilistic way instead of pure randomization. K means++ is more stable than classic K means.

3) **K -Medoids**

K medoids is also a clustering algorithm based on K means. The main difference between the two is the centroids of K means does not necessarily exist in the data set, which is not the case for K medoids. K medoids offer better interpretability of clusters. K means minimizes the total squared error, while K medoids minimize the dissimilarity between points.

Applications of Data Science in Engineering and Industrial Domains:

- **Mechanical Engineering:**

  Data Science helps to forecast the problems in mechanical engineering like Equipments performance, Accuracy of output of machines results, factors that are directly or indirectly affects the workflow. The future of machine learning will be deeply rooted in physics- The more we want to use machine learning in solving real-world problems, the more we will need professionals who can work with non-linear and dynamic systems in an environment with constantly changing factors.

Mechanical engineers have long been working in different areas. They have much to offer due to their experience with sensors, systems, and fluids. For instance, they can collect and convert energy from sources such as the sun, wind, and waves and account for turbulence in airplane designs.

- **Electrical Engineering:**

The field of Data Science is indebted to electrical engineering, Data science has adopted many techniques within the signal processing field ranging from signal analysis to neural network to deep learning and many more. Many consider machine learning as an outgrowth of statistical signal processing techniques

- **Civil and Construction Engineering:**

The world is overloaded with data. It results in a steady improvement in technologies. The construction industry has always been a victim of poor planning, management, budgeting, miscalculations, cost overruns, low return on construction assets, mistakes in proportions, and insufficient means for the building. Data science is called upon to make these problems miserable and facilitate construction on each of its levels. The construction companies use the benefit of data science to improve construction sites and manage the building process.

- **Finance:**

Use cases of Data Science in Financial Solutions:

1) Automating risk management
2) Managing customer data
3) Predictive analytics
4) Real-time analytics
5) Fraud detection
6) Consumer analytics

7) Algorithmic Trading
8) Deep personalization and customization

- **Pharmaceutical Industries:**

Use cases of Data Science in Pharma Industries:

1) Personalized Medication Plans
2) Marketing and Sales
3) Enhanced Drug Discovery and Development
4) Improved Drug Trials
5) Genomics
6) Genome Editing
7) Machine Learning
8) Patient Follow-ups
9) Safety and Risk Management
10) Operational Optimization

III. CONCLUSION

As per future of Technologies and the problems associated with the performance and accuracy of results in various different fields, Data Science is the solution and Data Analytics also plays an important role in analyzing the problem and target the audience for marketing.

Data science is emerging as a field that is revolutionizing science and industries alike. Work across nearly all domains is becoming more data driven, affecting both the jobs that are available and the skills that are required. As more data and ways of analyzing them become available, more aspects of the economy, society, and daily life will become dependent on data. It is imperative that educators, administrators, and students begin today to consider how to best prepare for and keep pace with this data-driven era of tomorrow. Undergraduate teaching, in particular, offers a critical link in offering more data science exposure to students and expanding the supply of data science talent.

Data science education is well into its formative stages of development; it is evolving into a self-supporting discipline and producing professionals with distinct and complementary skills relative to professionals in the computer, information, and statistical sciences. However, regardless of its potential eventual disciplinary status, the evidence points to robust growth of data science education that will indelibly shape the undergraduate students of the future. In fact, fueled by growing student interest and industry demand, data science education will likely become a staple of the undergraduate experience. There will be an increase in the number of students majoring, minoring, earning certificates, or just taking courses in data science as the value of data skills becomes even more widely recognized. The adoption of a general education requirement in data science for all undergraduates will endow future generations of students with the basic understanding of data science that they need to become responsible citizens. Continuing education programs such as data science boot camps, career accelerators, summer schools, and incubators will provide another stream of talent. This constitutes the emerging watershed of data science education that feeds multiple streams of generalists and specialists in society; citizens are empowered by their basic skills to examine, interpret, and draw value from data.

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A Novel Study on Design and Implementation of a Cyber Physical Industrial Control System by Using Cyber Security Techniques

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ABSTRACT

Because of late expansion in arrangement of Cyber-Physical Industrial Control Systems in various basic frameworks, tending to network protection difficulties of these frameworks is essential for guaranteeing their dependability and secure activity in presence of malignant digital assaults. In the ongoing scene that is controlled by innovation and organization associations, it is vital to know what digital protection is furthermore, to have the option to really utilize it. Frameworks, significant documents, information, and other significant virtual things are in danger on the off chance that there is no security to safeguard it. Securing the data have become perhaps of the greatest test in the current day. Whenever we ponder the network protection the primary thing that rings a bell is 'digital violations' which are expanding monstrously step by step. Different Governments and organizations are going to numerous lengths to forestall these digital wrongdoings. Other than different measures digital protection is as yet an extremely large worry to a large number. Towards this end, fostering a testbed to produce ongoing informational indexes for basic foundation that would be used for approval of constant assault recognition calculations are without a doubt profoundly required. This paper investigates and proposes the design and implementation of a cyber-physical industrial control system testbed where the Tennessee Eastman process is simulated in real-time on a PC and the closed-loop controllers are implemented on the Siemens PLCs. Misleading information infusion digital assaults are infused to the created testbed through the man-in-the-center construction where the vindictive programmers can continuously adjust the sensor estimations that are shipped off the PLCs. Moreover, different digital assault location calculations are created and executed continuously on the testbed and their exhibition and capacities are looked at and assessed.

Keywords : Cyber Security, Cyber Attacks, Industrial Control Systems, Hybrid Testbed, Cybercrime, Attack Detection Algorithms, Cyber Physical System.

I. INTRODUCTION

Today man can send and get any type of information might be an email or a sound or video just by the snap of a button yet did he at any point suppose how safely his information id being communicated or shipped off the other individual securely with practically no spillage of data?? The response lies in network protection. Today Internet is the quickest developing foundation in each day life. In the present specialized climate numerous most recent advancements are changing the substance of the humanity. Yet, because of these arising innovations we can't defend our confidential data in an extremely successful manner and thus these days digital wrongdoings are expanding step by step. Today in excess of 60% of complete business exchanges are done on the web, so this field required an excellent of safety for straightforward and best exchanges. Thus network safety has turned into a most recent issue. The extent of network protection isn't simply restricted to getting the data in IT industry yet additionally to different fields like the internet and so on.

A successful network protection technique has various layers of safeguard spread across the networks, PCs, projects, or information that one expects to keep non-poisonous. In a general public, the processes, individuals and apparatuses should all backup one choice to create a genuine safeguard on or after digital assaults. A brought together danger the board framework can automate increases across select Cisco Security merchandise and accelerate key security processes capabilities: revelation, assessment, and remediation.

Ongoing mechanical advances in charge, processing, and correspondences have produced serious interest being developed of new age of exceptionally interconnected and sensor rich frameworks that is known as basic Cyber-Physical Frameworks (CPS) foundation with application to assortment of designing spaces like interaction and computerization frameworks, savvy matrix and shrewd urban communities, and medical services frameworks. These complicated frameworks are turning out to be more appropriated what's more, PC arranged that have required the turn of events of novel checking, diagnostics, and disseminated control advances. Administrative Control and Data Acquisition (SCADA) systems, Wireless Sensor Networks (WSN), and PLCs, are presently settled ideal models that are used in numerous basic CPS framework. Then again, the imagined complex CPS foundation accomplish like never before require advancement of novel and proactive security innovations, as these frameworks are persistently being designated by digital assaults and interruptions by shrewd malignant enemies.

The foes are proficient of going after center control frameworks that are utilized in all key digital actual framework's foundation. These situations don't exist and are impractical or like security challenges that are available in customary IT frameworks. Hence, there exists a pressing need to concentrate on the weaknesses, examine the dangers, what's more, foster guarded and moderation components for basic CPS foundation. Because of responsiveness and high significance of the wellbeing basic frameworks, in actuality, any examination action that is straightforwardly applied to the actual framework can prompt disruption, unexpected harms or misfortunes, and thus advancement of testbeds that impersonate conduct of CPS in a limited scale style is profoundly fundamental for advancement of different network safety advances. In this paper, a crossover digital

physical testbed for modern control frameworks is created and different kinds of genuine digital assault situations are infused and carried out. Also, online continuous digital assault identification calculations are proposed to give an exhaustive arrangement to the digital protection of digital actual Industrial Control System (ICS).

In this paper, the hybrid testbed architecture is selected for development of the ICS testbed, where the Tennessee Eastman (TE) plant is simulated inside a PC and the remaining parts are implemented using actual industrial hardware. The TE plant is selected as the industrial process for our developed cyber-security testbed due to the following reasons. First, the TE model is a well-known chemical process that is used in control systems research and its dynamics are well-understood. Second, it should be properly controlled otherwise small disturbances will drive the system towards an unsafe and unstable operation.

Finally, from the anomaly detection perspectives, the cyber attack detection algorithms can be divided into five main categories, namely: linear, proximity-based, probabilistic, outlier ensembles, and neural networks approaches [7]. Therefore, in order to have a comprehensive comparison for cyber attack detection approaches that t the TE process, the following algorithms have been chosen from various categories such as: Principal Component Analysis (PCA), One-Class Support Vector Machines (OCSVM), Local Outlier Factor (LOF) k-Nearest-Neighbors (kNN), and Isolation Forest (IF). Comparative studies are conducted based on the cyber attack detection time and the confusion matrix performance metrics where subsequently, the OCSVM and kNN are demonstrated to yield promising performance for accomplishing the cyber attack detection objective.

II. RELATED WORK

Cyber attacks on TE processes are likewise researched in the writing. In [8], a respectability assault is infused on the controlled variable signs and the relating sensor estimations are seen by connection based grouping calculation. Various examinations have been directed on finding the ideal opportunity to send off the Denial of Administration (DoS) assault on either the sensor or actuator signals in the TE cycle. A few digital assault identification strategies, for example, model-based approaches [12], grouping based approaches [11], Gaussian blend models [10], and RNN-based approaches are created for discovery of various digital assaults on the TE interaction. Notwithstanding, the above work are all in view of the reproduced TE process and digital assaults are for the most part copied inside the simulation file.

Besides, a few ongoing ICS testbeds for exploring network protection are created in the writing and Table 1 presents correlations among these testbeds for different reach of uses that depend on TYPE (reenactment (S), physical (P), genuine ICS (R), and mixture (H)), Process, Data Type (network information (NET) and cycle information (PR)), Detection Technique, Attacks, Attack Type (copying (E) and physical (P)). As displayed in this table, the digital physical testbeds are produced for the actual water framework and different contextual analyses as far as information type, correspondence furthermore, assault infusion/location are introduced. In [1], a model-based location approach is created to recognize three various assaults by utilizing network information. Likewise, a physics based identification approach is introduced in [8] to distinguish subtle weakness by utilizing the cycle information. In [9], an Intrusion Detection System (IDS) approach is created to identify four different assaults by utilizing network information. In [2], various information driven interruption recognition calculations are created utilizing the organization information from the

Modbus correspondence convention. The water framework testbeds are created in view of the Ethernet/IP as the correspondence convention.

A reproduction testbed is utilized in [6] and in [7] a physical testbed is created and different assault discovery calculations are created by utilizing both the organization and the interaction information. In [29], [30], a simplified variant of the Tennessee Eastman process is used as the actual plant in the testbed and model-based assault location calculations are proposed for the reenactment based testbeds disregarding any actual equipment in the test system.

III. LITERATURE SURVEY

In this paper, a full version of the nonlinear chemical process of the Tennessee Eastman process is used as the physical process in the developed hybrid testbed. Moreover, based on the structure and features of PROFINET as the industrial field bus that is used in the Siemens distributed I/O, the actual real-time false data injection cyber attack is implemented through the man-in-the-middle (MITM) architecture on the developed testbed. This is achieved by utilizing Address Resolution Protocol such that the cyber hacker acts as the MITM in the closed-loop system and modifies the sensor measurements sent to the PLC or the actuator commands that are sent to the distributed I/O. Furthermore, various real-time online cyber attack detection algorithms are developed and implemented on the testbed and their performance capabilities are compared and evaluated. Consequently, this is the first work in the literature that completely simulates a full-version of the Tennessee Eastman Process using a hybrid testbed.

Table 1. Overview of the existing cyber-security study

TESTBED	TYPE	Process	Data Type (NET,PR)	Communication Type	Detection Method	Attacks	Attack Type Emulation Physical
[17]	P	Realistic water system emulator	NET	Modbus	Model-Based	DoS[1], FDI[2], Replay	P
[18]	S, P, R	Water treatment	PR	Modbus	Physics-Based	Stealthy	p
[19]	P	Water level control and air pollution control	NET	Modbus	IDS[3]	Reconnaissance, Response Injection, Command Injection, DoS	p
[20]	P	Water treatment	NET	Modbus	RF, DT, LR[4], NB[5]KNN.	Reconnaissance, Command injection, (DoS)	P
[21]–[23]	P	Water treatment (SWAT)	PR,NET	Ethernet	Model-Based	Reconnaissance, FDI, Physical	P
[24], [25]	P	Water Distribution (WADI)	PR	Ethernet	Model-Based	FDI	P
[26]	S	Distribution substation of a power grid	NET	Modbus	NA[6]	Reconnaissance, DoS	E
[27]	P	Two-loop nuclear power system	NET, PR	NA	Defense-in-depth, Data-driven, (AAKR)[7], KNN[8] DT[9], Bagging, RF[10]	MITM[11], FDI, (DoS) Data exfiltration, Data tampering	P
[28]	P	3 phase power distribution system	NET	Modbus	Mitigation techniques	FRE[12], MITM, PWB[13], Web based	P
[29]	S	Simplified Tennessee Eastman	PR	NA	IDS	FDI, DoS	E
[30]	S	Simplified Tennessee Eastman	NET	NA	IDS	NA	E
This paper	**H**	**Tennessee Eastman**	**PR**	**Profinet**	**PCA[14],OCSVM[15], LOF[16], KNN, IF[17]**	**FDI**	**P**

As such, this work gives an extensive arrangement for the network protection of ICS empowered with the accompanying primary contributions

1) A cross breed testbed is created by utilizing the mimicked full-rendition of the Tennessee Eastman Process as a nonlinear temperamental cycle and the Siemens field gadgets like PLC and disseminated I/O, though the past work in [29], [30] just thought to be the simplified adaptation
of TE without having any genuine equipment in the testbed.

2) Real-time false data injection cyber attacks are implemented by compromising the PROFINET field-bus protocol for the first time in the literature, where as shown in Table 1, all of the previous works are based on either the Modbus or the Ethernet communication protocols.

3) Several online cyber attack detection methodologies such as PCA, OCSVM, LOF, KNN, and IF are developed and implemented for real-time detection of cyber attacks in the supervisory level of the testbed. In contrast, in most of the previous work in the literature the detection algorithms are implemented off-line after collecting the data from the testbed.

IV. TENNESSEE EASTMAN (TE) PROCESS SIMULATION

The TE process has 12 manipulated variables (XMVs), 41 measured variables (XMEAS), and 20 different process disturbances (IDVs) which can be chosen by the user [6]. The output measurements (XMEAS) of the plant are divided into 22 continuous-time and 19 discrete-time measurements. In the developed testbed in this work, only 9 inputs and 16 continuous-time outputs are used as specified in Tables 2 and 3, respectively. It should be noted that the time unit of the original TE process model was in hours which is not suitable for a real-time simulation. Thus, in order to make the process real-time, the model is modified accordingly by changing the state dynamics of the system and correspondingly the controller gains.

Table 3. Process measurements used in the testbed

Variable name	Variable number	Units
A feed	XMEAS 1 (y_1)	kscmh
D feed	XMEAS 2 (y_2)	kg/h
E feed	XMEAS 3 (y_3)	kg/h
A and C feed	XMEAS 4 (y_4)	kscmh
Reactor pressure	XMEAS 7 (y_7)	kPa gauge
Reactor level	XMEAS 8 (y_8)	%
Reactor temperature	XMEAS 9 (y_9)	C
Purge rate	XMEAS 10 (y_{10})	kscmh
Prod. separator temperature	XMEAS 11 (y_{11})	C
Prod. separator level	XMEAS 12 (y_{12})	%
Prod. separator underflow	XMEAS 14 (y_{14})	m3/h
Stripper level	XMEAS 15 (y_{15})	%
Stripper underflow	XMEAS 17 (y_{17})	m3/h
A Concentration	XMEAS 23 (y_{23})	mol %
C Concentration	XMEAS 25 (y_{25})	mol %
G Concentration	XMEAS 40 (y_{40})	mol %

In the developed ICS testbed, the Siemens S7-1200 PLC CPU and the SIMATIC EP 200SP distributed I/O modules are used. For establishing the interface between the simulated process on the PC, and PLCs and distributed modules, MF644 and MF634 DAQ boards are used mainly due to a high number of analog inputs/outputs and their compatibility with MATLAB/Simulink. Each I/O module contains 4 analog inputs and 2 analog outputs and in order to connect all PLCs with all I/Os, the Siemens CSM 1277 switch modules are used.

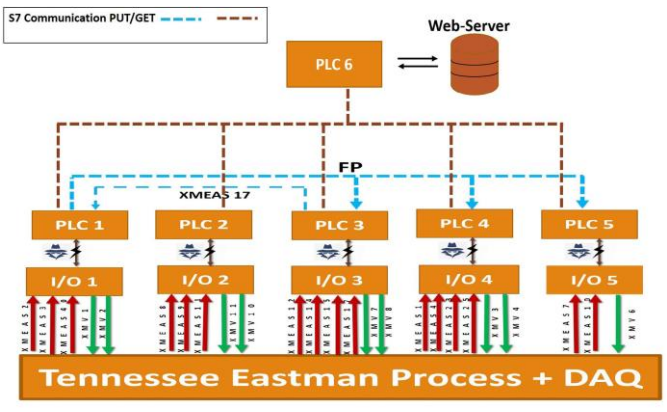

Figure 1. The TE process block diagram.

V. CYBER ATTACK INJECTION

In this section, our methodology for injecting cyber attacks on the developed testbed is presented. Generally, different protocols enable various attack surfaces such as the Data Integrity (DI) attack (e.g. manipulating sensor measurements), and Denial-of-Service (DoS) which causes disruption of communication now among entities. In an ICS architecture, cyber attacks can be categorized into two general types, namely as configuration and operational attacks. In the configuration attack, the malicious hacker targets the configuration protocols of the ICS, and consequently gets access to full control of the system. On the other hand, in the operational attacks, the malicious hacker mainly targets the operational communication protocol such as the PROFINET IO Real-time data, in which critical field data are transferred.

For this cyber attack to take place, it is assumed that (i) The hacker has a field level access to the IO Module and PLCs.(ii) Hacker has knowledge of the physical system, implying that, he/she is aware of what is being transmitted from the sensors and what are being transferred to actuators.

In [4], the authors exploit a vulnerability of the PROFINET Discovery and Basic Configuration Protocol (DCP) to inject DoS attacks through port stealing, against the application relation between the IO Controller and the IO Device. This type of cyber attack is not designed to be stealthy and has a higher probability of detection. An early attempt for false data injection through port stealing is presented in [35] although the developed attacks are not implemented on a real testbed.

In this paper, based on the structure and features of the PROFINET, a false data attack is injected into the PROFINET IO. Real-time data through the man-in-the-middle (MITM) structure is also validated on the developed testbed. This is mainly achieved by utilizing the ARP in which the port of the victim on the shared medium (such as a switch) is stolen and the hacker acts as a Man-in-the-Middle (MITM) in the closed-loop system that can modify the sensor measurements that are sent to the PLC. The PROFINET IO devices do not have any endpoint security functionality [36] which allows cyber attacks feasible once a malicious hacker has a physical access to a device or its network connections. One of the most effective and damaging cyber attacks on the PROFINET IO devices is the MITM cyber attack.

The MITM cyber attack will be implemented in our developed testbed, by utilizing the Port Stealing methodology. In the Port Stealing attack, the switch MAC table is compromised such that the hacker's MAC address is registered in place of the victim. Therefore, the intended port from the I/O module is stolen by the hacker, and consequently he/she can transmit false data to the PLCs. Port Stealing is an active cyber attack which allows a hacker to sniff packets in a switched network as well as modify packets by injecting new packets. This cyber attack targets the Application Relationship between the IO Controllers and the IO devices. Successful Port Stealing requires the hacker to synchronize with the real-time data communication and establish a race condition.

Algorithm: Nearest-Neighbor Algorithm

Training:

Input: xi - training data (i 2 f1; 2; 3; : : : ;Ng), k,

Output: Threshold Tr

1: for i D 1; : : : ;N do

2: Compute the k nearest neighbors of xi using the Ball-tree algorithm.

3: Compute the decision score (ascore(xi)) as the largest distance between xi and its nearest neighbors.

4: end

5: Set threshold as Tr D maxi(ascore(xi))

Testing:

Input: D - test data, xi - training data, Tr ,

Output: Test data ag r

1: Compute the k nearest neighbors of D using the Ball-tree algorithm.

2: Compute the decision score (ascore(D)) as the largest distance between D and its nearest neighbors.

3: if ascore(D) > Tr then

4: D is abnormal, r D 1.

5: else

6: D is normal, r D 0.

7: end

VI. PERFORMANCE EVALUATION AND ASSESSMENT

In this section, evaluation and validation of our proposed cyber attack detection schemes are provided and demonstrated for the developed TE testbed infrastructure.

DATASET

As previously indicated, the proposed methodologies of this work are demonstrated by using the real datasets that are generated from the implemented ICS testbed. The generated dataset consists of 25 variables such that 16 variables are corresponding to the sensor measurements and 9 variables are corresponding to the actuator signals.

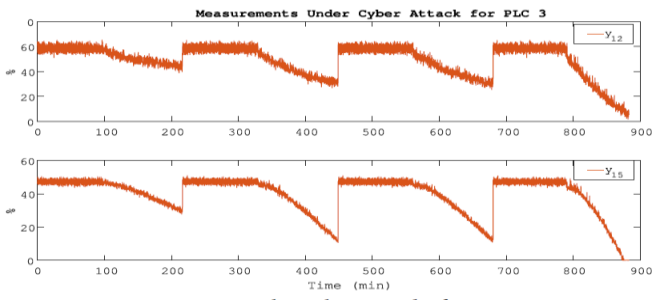

Figure 2. Measurements under cyber attacks for PLC3.

Two types of datasets are generated, where initially the testbed was run for almost 72 hours under the normal condition (that is, cyber attack free) for generating the training set of the size (25 X 96827) (after removing the initial transient behavior), i.e. N D 96827. Subsequently, the testbed was run several times subject to different cyber attack scenarios and different cyber attack gateways and points.

VII. PERFORMANCE EVALUATION METRICS

The confusion matrix is a form of contingency table with two dimensions identified as True and Predicted, and a set of classes corresponding to both dimensions, as presented in Table 5. The following detection and classification performance metrics are derived from the confusion matrix as follows:

Table 1. The confusion matrix.

	Predicted	
	Positive	Negative
Positive	True Positive (TP)	False Negative (FN)
Negative	False Positive (FP)	True Negative (TN)

Accuracy	Accuracy specifies the closeness of measurements to a specific category/class and it is computed as	$Accuracy = \frac{TP + TN}{TP + FP + TN + FN}$
Recall	Recall is the True Positive Rate (TPR) and is computed as	$TPR = \frac{TP}{TP + FN}$
Precision	Precision is the Positive Predictive Value (PPV) and is computed as	$PPV = \frac{TP}{TP + FP}$
F1 Score	F1 Score is the harmonic average of the precision and recall, where it is at its best at a value of 1, implying perfect precision and recall and is computed by	$F1 = 2\frac{PPV * TPR}{PPV + TPR}$

It should be noted that the main aim of this section is to perform a quantitative comparison study of various cyber attack detection schemes is presented using the real-time data generated by the developed testbed.

Table 2. Performance of the proposed schemes.

ML Algorithm	Accuracy	Recall	Precision	F1
PCA	0.9754	0.9568	0.9968	0.9764
OCSVM	**0.9910**	**0.9876**	**0.9954**	**0.9915**
LOF	0.9863	0.9774	0.9969	0.9870
kNN	0.9869	0.9896	0.9859	0.9877
IF	0.9628	0.9338	0.9960	0.9639

In this subsection, a quantitative comparison study of various cyber attack detection schemes is presented. As previously indicated, the field data are collected in real-time from the PLC's local cloud. Therefore, by implementing the cyber attack detection schemes on the process data in real time, the status of the data can be determined online. Table 6 provides the efficiency of the proposed schemes. As illustrated is Table 6, the IF has the worst performance over the provided datasets due to high oscillation in the detection signal (high number of false negative alarms), while it has the fastest training time (speed) in comparison with the other techniques. Moreover, the OCSVM scheme has achieved quite promising results as compared to other methods. In general, the training speed is directly proportional to the characteristics of the scheme.

Table 3. The cyber attack detection time (DT).

DT	λ	PCA	OCSVM	LOF	kNN	IF
PLC 1	98%	9:30	1:22	4:30	1:20	1:22
	96%	3:56	1:22	1:22	1:22	1:22
	94%	1:34	1:22	1:22	1:22	1:22
	92%	1:20	1:20	1:20	1:20	1:20
PLC 2	98%	1:00	1:00	1:00	0:54	0:58
	96%	1:18	1:14	1:18	0:52	0:48
	94%	0:46	0:46	0:46	0:42	0:44
	92%	0:58	0:58	0:58	0:56	1:00
PLC 3	98%	22:24	4:48	10:32	1:32	2:30
	96%	10:0	1:26	4:58	1:26	1:38
	94%	9:24	1:22	4:42	1:20	2:18
	92%	5:48	1:24	2:28	1:22	2:16
PLC 4	98%	13:40	2:00	6:48	1:16	1:36
	96%	6:22	1:20	1:32	1:14	1:24
	94%	3:38	1:22	1:26	1:22	0:18
	92%	1:28	0:02	1:24	0:02	1:00
PLC 5	98%	1:24	1:24	1:24	1:18	11:20
	96%	1:30	1:30	1:30	1:30	4:18
	94%	1:22	1:22	1:22	1:22	12:28
	92%	1:22	1:22	1:20	1:18	11:56
Average DT		**4:56**	**1:26**	**2:36**	**1:11**	**3:06**

For instance, the IF infrastructure is based on combination of multiple decision trees (binary) which leads to having a considerably fast training speed. On the other hand, OCSVM scheme calculates the decision boundaries about the data points, and hence its training speed is slow. Table 7 shows the cyber attack detection time (DT) corresponding to various cyber attack scenarios. Overall, as expected from Table 6, the OCSVM and kNN have the fastest detection times and by increasing the cyber attack severity, the cyber attack detection times are generally improved. However, for the IF algorithm, due to high oscillations in the original signal and effects of post processing algorithm, by increasing the detection times are not improved.

VIII. CONCLUSION

In this paper, a hybrid testbed is created and executed for a industrial control systems (ICS) through continuous reenacting the Tennessee Eastman (TE) process as the physical part of the testbed and executing the other layers of the ICS utilizing Siemens modules, like PLC furthermore, circulated I/O. Because of different security parts of ICS, there are numerous imperatives and difficulties in acquiring real field information. Hence, by producing and logging the information from the actual piece of the proposed testbed, a dataset as close as conceivable to the genuine field information is produced. Appropriately, by utilizing this dataset, the effect of different ongoing digital assaults on the framework and the relating proposed online location approaches are considered. The Man-In-The- Center (MITM) digital assaults are straightforwardly carried out on the PROFINET correspondence conventions to such an extent that the pernicious programmer can change the sensor estimations that are shipped off the PLC.

Accordingly, a few digital assault location approaches have been created and carried out in real time. Table 6 shows the general presentation of each digital assault discovery philosophy under different pernicious assault situations. Besides, Table 7 gives the digital assault discovery time for each plan. Albeit, all the assessed plans have had the option to identify the digital assaults previously close bringing down of the plant, notwithstanding, the OCSVM conspire shows the best presentation for this specific application. This review that depends on the proposed testbed can help in deciding the ideal methodology for a specific ICS process that depends on specified limitations (for example the plant closure condition) and prerequisites (for example the plant creation rate). It ought to be stressed that none of the past works in the writing have thought about the full Tennessee Eastman process in their created testbed. Likewise, to the best of the creators' information, none of the past work have worked on the PROFINET convention for infusing constant digital assaults. Besides, in a large portion of the past work, the digital assault recognition calculations are carried out disconnected later gathering the information from the testbed where as in this work, the digital assault recognition plans are executed in with no reservations continuous in the administrative level of the testbed. Thus, in this work the web-based execution for our proposed digital assault discovery plans are shown and given. Future work will include the execution of more complicated multi-point digital assaults on the testbed and assessment of the presentation of digital assault location and alleviation plans progressively on the testbed.

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Study of Dielectric Parameters of Binary Liquid Mixtures of 2-Aminopropane with Methanol at Microwave Frequency

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ABSTRACT

The binary mixture 2-aminopropane with methanol for different mole fractions have been measured at 10GHz microwave frequency .at 40^0 temperature. The viscosity(η), density(ρ),square refractive index (n_D^2)have measured of pure liquid and mixture also. These data is utilized to calculate various parameters such activation energy(E_a),molar polarization (P_{12}),The excess parameters are also estimated such as square of refractive index (Δn_D^2), viscosity ($\Delta\eta$) and activation energy (ΔE_a), These are used to explain the formation of complexes in system. Intermolecular interactions between the components in liquid mixtures were discussed.

Keywords: Dielectric constant, Microwave frequency and complex formation.

I. INTRODUCTION

It is very important to know the intermolecular and intra molecular interactions for dipole study and hydrogen bonding .Hence the dielectric study of binary mixtures of both polar and non polar is important.

The dielectric investigations of binary polar liquid mixtures provide valuable information regarding intermolecular interactions and the consequent structural rearrangement of molecules in solutions several researches have reported the heterogeneous and homogeneous interactions in mixtures using dielectric parameters. The refractive index measurement with density and other analytical data have wide applications in chemical industry. The measurement of relative permittivity is useful in characterizing the molecular structure ,solute-solute and solute-solvent interactions in solutions[1,5].

2-aminopropane is a organic compound with chemical formula C3H9N.It has average mass 59.110 Da , monoisotope mass 59.073498 Da, preferred IUPAC name as propane-2-amine.It is hygroscopic colorless liquid with ammonia like odour, it is miscible with water and flammable and used in bidegntate ligand in coordination chemistry and useful sale n type ligand.salpn is used as fuel additive as a metal deactivator in motor oils. It suppresses the catalytic activity[2]

Methanol is a polar liquid at room temperature .it is used as antifreeze, solvent, fuel and as a denaturant for ethanol methanol is essential in our lives everyday .It is also used in automotive antifreezes , in rocket fuels and as a general solvent .methanol is also

a high octane , clean burning fuel used in automotive vehicles the methanol derived from wood is used chiefly for rendering ethyl alcohol unfit to drink binary mixtures leads to polarization between molecules[6]

II. METHODS AND MATERIAL

The chemicals are used of A R grade and purified. The viscosities were measured with the help of Ostwalds Viscometer . The densities were measured using Picnometer .The refractive indices were measured by an Abbes refractometer. The measurements of ϵ' and ϵ'' were carried out at X-band bench at 10GHz using Surbers technique.

Dielectric Parameters :

The dielectric values are calculated by using following equations [10,11,12]

$$\epsilon' = \left[\frac{\lambda_o}{\lambda_c}\right]^2 + \left[\frac{\lambda_o}{\lambda_d}\right]^2 \quad \text{------(1)}$$

$$\epsilon'' = \frac{2}{\pi}\left[\frac{\lambda_o}{\lambda_c}\right]^2 \left(\frac{\lambda_g}{\lambda_d}\right)\left(\frac{d\varrho}{d\mathrm{n}}\right) \quad \text{------ (2)}$$

Where

λ_0 is the free space wavelength

λ_c is the cutoff wavelength

λ_d is the dielectric wavelength

λ_g is the guide wavelength

ϱ Is the inverse of the voltage standing Wave ratio

n is the number as (1,2,3,4,---)

$\frac{d\varrho}{d\mathrm{n}}$ is the slope of ϱ Vs n

The viscosity equation is

$$\eta = \left(\frac{\mathrm{hN}}{\mathrm{V}}\right) e^{\left[\frac{E_a}{RT}\right]} \quad \text{------(3)}$$

V is the molar volume of liquid

E_a is the free energy of activation

The molar polarization of the mixtures were obtained by using formula

$$P_{12} = \left(\frac{\epsilon'-1}{\epsilon''-1}\right)\left[\frac{M_1X_1 - M_2X_2}{2}\right] \quad \text{------(4)}$$

Where,M1 and M2 are the molecular weight,X1 and X2 are the mole fraction of the mixture.

The excess parameters can be obtained by using the relation

$$\Delta Y = Y_m - [X_1Y_1 + X_2Y_2] \quad \text{------(5)}$$

Y refers for excess dielectric parameters. The subscripts 1 &2 used for liquid (1) and liquid (2).

III. RESULTS AND DISCUSSION

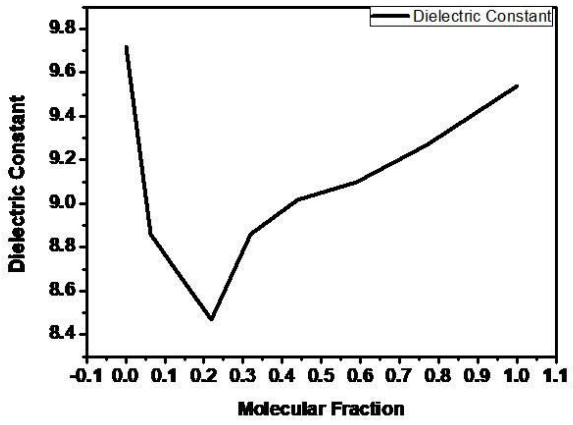
Table-1: The values of viscosity(η), square refractive index (n_D^2), dielectric constant (ϵ'), dielectric loss (ϵ''), loss tangent (Tan δ), activation energy(E_a) and molar polarization (P_{12}) with increasing mole fraction (X) of Amine propane (AP) with Methanol.

Sr. No.	X	Density ρ gm/cm³	η	n_D^2	ϵ'	ϵ''	Tan δ	E_a kcal/mol	P_{12}
1	0.00	0.80	0.69	1.78	9.72	2.40	0.25	3.01	29.65
2	0.063	0.81	0.99	1.88	8.86	2.15	0.24	3.22	30.95
3	0.14	0.82	1.94	2.09	8.66	2.17	0.25	3.41	32.97
4	0.22	0.84	1.62	2.07	8.47	2.73	0.32	3.53	35.00
5	0.32	0.86	1.78	2.04	8.86	2.24	0.25	3.58	38.53
6	0.44	0.87	1.79	2.04	9.02	2.42	0.27	3.58	42.41
7	0.59	0.873	1.79	2.06	9.1	2.44	0.27	3.58	47.56
8	0.77	0.88	2.01	2.09	9.27	2.73	0.29	3.65	54.07
9	1.00	0.884	2.21	2.09	9.54	2.55	0.27	3.71	62.76

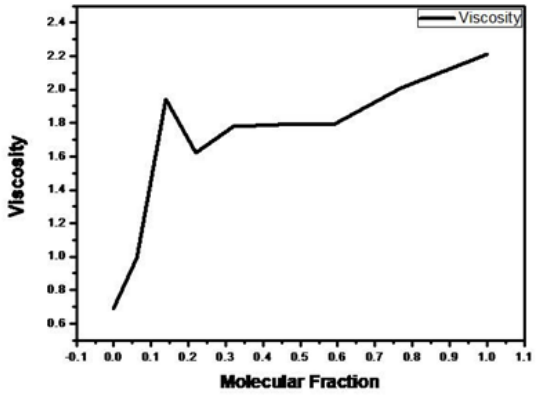
Table-2: The values excess of viscosity(Δη), excess dielectric constant (Δε'), excess dielectric loss factor (Δε''), excess activation energy(ΔE_a) and excess molar polarization (ΔP_{12}) with increasing mole fraction (X) of Amine propane (AP) with Methanol.

Sr.No.	X	Δη	Δε'	Δε''	ΔE_a kcal/mol	ΔP_{12}
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.063	0.21	-0.45	-0.26	0.18	-0.79
3	0.14	0.44	-1.03	-0.26	0.30	-1.18
4	0.22	0.59	-1.21	0.30	0.36	-1.94
5	0.32	0.61	-0.80	-0.21	0.35	-1.73
6	0.44	0.44	-0.62	-0.04	0.27	1.81
7	0.59	0.20	-0.51	-0.05	0.16	-1.63
8	0.77	0.15	-0.31	0.22	0.11	-0.99
9	1.00	0.00	0.00	0.00	0.00	0.00

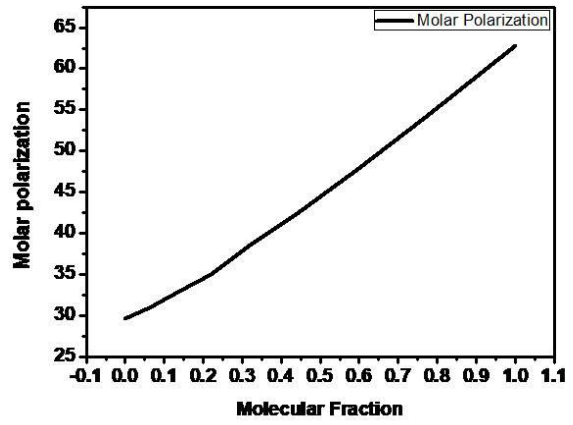
Fig(1)



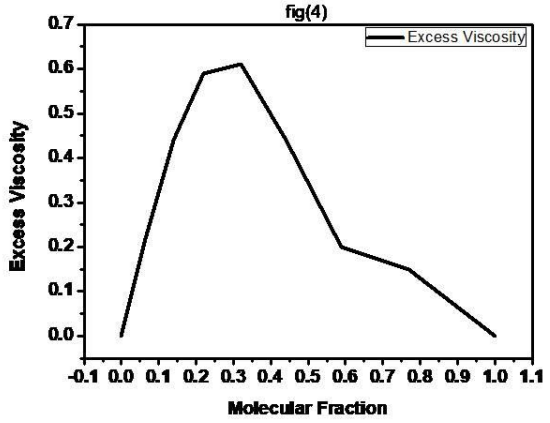
Fig(2)

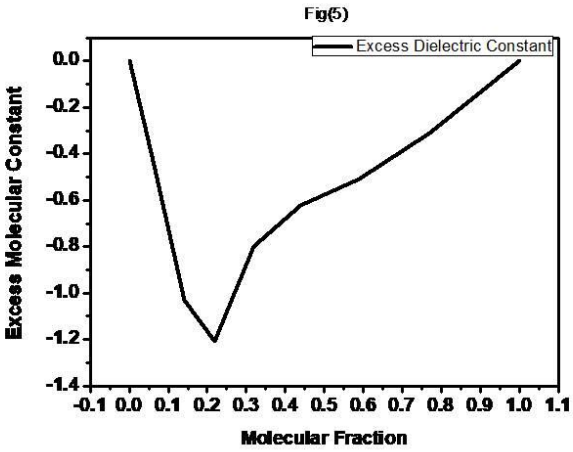


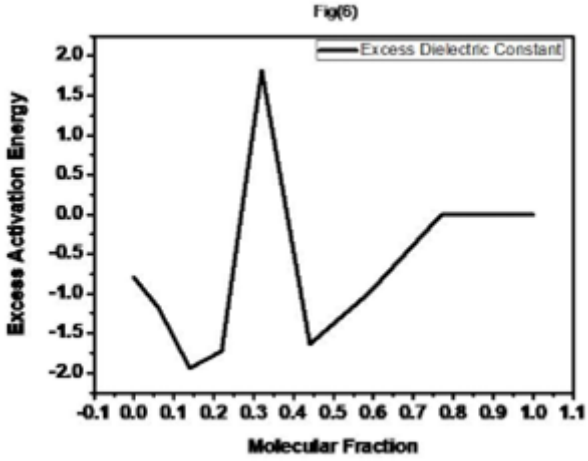
fig(3)



fig(4)







- The Variation of with X of AP in mixture is shown in fig(1)
- According to Narwade etal(7), The curve is nonlinear then there is complex formation and curve shows maximum deviation from linearity at X=0.22 of AP.
- The variation of with X of AP in mixture is shown in fig (2). The value of increases around 0.44 mole fraction of AP.
- There is solute-solute interaction between AP and Methanol. It shows stronger intermolecular dipole-dipole interactions. The increase in Viscosity up to 0.44 mole fraction may also be attributed to the mutual viscosity of alcohol-amine molecules as per Andrades's theory(4).
- The variation of P_{12} with X of AP in mixture is shown in fig (3) It shows the nonlinear and maximum slope occurs at X=0.22
- The variation of and X shown in Fig(4) The values are positive for entire range of mole fraction. It shows the string interaction between the unlike molecules of the system(3)
- The variation of and X is shown in fig(5). The excess dielectric permittivity is negative which is associated with polarization and excess loss is regarded due to molecular motions which are governed by complex forces of molecular interactions. It indicates total effective dipoles gets reduced(8,13,14).
- The variations of and X are as shown in fig(6) . All the values are positive for entire region, it indicates strong interaction (9) between solute-solvent(7), which supports our earlier conclusion.

IV. CONCLUSION

- The study suggest that there is strong interaction in between 2-aminopropane and methanol molecules.
- The dielectric constant and viscosity curves suggest that there is complex formation of 1:1 complex in the binary mixture of 2-AP and Methanol.
- The experiment al study suggest there is significant intermolecular interaction is present at temperature 40^0C.

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A Novel Classification Performance Approach for Remotely Sensed Multispectral Image Data by Using Data Mining Techniques

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ABSTRACT

In order to combine multimedia imagery and multispectral remote sensing data to analyze information, preprocessing becomes a necessary part of it. As one of the most important branches in the field of data analysis, it is widely used in many fields such as classification, regression, missing value filling, and machine learning. As a lazy algorithm, this method requires no prior statistical knowledge and no additional data to train description rules and is easy to implement. This study compares classification algorithm performances of data mining clustering algorithms for remotely sensed multispectral image data using WEKA data mining software. Clustering algorithm selection is very important for data mining classification method-based clustering. The class attribute for remotely sensed multispectral image data is obtained from six different clustering algorithms for classification. Classification algorithm performances computed depending on the data labeling of six different clustering algorithms in terms of correctly classified instances and kappa statistics for seven different classification algorithms. A strategy is developed for selecting the best unsupervised clustering algorithm, among different clustering algorithms, giving the highest supervised classification accuracy in terms of correctly classified instances and kappa statistics for semi supervised classification of remotely-sensed multispectral image data. The performances of seven semi-supervised classification methods assessed depending on six different unsupervised clustering algorithms for supervised classification of remotely sensed multispectral image data. This study determines data free clustering algorithms for classification.

Keywords: Data mining, remotely-sensed multispectral image data, clustering, classification

I. INTRODUCTION

Remote sensing image fusion is a technology that combines multisource remote sensing images through advanced image processing. It makes full use of the different characteristics of a variety of data, so that the image has a higher spectral and spatial resolution at the same time, and improves the vision of the image. The effect and accuracy of image feature recognition and classification accuracy Remote sensing image fusion is a hot research topic in the international remote sensing community in recent years. In the method of image fusion, there are some classic algorithms, such as HIS transformation method, COS transformation method, HIS transformation method, and HSV transformation method. In recent years, with the introduction of wavelet transform into the field of image processing, image fusion methods based on wavelet transform have attracted people's attention. Remotely sensed multispectral image data is big (stream) data. Data mining unsupervised clustering algorithms applied for labeling remotely sensed multispectral image data. With the rapid development of data collection and storage technology, there are plentiful unlabeled data but very few and often expensive labeled data in real-world applications.

Guerra et al.[1] studied the comparison between data mining supervised and unsupervised classifications of neuronal cell types. The increased developments of high-spatial resolution multispectral images improved the level of complexity required in data processing. To overcome this problem, several approaches investigated on both per-pixel and per-field based classifications of the remotely sensed multispectral image data.

Semi-supervised classification performances of data mining unsupervised clustering algorithms for remotely sensed multispectral image data is examined in this study to determine data free clustering algorithms. Unsupervised clustering algorithm selection is very important for labeling data in data mining. Selecting the best unsupervised clustering algorithm, among different clustering algorithms, giving the highest semi supervised classification accuracy in terms of correctly classified instances and kappa statistics is developed for semi supervised classification of remotely-sensed multispectral image data using WEKA data mining software [5]. The performances of semi-supervised classification methods assessed depending on different unsupervised clustering algorithms for supervised classification of remotely sensed multispectral image data. Data mining method applied is a semi-supervised classification method since it uses supervised classification based on unsupervised clustering of data. The results of supervised classification methods assessed and the performances of different unsupervised clustering algorithms compared for supervised classification of remotely sensed multispectral image data.

II. LITERATURE SURVEY

In the last years, a large interest has been devoted to the development of novel methodologies for multitemporal information extraction and analysis. This is demonstrated by the sharp increase in the number of papers published in the major remote sensing journals, the increased number of sessions in international conferences, and the increased number of projects related to multitemporal images and data.

The main reasons for this are: (i) the increased number of satellites with shorter revisit time that allow the acquisition of either long time series or frequent bitemporal images, (ii) the new open policy for data distribution of archive data that makes it possible a retrospective analysis on large scale (e.g., the Landsat Thematic Mapper archive), and (iii) the policies for the free distribution of many new satellites' data (e.g., Landsat 8, ESA Sentinels).

Multitemporal information extraction methodologies differ because of both the specific investigated application and the kind of data available. The most widely addressed applications are related to products obtained through multitemporal change detection, detection of land-cover transitions, and trend analysis of time series of data (for long terms change identification or forecasting/ prediction).

According to an information theory perspective, the information in multitemporal data is associated with the dynamic of the variables that are measured, which is linked with the changes occurring between successive acquisitions. Thus, the most interesting applications are related to the classification/integration of multitemporal data/images for the detection of changes. We can distinguish among abrupt changes, which occur in a short time (e.g., the ones caused by forest fires, floods, and earthquakes) and medium/long term changes, which can be appreciated only by comparing long time series of images (e.g., desertification, urban growth, and vegetation monitoring). The abovementioned applications can be addressed by using images acquired at different times by: (i) the same sensor, (ii) different sensors with similar properties (multisensor images), or (iii) different sensors with different properties (multisource images).

The main methodological approaches proposed in the literature for the analysis of changes in multitemporal remote-sensing images can be categorized by the use of bitemporal images or image time series. Accordingly, the following three groups of methods for multitemporal image analysis will be reviewed: (i) unsupervised bitemporal image analysis methods, (ii) supervised/semi supervised bitemporal image analysis methods, and (iii) image time series analysis methods.

1. Unsupervised bitemporal image analysis includes algorithms where change information is extracted by analyzing multitemporal features/images. Multitemporal information is associated with differences in the spectral signatures (or the backscattering coefficient) of the land-covers. After multitemporal comparison, the separation/classification between changed and unchanged areas (i.e., each pixel is associated with one of two possible classes: the class of changed patterns or the class of unchanged patterns) is performed by unsupervised approaches. Sometimes land-cover transitions can be distinguished, but without explicit labelling.

2. Supervised/semi-supervised bitemporal image analysis includes algorithms that elaborate the multitemporal signature using classification techniques. Approaches in this category are mainly supervised or semi-supervised. They explicitly identify land cover classes at each considered time and land-cover transitions are labelled accordingly (these methods can also be used when there are no changes between images for generating land-cover maps).

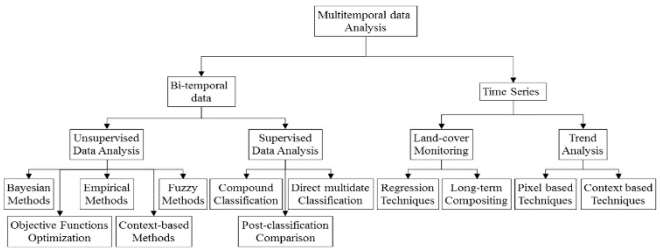

Fig. 1 Multitemporal data classification approaches.

3. Image time series analysis algorithms depend on the application goal and the temporal scale. At very high temporal resolution, changes such as those which occur on agricultural or urban areas become interesting and can be studied, whereas at lower temporal resolution, changes such as desertification/revegetation can be investigated. In both cases, a proper sampling of time series is required. Nevertheless, factors like atmospheric conditions or revisit period of the satellites can lead to

the availability of irregular and noncontinuous time series. Therefore, techniques that aim at building/studying time series by means of gap-filling, curve-fitting, and warping methods, and by using multisensory and multisource data can be found in the literature. Once proper time series are available, the analysis of different trends, at pixel or region levels, can lead to the classification/detection of interannual (seasonal) changes and inter-annual changes.

The first preprocessing step aims at making the multitemporal images radiometrically comparable. Ideally, a ground object should show the same brightness values if no change has occurred. In reality, measured intensity/backscattering values are sensitive to differences in acquisition geometry and environmental conditions (e.g., soil moisture for SAR systems, atmospheric contusions for optical passive systems). Radiometric conditions can be influenced by many factors such as imaging seasons, incidence angles, meteorological conditions, etc. Acquisition geometry, such as sensor viewing angle, local incident angle, and solar orientation have strong effects on the acquired images.

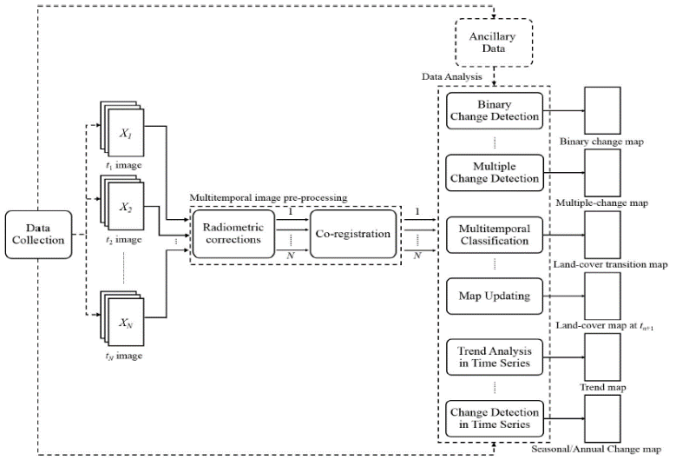

Fig. 2 General high level block scheme of multitemporal data analysis.

Atmospheric conditions have a serious impact on the measured radiance when using optical remotely sensed images. Absolute or relative normalization is often used to reduce this impact and make the multitemporal optical images comparable. Absolute normalization converts digital numbers to scaled surface reflectance and requires information about the atmospheric condition during image acquisition, which is not always easy to obtain. Relative normalization consists of linear transformation of spectral characteristics of the image in order to correct them to match those of a reference image. SARs are less affected by atmospheric condition.

III. RELATED WORK

A. Remotely Sensed Multispectral Image Data Analytics Remotely-sensed multispectral image data, used in this study, taken by Landsat Thematic Mapper [6]. There are three attributes (variables): first variable, taken as, X1, consists of spectral bands values of band 3, second variable, taken as X2, consists of spectral bands values of band 4 and third variable, taken as X3, consists of spectral bands values of band 5. There are 39600 instances (observations) or pixel values surrounding 198×200 data matrix.

Calis and Erol [2] applied a mixture of normal distribution models to determine the homogeneity of the per-field data structure. They classified remotely-sensed multispectral image data of an agricultural region on per-field basis using mixture discriminant analysis.

There are 5 crop types as agricultural features which were assigned into 24 homogeneous classes. Our analysis of data involved exporting the data from Excel worksheet to a Comma Separated Value (CSV) format, which was converted into Attribute Related File Format (ARFF) for use in WEKA data mining software. The original data labels thus, class attribute for remotely-sensed multispectral image data exists.

The class attribute consists of 24 homogeneous clusters.

Histograms for spectral brightness of spectral bands values of three attributes (variables): first attribute X1, second attribute X2, third attribute X3 and the class attribute obtained from original data are shown in Figure 1.

Data mining supervised classification methods based on selecting the best unsupervised clustering algorithm giving the highest supervised classification accuracy in terms of correctly classified instances and kappa statistics are applied for supervised classification of remotely-sensed multispectral image data. In unsupervised clustering algorithms, the aim is to discover groups of similar instances within the multispectral image data. There is a prior information about the class labels of data. There are 24 homogeneous clusters in the class attribute. Homogeneous clusters are supervised classified by using spectral signatures of crop types.

The best unsupervised clustering algorithm leading the best supervised classification of multispectral image data with highest classification accuracy in terms of correctly classified instances and kappa statistics [7] is selected and determined. B. Unsupervised Clustering Algorithms Applied For Supervised Classification Of Remotely Sensed Multispectral Image Data

Remotely sensed multispectral image data are classified by applying seven different classification methods: (1) Naïve Bayes [8] from Bayes group; (2) Multi Layer Perception from Functions group; (3) SMO from Functions group; (4) KStar from Lazy group; (5) Bagging from Meta group; (6) Decision Table from Rules group and (7) J48 from Trees group using WEKA data mining software [5]. The classification methods used in this study are all supervised classifications.

The class attribute for each classification method should be obtained from remotely sensed multispectral image data thus, actual big data using a clustering algorithm for comparing the performances in WEKA data mining software [5]. The class attribute for each classification method obtained from different unsupervised clustering algorithms. These unsupervised clustering algorithms are: (1) Class attribute obtained from Canopy clustering; (2) Class attribute obtained from EM clustering; (3) Class attribute obtained from Farthest First clustering; (4) Class attribute obtained from Filtered clustering; (5) Class attribute obtained from Make Density Based clustering; (6) Class attribute obtained from Simple K means clustering and (7) Class attribute obtained from original data.

Table.1. The Results for Classification of Remotely Sensed Multispectral Image Data Using Different Classification Methods Based on the Class Attribute Obtained from Canopy Clustering.

Number	Classifier	Correctly Classified Instances %)	Kappa Statics
1	Naïve Bayes	87.55	0.8609
2	Multi-Layer Perception	88.19	0.8511
3	SMO	89.25	0.8910
4	KStar	90.10	0.8308
5	Bagging	96.55	0.9504
6	Decision Table	92.88	0.9102
7	**J48**	**98.85**	**0.9815**

Results for classification of remotely sensed multispectral image data using different classification methods: (1) Naïve Bayes; (2) Multi-Layer Perception; (3) SMO; (4) KStar; (5) Bagging; (6) Decision Table and (7) J48; based on the class attribute obtained from EM clustering [9] is given in Table 2.

Table 2. The Results for Classification of Remotely Sensed Multispectral Image Data Using Different Classification Methods Based on the Class Attribute Obtained From EM Clustering.

Number	Classifier	Correctly Classified Instances %)	Kappa Statics
1	Naïve Bayes	96.55	0.8611
2	Multi-Layer Perception	89.19	0.8521
3	SMO	88.25	0.8901
4	KStar	90.10	0.8305
5	Bagging	98.55	0.9513
6	Decision Table	92.88	0.9111
7	**J48**	**99.45**	**0.9915**

Results for classification of remotely sensed multispectral image data using different classification methods: (1) Naïve Bayes; (2) Multi Layer Perception; (3) SMO; (4) KStar; (5) Bagging; (6) Decision Table and (7) J48; based on the class attribute obtained from Farthest First clustering is given in Table 3.

Table 3. The Results for Classification of Remotely Sensed Multispectral Image Data Using Different Classification Methods Based on The Class Attribute Obtained from Farthest First Clustering.

Number	Classifier	Correctly Classified Instances %)	Kappa Statics
1	Naïve Bayes	85.23	0.8210
2	Multi-Layer Perception	93.24	0.9421
3	SMO	91.27	0.9104
4	KStar	95.10	0.8708
5	Bagging	98.55	0.9832
6	Decision Table	94.68	0.9302
7	**J48**	**99.62**	**0.9913**

Results for classification of remotely sensed multispectral image data using different classification methods: (1) Naïve Bayes; (2) Multi-Layer Perception; (3) SMO; (4) KStar; (5) Bagging; (6) Decision Table and (7) J48; based on the class attribute obtained from Filtered clustering is given in Table 4.

Table 4. The Results for Classification of Remotely Sensed Multispectral Image Data Using Different Classification Methods Based on The Class Attribute Obtained from Filtered Clustering.

Number	Classifier	Correctly Classified Instances %)	Kappa Statics
1	Naïve Bayes	95.23	0.9420
2	Multi-Layer Perception	93.29	0.9402
3	SMO	91.25	0.9131
4	KStar	95.10	0.9210
5	Bagging	98.55	0.9812
6	Decision Table	93.68	0.8905
7	**J48**	**99.15**	**0.9911**

Results for classification of remotely sensed multispectral image data using different classification methods: (1) Naïve Bayes; (2) Multi-Layer Perception; (3) SMO; (4) KStar; (5) Bagging; (6) Decision Table and (7) J48; based on the class attribute obtained from Make Density Based clustering [10] is given in Table 5.

Table 5. The Results for Classification of Remotely Sensed Multispectral Image Data Using Different Classification Methods Based on the Class Attribute Obtained from Make Density Based Clustering.

Number	Classifier	Correctly Classified Instances %)	Kappa Statics
1	Naïve Bayes	95.55	0.9406
2	Multi-Layer Perception	92.29	0.9423

3	SMO	94.25	0.9108
4	KStar	95.10	0.9224
5	Bagging	98.55	0.9810
6	Decision Table	89.68	0.8908
7	**J48**	**99.16**	**0.9910**

Results for classification of remotely sensed multispectral image data using different classification methods: (1) Naïve Bayes; (2) Multi-Layer Perception; (3) SMO; (4) KStar; (5) Bagging; (6) Decision Table and (7) J48; based on the class attribute obtained from Simple K means clustering is given in Table 6.

Table 6. The Results for Classification of Remotely Sensed Multispectral Image Data Using Different Classification Methods Based on The Class Attribute Obtained from Simple K Means
Clustering.

Number	Classifier	Correctly Classified Instances %)	Kappa Statics
1	Naïve Bayes	95.23	0.9420
2	Multi-Layer Perception	93.29	0.9402
3	SMO	91.25	0.9131
4	KStar	95.10	0.9210
5	Bagging	98.55	0.9812
6	Decision Table	93.68	0.8905
7	**J48**	**99.10**	**0.9908**

Results for classification of remotely sensed multispectral image data using different classification methods: (1) Naïve Bayes; (2) Multi-Layer Perception; (3) SMO; (4) KStar; (5) Bagging; (6) Decision Table and (7) J48; based on the class attribute obtained from original data clustering is given in Table 7.

Table 7. The Results for Classification of Remotely Sensed Multispectral Image Data Using Different Classification Methods Based on The Class Attribute Obtained from Original Data Clustering.

Number	Classifier	Correctly Classified Instances %)	Kappa Statics
1	Naïve Bayes	95.23	0.9420
2	Multi-Layer Perception	93.29	0.9402
3	SMO	91.25	0.9131
4	KStar	95.10	0.9210
5	Bagging	98.55	0.9812
6	Decision Table	93.68	0.8905
7	**J48**	**99.20**	**0.9918**

IV. CONCLUSION

Supervised classification algorithms are used to inferring a function from labeled training data, of which an algorithm analyzes the training data and inferred function are produced, thus creating for new entries to be mapped using a defined set of rules. The best model will allow for the algorithm to correctly determine the class labels for unseen instances. The classification algorithms of WEKA data mining software [5] were used for the supervised classification of remotely sensed multispectral image data. The classification algorithm organizes observations into groups, by splitting the data based on homogeneity, where the classification is based on similarity until or purity is achieved. The K-means algorithm was used as a precursor to reduce the multispectral image data into much smaller space (k=24), for finding meaningful structure in the multispectral image data. Seven different unsupervised clustering algorithms: (1) Class attribute obtained from Canopy clustering; (2) Class attribute obtained from EM clustering; (3) Class attribute obtained from Farthest First clustering; (4) Class attribute obtained from Filtered clustering; (5) Class attribute obtained from Make Density Based clustering; (6) Class attribute obtained from Simple K means clustering and (7) Class attribute obtained from

original data; were used for labeling the proposed data into the 24 known clusters [2]. This approach was succeeded by classification of features into the known clusters using the proposed seven different data mining classification methods for classification of remotely sensed multispectral image data using WEKA data mining software. The percentages of correctly classified instances and kappa statistics for each of the proposed seven different classification algorithms were explained. In the semi supervised classification approach, the J48 classifier from trees group of WEKA implementation performed better than other classifiers with highest classification accuracy in terms of correctly classified instances and kappa statistics for the best supervised classification of multispectral image data. It is concluded that using the true number of clusters for data labeling and constructing the class attribute for big data is very important in clustering algorithms. This study determines that J48 classification algorithm, among seven different classification algorithms, is data free classification algorithm and it is independent from clustering algorithms for classification of remotely sensed multispectral image data. The data free classification algorithm means that which clustering algorithm, among six different clustering algorithms, were used for data labeling for obtaining the class attribute is not important or semi-supervised classification using J48 classifier algorithm, among seven different classification algorithms, for classification of remotely sensed multispectral image data in this study. J48 classifier algorithm gives the highest classification accuracy in terms of correctly classified instances and kappa statistics for the best supervised classification of multispectral image data for all of six different unsupervised clustering algorithms.

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Organic Farming and Sustainable Development

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ABSTRACT

With the increasing pressure of population on the resources has increased the demand of grains to fulfil the food requirement. Production of food grains in agriculture was very less in the first half of the 20th century. After Independence first five year plan was dedicated to agriculture. Green revolution also introduce in the country to reduce the scarcity of grains. Consequently India became self-depend on the production of grains and fulfil the demand of its huge population but with introduction of chemicals fertilizers, pesticides and weedicides it's also increases the problem of soil pollution, reducing the soil fertility and have bad impact on the health of human as well as on the animals. Today India is practicing organic farming for sustainable development in the field of agriculture. This paper is an attempt to study the benefits of organic farming and its issues and challenges in India. Organic farming which is a holistic production management system that promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity is hence important. Many studies have shown that organic farming methods can produce even higher yields than conventional methods. Here in this paper we tried to focus the organic farming it issues and challenges moving towards sustainable development with it.

Keywords : Organic Farming, Issues and Challenges, Green Revolution, Agro-Ecosystem Health, Conventional Methods.

I. INTRODUCTION

Agriculture without the use of synthetic fertilizers and chemicals is called organic farming. It is a method of cultivation of plants and rearing of animals in a natural way. Biological materials such as cow and other animals dung is used to avoid synthetic substances and for the improvement of soil fertility and ecological stability. These methods minimize the soil pollution and lead agricultural activities without chemicals and pesticides. Crop rotation, green manure, organic waste, biological pest control, mineral, and pesticides are used to follow the organic farming. International Federation of Organic Agriculture Movements (I F O A M) established in 1972 for organic farming specify organic farming. Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on

ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of input with adverse effects. Organic agriculture combines traditions, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.

II. Merits of Organic Farming

With the help of chemicals and synthetic fertilizers people may produce huge amount of grains, vegetables and other agrarian and horticultural products but they cannot achieve the goal of good health and sustainable development. Organic farming leads to sustainability and helps to health and better environment in India since it has many benefits given below - Use of local resources Organic farming utilizes the local renewable resources as many people in villages practice rearing of cattle providing with natural manure to the purpose of organic farming.

Improvement of soil fertility Organic farming improves the soil fertility as it avoids the use of synthetic fertilizers and chemicals. Support diversity Organic farming support diversity in production system and agricultural landscape. Support natural taste Organic farming protects beneficial nutrients to support natural taste and health. Free of Poison Organic farming is free of poison and as it works on living ecological system maintain the ecological balance and prevent human beings and animals from the products. Historical perspectives of organic farming India faced many agitations from 1970s onwards the most approaching was the Chipko Movement (1973) in Tehri Gharwal Uttrakhand. This movement created the awareness to protest against different social issues such as domestic violence, alcoholism and women's representation in village council etc across the country. In the 1970 and 1980s, green revolution brought huge production in grains and overuse of chemical fertilizers. The farmers and environmentalist set the stage for different farm movements such as Beej Bachao Andolan, organic farming and Go Mata as these became the central way for organic farming in India to achieve sustainable development goal.

"Sustainable development meets the need of present without compromising the ability of future generation to meet their own needs". -Brundtland Report.

The Sustainable development goals set by UN In sept.2015, the UN General Assembly formally adopted the 2030 Agenda for sustainable development, a set of 17 Sustainable development Goals have been Implemented and achieved in every country from 2016 to 2030. These goals are 1) No poverty. 2) Zero hunger. 3) Good health or wellbeing. 4) Quality education. 5) Gender equality. 6) Clean water or sanitation. 7) Affordable or clean energy. 8) Promote sustained inclusive sustainable, economic growth, full and productive employment. 9) Industry innovation and infrastructure 10) Reduced inequality. 11) Sustainable city and communities. 12) Responsible consumption and production. 13) Climatic action 14) Life below water. 15) Life on land (Bio-diversity). 16) Peace, justice and strong institution. 17) Partnership for the goals. Thus sustainable agriculture is the need of the today world, to achieve the goal of economic development, social development and clean environment.

Organic Farming: Challenges to organic farming in India

Lack of Awareness - The most important challenge in the development of OrF is the lack of awareness among farmers about the OrF and its potential benefits. **Marketing Problems** -Before the beginning of organic crop cultivation, their marketability over conventional produce must be assured. **Inability to obtain a premium price** for the produce, at least during the nascent stages, leads to a setback. **Shortage of Biomass** - There could be a **shortage of required quantities of the nutrients** which could simply not be enough to meet the requirements. **Inadequate Infrastructure Support**- despite NPOP adoption, the state governments are yet to formulate a credible

mechanism and necessary policies for implementation. The certifying agencies are inadequate.

High Input Costs - The costs of the organic inputs are more than those of industrially-produced agrochemicals used in the conventional farming system.

Like other parts of the country has also adopted the chemicals in agriculture to increase the production of vegetables, fruits and grains etc. But day by day these chemicals are reducing the fertility of soil, causing harm to humans, animals and creating ecological imbalance.

People are not keeping more animals because of less participation of animals in agricultural activities. In India due to hilly terrain mostly work of sowing was performed by the oxen etc. but with the introduction of small agricultural machines in the region demand of oxen decreases hence people are not keeping calf and oxen. Number of cows also decreases as people are keeping one cow which produce 10-15ltr milk so the number of cow also decrease in present day scenario. This results in the decrease of cow dung. Less cows less dung.

The main objective of organic agriculture is to meet the human development goal and at the same time sustaining the ability of natural system to provide the natural resources upon which every living being depends.

Following are the objectives of organic farming in India –

1) Encouragement to the organic sector in the country which include organic farming to overall development of agriculture in the country.

2) To make Indian organic country.

3) To provide organic food to the people of country to lead the purpose of healthy country.

4) To provide organic fodder to the animals and livestock.

5) To promote organic agribusiness and organic villages, and agro tourism.

6) To create self-employment and development of rural areas.

III. Need/ Significance of the Study

There are three categories of opinions about the relevance of organic farming for India. The first one simply dismisses it as a fad or craze. The second category, which includes many farmers and scientists, opines that there are merits in the organic farming but we should proceed cautiously considering the national needs and conditions in which Indian agriculture functions. They are fully aware of the environmental problems created by the conventional farming. But many of them believe that yields are lower in organic cultivation during the initial period and also the cost of labour tends to increase therein. The third one is all for organic farming and advocates its adoption wholeheartedly. They think that tomorrow's ecology is more important than today's conventional farm benefits. Organic farming involves management of the agro-eco system as autonomous, based on the capacity of the soil in the given local climatic conditions. In spite of the ridicule poured out on organic farming by many, it has come to stay and is spreading steadily but slowly all over the world. India has been very slow to adopt it but it has made Inroads into our conventional farming system. One advantage we have here is the fact that the farming techniques practiced in this country before the advent of the green revolution were basically eco-friendly and they have not faded away from the memories of the present elder generation of our farming community. India's options in finding out an alternative method to the conventional farming are limited. Sensing the importance, the Central and state governments have taken several initiatives to popularise organic farming in the country.

Objectives of the Study:

1) To overview the current status of organic farming in India.
2) To study about various schemes for organic farming of central and state government.
3) To study the issues and challenges for organic farming.

IV. Research Methodology

The study is based on the secondary data only. The data has been extracted from some Government of India's websites and some reference books mentioned below in references.

Data table and statistics in this paper has been taken from government sources only.

Secondary data:

The data has been taken from Magazine, newspaper articles, Governments reports and related research paper.

Findings based on the objectives:

Organic coverage under NPOP, PKVY, and MOVCD

Coverage in India -

India introduced the organic farming policy in 2005. The 78 million hectares covered under organic farming in India is about 2% of the 140.1 million hectares of the net sown area in the country. 94 million hectares under National Programme for Organic Production (NPOP) 07 million hectares under Mission Organic Value Chain Development for North Eastern Regions (MOVCD) 59 million hectares under Paramparagat Krishi Vikas Yojna (PKVY) NPOP vs PKVY and MOVCD- NPOP scheme began in 2001 and covers nearly 70% of India's total organic area coverage of which 30% is under conversion. NPOP aims to provide the means of evaluating certification programs for OrF and its products. It aims to encourage the development of OrF& processing and would be implemented by APEDA. Beginning in 2015-16, PKVY and MOVCD schemes cover 21.5% and 2.6% respectively, of India's total organic area coverage. PKVY is an elaborated component of Soil Health Management of the National Mission of Sustainable Agriculture (NMSA), while MOVCD is a Central Sector Scheme, a sub-mission under NMSA, and aims to develop certified organic production.

State schemes -

The remaining 6.1% of the area under organic cultivation is either under a state scheme or not related to any scheme.

Organic Statistics: Important States, Area and farmers

States	Organic	In-conversion	Total area in ha	Total No of farmers
Madhya Pradesh	322863	140689	463553	167141
Maharashtra	129077	148703	277780	213456
Orissa	60006	21554	81560	43852
Gujarat	23559	27367	50927	17057
Andhra Pradesh	7377	25072	32450	34185
Mizoram	12097	22808	34906	41841
Uttarakhand	11093	19408	30501	46135
Rajasthan	9959	19307	29267	15214
Nagaland	1212	22830	24042	28365
Uttar Pradesh	9613	12633	22246	15417

Source: Government of India (present status of organic farming)

Organic farming master plan in India– Now with the spread of awareness about the demerits of synthetic Agriculture Country has also launched some project to enhance the organic agriculture in India. Master plan included adoption of organic farming to reduce the use of chemicals for sustainable development.

Organic agriculture increases the quality of agricultural product and makes better use of cow dung. It create additional source of income by selling worms and vermin compost project for the development of organic agriculture in the country.1) India government launched Zero Budget Natural Farming (ZBNF) project to promote organic farming. The project aims to increase agriculture produce and the income of the farmer by the year 2022. 2) NMSA – National Mission for Sustainable agriculture project by the central Government had launched in India to soil health management, enhanced water use efficiency, nutrient management, crop – livestock farming and integrated approaches like sericulture, agro- forestry, fish farming etc.

V. Conclusion

Natural farming is not a new concept in India, with farmers having tilled their land without the use of chemicals since time immemorial largely relying on organic residues, cow dung, composts, etc. This is also in accordance with the Sustainable Development Goal 2 which targets to 'end hunger, achieve food security and improved nutrition and promote sustainable agriculture. With capacity building and greater awareness of the producers, organic farmers could soon be reinforcing their rightful place in the global agriculture trade. In a world bruised by the COVID pandemic, the demand for safe and healthy food is showing an upward trend and hence could be an opportune moment to be captured for a win-win situation for our farmers, consumers, and the environment. To gain the national and international objectives of sustainable development in the country we need to adopt natural way of farming called organic farming. To promote organic farming in the country need to spread awareness among the people and farmer about the less cost of production inputs in the agriculture and higher value of organic product and bring higher income per unit area. Government and local bodies need to help the farmers to eradicate the challenges and issues causing trouble to the farmers. Country has great potential to harvest the income by organic farming which leads sustainable development and green India.

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Single-Feed Triple Band Microstrip Antenna for High Frequencies

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ABSTRACT

This project presented a Design of a Single feed microstrip antenna has proposed for the Triple band operations and at the same time it mainly designed for satellite communication and the applications in K/Ka/Ku bands it is easy to fabricate, and high flexibility and improved antenna improved efficiency. The antenna has small dimensions of 70×29×0.787 and operates at 1GHz. This antenna mainly consists of a microstrip line in the center, two slot-loaded rectangular patches on the lateral sides, with two thin microstrip lines. The antenna is designed and simulated on High-Frequency Structure Simulator (HFSS) platform using Rogers RT/Duroid 5880 substrate with 0.787 dielectric constant and 0.002 loss tangent. The radiation pattern, return loss, vswr and gain results reveal that the antenna performs quite well at all frequencies.

Keywords : Triple band, return loss, microstrip insert feed, VSWR,5G Wireless communication

I. INTRODUCTION

Now a days wireless Technologies are increasingly popular. However, he technologies for wireless communications still need to be improved further to satisfy the higher resolution and data requirements. The development of large bandwidth antennas that can handle a wide range of applications with MW and MMW, antenna is required to keep up with the rapid growth of wireless communications. Antenna is one of the major component communications. The Antenna which is used mainly to transmit and receive electromagnetic wave signals using some frequency bands. By Using of single frequency for single antenna the frequency band will not be utilized sufficiently. So multiband antennas came into existence where a single antenna can use multiple frequencies. There are the different sizes and shapes of antenna used in communications systems. Antennas come in all shapes and sizes from little ones that can be found on your roof to watch TV to big ones that capture signals from satellites millions of miles away. The most used antenna is patch antenna which is easy to design and fabricate with lost cost. The proposed antenna is also a

patch antenna which has insert feed structure and is printed on a Rogers RT/Duroid 5880 substrate using a microstrip feed line. The multiband 5g antenna has many more applications in the communications.

II. DESIGN GEOMETRY OF PROPOSED ANTENNA

The proposed antenna design with parasitic patches on the lateral sides of the antenna to improve the gain, with microstrip feed line, with lumped port. The dimensions of proposed antenna are 70*29mm^2 with substrate height of 0.787mm.

The projected antenna is designed with Rogers RT/duroid substrate dimensions of width= 5.3 mm, length= 20.1mm and. Here we use Rogers RT/duroid 5880 substrate with thickness of H=0.787 mm with relative dielectric constant 4.4. The proposed designed antenna resonating at three centre frequencies at 15Ghz, 22 Ghz and 37Ghz. This antenna is made up of a coplanar ground plane, a radiating structure. To improve the frequency spectrum, by using of insert feed is placed.

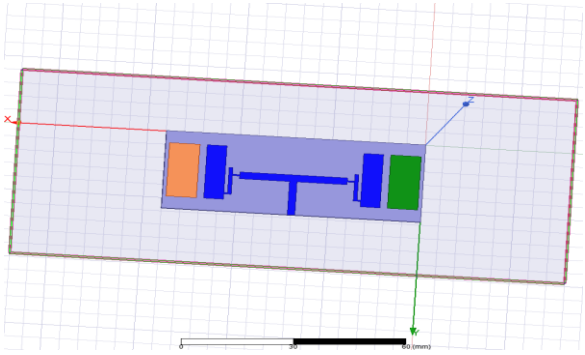

Fig.1: Front view of proposed antenna

III. RESULTS AND DISCUSSION

The design and simulation results are performed using Ansys electronics desktop version 19.2. The HFSS model is a terminal type with the operating frequency 15GHz. The terminal S parameter and terminal VSWR are plotted using rectangular plot in terminal solution data report. The gain parameter and radiation patterns were plotted using far field report.

S PARAMETER

S parameters is also referred as return loss. The S parameter is used to calculate how much the input power is transmitting to the output power. The ideal or theoretical value of S parameter should be -10dB, whereas in the practical case the S parameter value should be -20dB. If the value is less than -20dB it indicates that more input power is transmitting from the antenna.

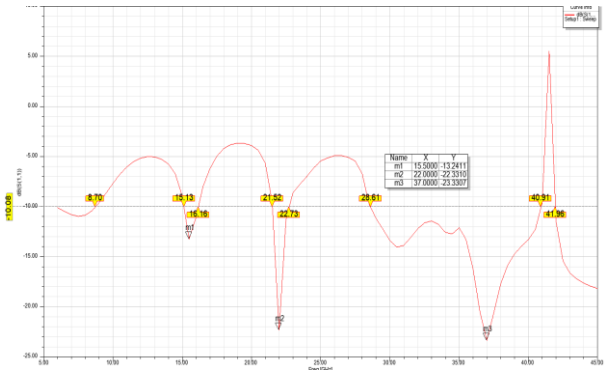

Fig 3: S parameter plot of proposed antenna

The proposed antenna achieved a return loss of -13.2411dB, -22.3310dB, and -23.33dB at 15.50, 22.00, and 37Ghz respectively. The S parameter values of proposed antenna satisfies the theoretical values.

VSWR (VOLTAGE STANDING WAVE RATIO)

The voltage standing wave ratio is measured to check whether the feed line can match the antenna or not. i.e., the microstrip feed line should be able to transmit the power from the source to antenna efficiently. The value of VSWR should be in between 1 and 2.

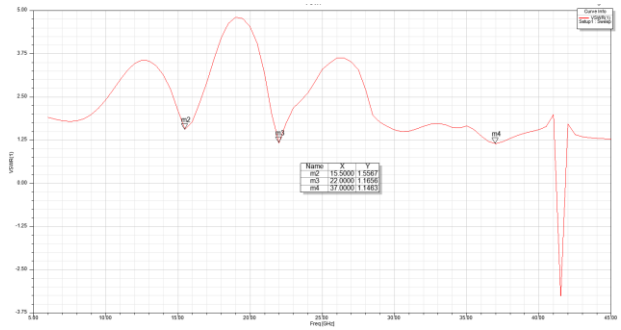

Fig 4: VSWR plot of proposed antenna

The proposed antenna has VSWR values 1.5567, 1.1656, 1.1463 at 15.5GHz, 22GHz, 37GHz respectively.

GAIN

The gain of the antenna indicates the ability of antenna how much it radiates in the free space. The gain is measured in decibels.

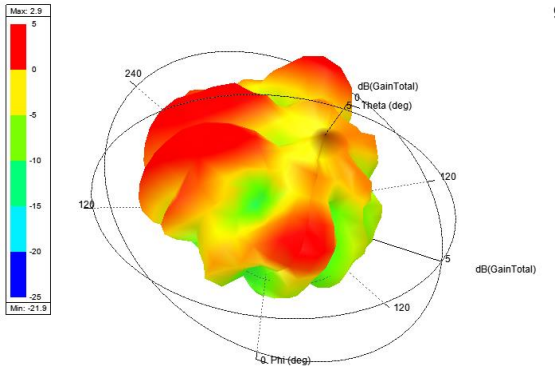

Fig 8: Gain of antenna at 15.5 GHz

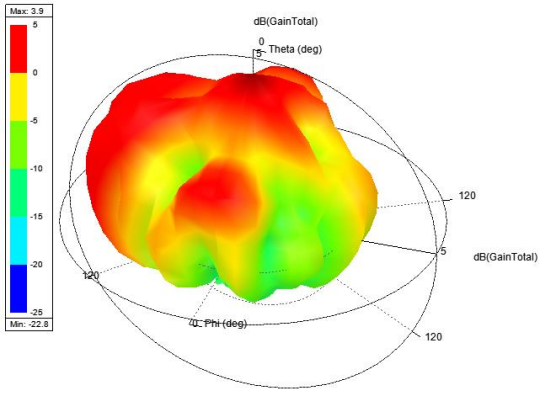

Fig 9: Gain of antenna at 22 GHz

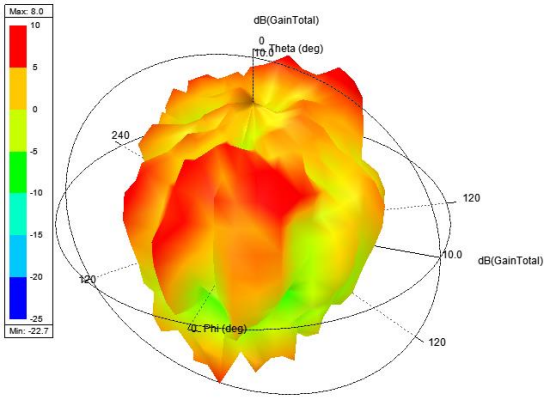

Fig 10: Gain of antenna at 37 GHz

The overall gain of antenna is calculated at the operating frequency and achieved a gain of 3.9dB at 22GHz. The proposed antenna achieves gain of 2.9dB, 3.9db, 8dB at 15.5, 22, and 37GHz respectively.

IV. CONCLUSION

The proposed microstrip insert feed antenna is applicable to use in multiple frequencies which has low return loss, with good gain, high bandwidth, and low VSWR. In future the proposed antenna can be modified to work in multiband with more gain by sing of arrays. The proposed antenna is very simple to design, and it is a compact size of 70*29mm2 with thickness 0.787mm. The results shows that the return loss values are less than -10dB, and VSWR values is in between 1 to 2. The proposed antenna has achieved wide bandwidth where it will be allows more data to be transmitted.

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Study of Thermal Stability in A Newtonian Fluids

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ABSTRACT

In this present paper, we studied about thermal stability in a Newtonian fluid. A detailed account of thermal convection in a Newtonian fluid layer in the presence of magnetic field has been given by Chandrasekhar [11]. Stokes [79] has formulated the theory of couple-stresses in fluids. The theory due to Stokes allows for polar effects such as the presence of couple stresses and body couples. The theory has been applied to the study of some simple lubrication problems. According to the theory, couple-stresses are found to appear in noticeable magnitudes in fluids with very large molecules. Since the long chain hyaluronic acid molecules are found as additives in synovial fluid, Walicki and Walicka [80] modeled synovial fluid as a couple-stress fluid in human joints. A human joint is a dynamically loaded bearing which has particular cartilage as the bearing and synovial fluid as the lubricant. A synovial fluid is the natural lubricant of joints of the vertebrates. The synovial is obtained from the hyaluronic acid, a fluid of high viscosity, near a gel. Normal synovial fluid is clear or yellowish and is a non- Newtonian, viscous fluid. The shoulder, hip, knee and ankle joints are loaded with the synovial fluids and joints have a low friction coefficient and negligible wear.

Keywords: Thermal Stability, Newtonian Fluid, Instability, Rotation, Magnetic Field.

I. INTRODUCTION

The presence of small amounts of additives in a lubricant can improve bearing performance by increasing the lubricant viscosity and thus, producing the increase in the load capacity. These additives in a lubricant also reduce the coefficient of friction and increase the temperature range in which the bearing can operate. Lin [51] showed that the bearing with couple stresses in fluid as the lubricant improves the squeeze film characteristic and results in a longer bearing life. All diseases of joints are caused by or connected with a malfunction of the lubrication. One of the applications of couple- stresses in fluid is its use in the study of the mechanism of lubrication of synovial joints, which has become the objective of

scientific research. The problem of couple-stress fluid heated from below in porous medium is considered by Sharma and Sharma [225] and Kumar [226]. Sharma and Aggarwal [203] and Singh et al [227] considered the effect of compressibility, suspended particles and rotation on thermal convection in an elastic-viscous fluid in hydromagnetic.

II. MATHEMATICAL FORMULATION

Consider an infinite, horizontal, electrically conducting, incompressible, couple-stress fluid layer to thickness d, bounded by the planes *z=0* and *z=d*. This fluid layer is heated from below so that a uniform temperature gradient $\beta\left(\left|\frac{dT}{dz}\right|\right)$ is maintained and the layer is acted upon by the gravity field g(0,0,-g), a uniform vertical magnetic field H(0,0 *H*) and rotation $\Omega(0,0,\Omega)$.

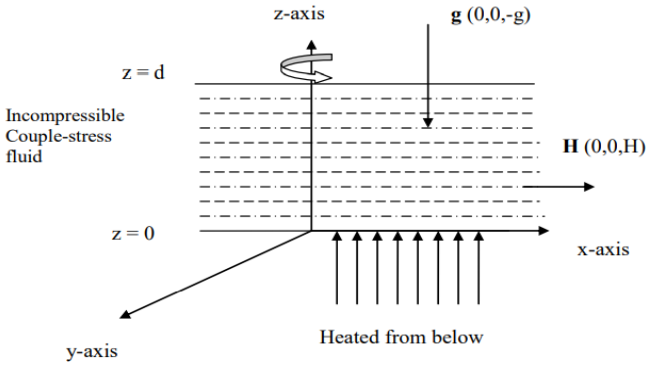

Figure 1: Geometrical configuration

Let $p, \rho, T, a, v, \mu', k, and\ q(u,v,w)$ denote respectively pressure, density, temperature, thermal coefficient of expansion, kinematic viscosity, couple-stress viscosity, thermal diffusivity and velocity of the fluid. The equation of motion, continuity and heat conduction of couple-stress fluid are

$$\frac{\partial q}{\partial t} + (q.\nabla)q = -\frac{1}{\rho_0}\nabla p + g\left(1+\frac{\delta\rho}{\rho_0}\right) + \left(v - \frac{\mu'}{\rho_0}\nabla^2\right)\nabla^2 q + 2(q\times\Omega) + \frac{\mu_e}{4\pi\rho_0}[\nabla\times H\times H] \quad (1)$$

$$\nabla.q = 0 \quad (2)$$

$$\frac{\partial T}{\partial t} + (q.\nabla)T = k\nabla^2 T \quad (3)$$

$$\frac{\partial H}{\partial t} = (H.\nabla)q + \eta\nabla^2 H \quad (4)$$

$$\nabla.H = 0 \quad (5)$$

The equation of state is

$$\rho = \rho_0[1-\alpha)T - T_0)] \quad (6)$$

where the suffix zero refers to the values at the reference level z=0.

The basic motionless solution is

$$q = (0,0,0), p = p(z), T = T_o - \beta z, \rho = \rho_o(1+\alpha\beta z), N = N_o, \text{ a constant.} \quad (7)$$

Assume small perturbations around the basic solution and let $\delta p, \delta\rho, \theta, N, H\ (h_x, h_y, H+h_z)$ and q(u,v,w,) denote respectively the perturbations in pressure, density, temperature, number density, magnetic field and couple-stress fluid velocity (0,0,0). The change in density $\delta\rho$ caused mainly by the perturbbation θ in temperature is given by

$$\delta\rho = -\alpha\rho_o\theta \quad (8)$$

Then the linearized perturbation equations of the couple-stress fluid become

$$\frac{\partial q}{\partial t} = -\frac{1}{\rho_o}\nabla\delta p - ga\theta + \left(v - \frac{\mu'}{\rho_0}\nabla^2\right)\nabla^2 q + 2(q\times\Omega) + \frac{\mu_e}{4\pi\rho_0}[\nabla\times H\times H] \quad (9)$$

$$\nabla.q = 0 \quad (10)$$

$$\frac{\partial\theta}{\partial t} = \beta w + k\nabla^2\theta \quad (11)$$

$$\frac{\partial q}{\partial t} = (H.\nabla)q + \eta\nabla^2 h \quad (12)$$

$$\nabla.h = 0 \quad (13)$$

where $k = \frac{q}{\rho_0 c_v}$

2.1 Dispersion Relation

Analyze the perturbations in to normal modes by seeking solutions in the form $[w, \theta, h, \zeta, \xi] = [W(z), \Theta(z), K(z), Z(z), X(z)] \exp(ik_x x + ik_y y + nt)$. where k_x, k_y are the wave numbers along x and y directions respectively, and $k = \left(k_x^2 + k_y^2\right)^{1/2}$ is the resultant wave number of the disturbance and n is the growth rate which is, in general, a complex constant and $\zeta = \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}$ and $\xi = \frac{\partial h_y}{\partial x} - \frac{\partial h_x}{\partial y}$ stand for the z-components of vorticity and current density, respectively.

The non-dimensional system of equations eliminating the physical quantities is

$$\left[\sigma - \left(1 - F(D^2 - a^2)\right)(D^2 - a^2)\right](D^2 - a^2)W = -\frac{g\alpha a^2 d^2}{\upsilon}\Theta - \frac{2\Omega d^3}{\upsilon}DZ + \frac{\mu_e H d}{4\pi\rho_0 \upsilon}(D^2 - a^2)DK \quad (14)$$

$$\left[\sigma - \left(1 - F(D^2 - a^2)\right)(D^2 - a^2)\right]Z = \left(\frac{2\Omega d}{\upsilon}\right)DW + \frac{\mu_e H d}{4\pi\rho_0 \nu}DK \quad (15)$$

$$(D^2 - a^2 - \sigma p_1)\Theta = -\left(\frac{\beta d^2}{k}\right)W \quad (16)$$

$$(D^2 - a^2 - p_2\sigma)\mathrm{K} = -\frac{Hd}{\eta}DW \quad (17)$$

$$(D^2 - a^2 - p_2\sigma)\mathrm{X} = -\frac{Hd}{\eta}DZ \quad (18)$$

Eliminating Z, X, Θ and K between equations (14) – (18), we obtain

$$[\sigma + F(D^2 - a^2)^2 - (D^2 - a^2)][D^2 - a^2 - \sigma p_1][D^2 - a^2 - \sigma p_2][D^2 - a^2]W + R\lambda a^2[D^2 - a^2 - \sigma p_2]W + Q[D^2 - a^2 - \sigma p_1][D^2 - a^2]D^2 W \quad (19) \quad + T_A \frac{\left[D^2 - a^2 - \sigma p_2\right]^2 [D^2 - a^2 - \sigma p_1]D^2 W}{[\{\sigma + F(D^2 - a^2) - (D^2 - a^2)\}(D^2 - a^2 - \sigma p_2) + QD]} = 0$$

where $R = \frac{g\alpha\beta d^4}{\nu k}$ is the thermal Rayleigh number, $T_A = \left(\frac{2\Omega d^2}{y}\right)^2$ is the Taylor's number and $Q = \frac{\mu_e H^2 d^2}{4\pi\rho_o \nu\eta}$ is the Chandrasekhar number.

Consider the case in which both the boundaries are free, the medium adjoining the fluid is perfectly conducting and temperatures at the boundaries are kept fixed. The boundary conditions, appropriate for the problem, are

$$W = 0 = Z = \Theta \; and \; D^2 W = 0 \quad at \quad z = 0 \; and \; z = 1 \quad (20)$$

$$\mathrm{W} = W_0 \sin\pi z \quad (21)$$

where W_0 is constant. Substituting the proper solution (21) to equation (19), we obtain the dispersion relation

$$R_1 = \frac{(1+x)}{\lambda x}[i\sigma + F_1 + (1+x)][1 + x + i\sigma p_1] + \frac{Q_1(1+x)[1 + x + i\sigma_1 p_1]}{\lambda x[1 + x + i\sigma_1 p_1]} + \frac{T_{A_1}[1+x+i\sigma_1 p_2][1+x+i\sigma_1 p_1]}{\lambda x[\{i\sigma + F_1(1+x)^2 + (1+x)\}(1+x+i\sigma_1 p_2) + Q_1]} \quad (22)$$

where, $R_1 = \frac{R}{\pi^4}, T_{A_1} = \frac{T_A}{\pi^4}, i\sigma_1 = \frac{\sigma}{\pi^2}, Q_1 = \frac{Q}{\pi^2}$ and $F_1 = \pi^2 F$

The above relation expresses the modified Rayleigh number R_1 as a function of couple stress parameter F_1, rotation parameter T_{A_1}, magnetic field parameter Q_1 and dimension less wave number x.

2.2 The Stationary Convection

For stationary convection, the marginal state will be characterized by $\sigma = 0$. Thus equation (22) reduces to

$$R_1 = \frac{(1+x)}{\lambda x}\left[\{F_1(1+x) + 1\}(1+x)^2 + Q_1 + \frac{T_{A_1}(1+x)}{[\{F_1(1+x)+1\}](1+x)^2 + Q_1}\right] \quad (23)$$

To study the effect of suspended particles, rotation, couple-stress and magnetic field, we examine the nature of $\frac{dR_1}{dT_{A_1}}, \frac{dR_1}{dF_1}$ and $\frac{dR_1}{dQ_1}$ analytically. Equation (23) gives

$$\frac{dR_1}{dT_{A_1}} = \left(\frac{1+x}{x}\right)\left\{\frac{1+x}{[1+F_1(1+x)](1+x)^2 + Q_1}\right\} \quad (24)$$

which shows that rotation has a stabilizing effect on the system.

Also, from equation (3.1.23), we have

$$\frac{dR_1}{dF_1} = \frac{(1+x)^4}{x}, \left\{1 - T_{A_1}\frac{1+x}{\{[1+F_1(1+x)](1+x)^2 + Q_1\}^2}\right\} \quad (25)$$

$$\frac{dR_1}{dQ_1} = \left(\frac{1+x}{x}\right).\left\{T_{A_1}\frac{1+x}{\{[1+F_1(1+x)](1+x)^2+Q_1\}^2}+1\right\} \quad (26)$$

which shows that couple-stresses and magnetic field have a stabilizing or destabilizing effect on the system according to $T_{A_1}(1+x) < or > \{[1+F_1(1+x)](1+x)^2+Q_1\}^2$

In the absence of rotation ($T_{A_1}=0$), we have

$$\frac{dR_1}{dF_1} = \frac{(1+x)^4}{x} \quad (27)$$

$$\frac{dR_1}{dQ_1} = \left(\frac{1+x}{x}\right) \quad (28)$$

which shows that couple-stresses and magnetic field clearly have a stabilizing effect on the system.

In the absence of magnetic field ($Q_1=0$), we have

$$\frac{dR_1}{dF_1} = \frac{(1+x)^4}{x}.\frac{1}{H}\left\{1-T_{A_1}\frac{1}{[1+F_1(1+x)]^2(1+x)^3}\right\} \quad (29)$$

which shows that couple-stress has a stabilizing (destabilizing) effect on the system according as $T_{A_1} < or > (1+x)^3[1+F_1(1+x)]^2$

The dispersion relation (22) is also analyzed numerically. In figure 2, R_1 is plotted against x for T_(A_1)=100,150,200,F_1=0.5 and Q_1=10. In figure 3, R_1 is plotted against notation parameter T_(A_1) for various values of wave number x. In both the figures, it is found that rotation postpones the onset of convection as the Rayleigh number increases with the increase in rotation parameter. In figure 4, R_1 is plotted against x for Q_1=20,40,60; F_1=0.2,T_(A_1)=70 and in figure 5 R_1 is plotted against Q_1 for x =12,4,8,10. Here it is observed that the magnetic field hastens the onset of convection for small wave numbers as the Rayleigh number decreases with an increase in the magnetic field parameter and postpones the onset of convection for higher wave numbers as the Rayleigh number decreases with the increase in couple-stress parameter and postpones the onset of convection for higher wave numbers as the Rayleigh number increases with the increase in couple-stress parameter.

The critical Rayleigh numbers listed in tables 1 to 3 and illustrated in figures 8-10 are obtained from figures 2 to 7 by locating the minimum numerically. From table 1 and figure 8, it is clear that rotation has stabilizing effect on the system. From the table 2 and figure 9, it is observed that the magnetic field has stabilizing effect in the absence of rotation, destabilizing effect for T_(A_1)=6000 and for T_(A_1)=2000, the value of critical Rayleigh number first decreases and then increases for the increase in the value of magnetic field parameter. In figure 10, critical Rayleigh number R_cis plotted against couple-stress parameter F_1. In the absence of rotation, couple-stresses have stabilizing effect whereas in the presence of rotation, the value of critical Rayleigh number R_c decreases and then increases for the increase in value of couple-stress parameter F_1. Table 3 confirms these results numerically.

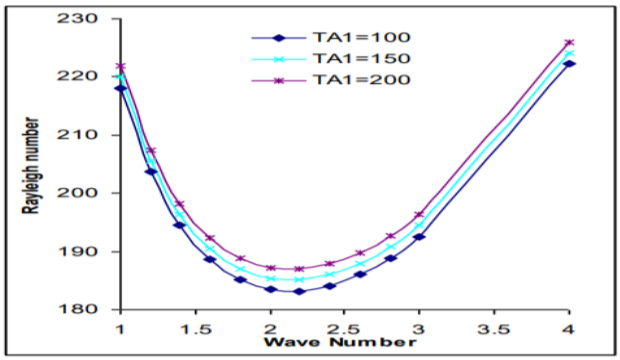

Figure 2: Variation of R_1 with x

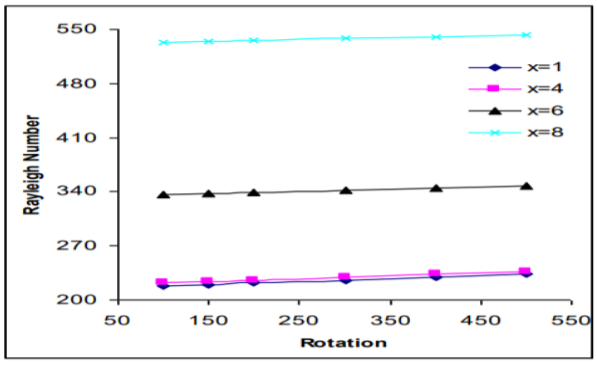

Figure 3: Variation of R_1 with T_{A1}

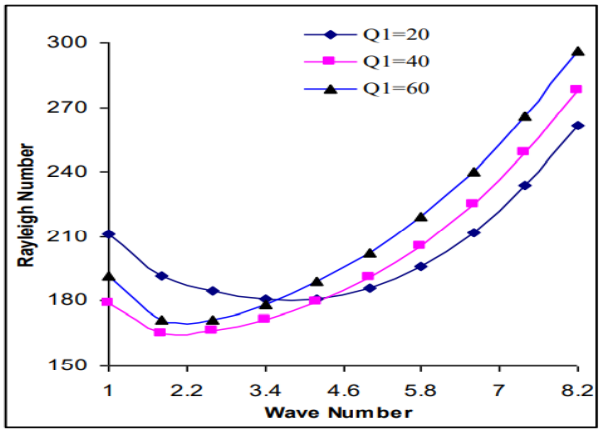

Figure 4: Variation of R1 with x

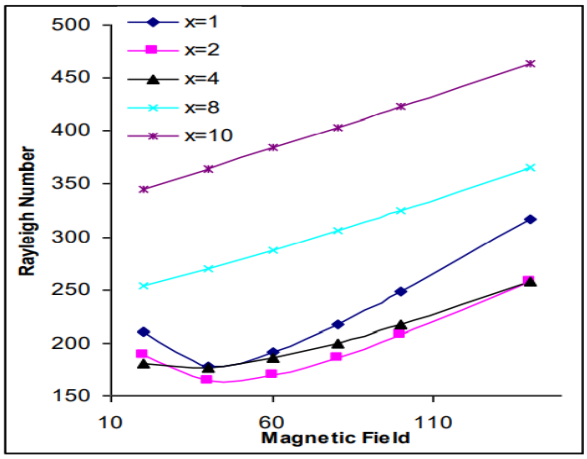

Figure 5: Variation of R1 with Q1

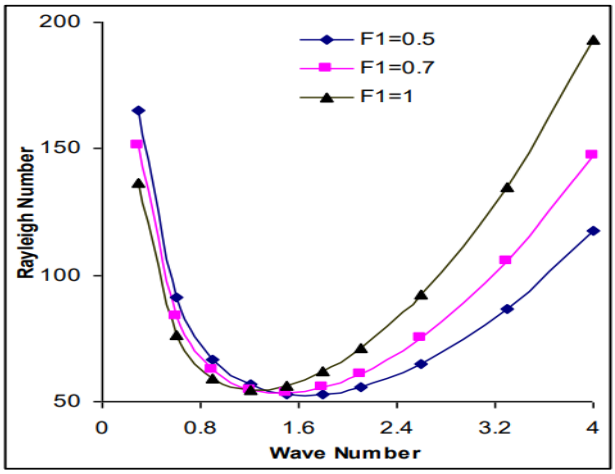

Figure 6: Variation of R1 with x

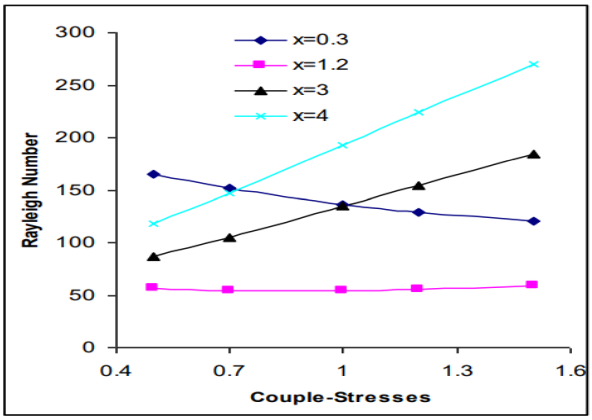

Figure 7: Variation of R1 with F1

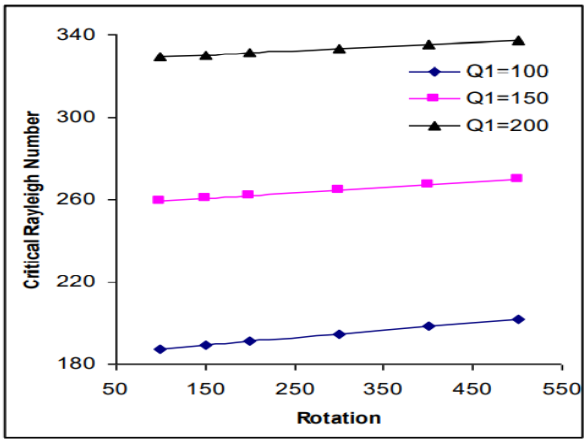

Figure 8: Variation of Rc with TA1

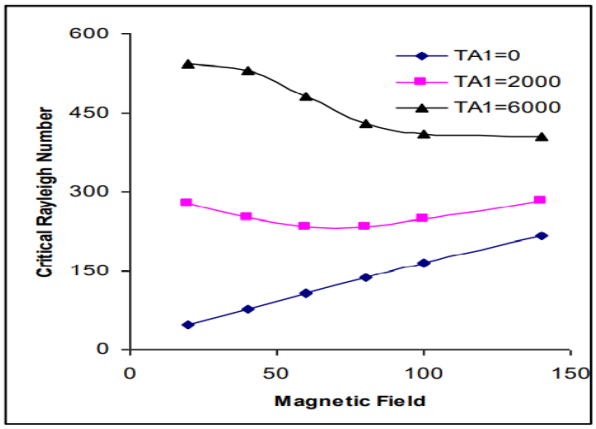

Figure 9: Variation of Rc with Q1

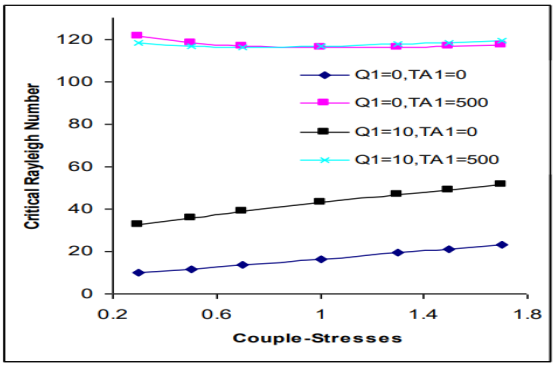

Figure 10: Variation of Rc with F1

Table 1: The critical Rayleigh numbers and the wave numbers of the associated disturbances for the onset of instability as stationary convection for various values of T_A.

T_{A1}	$Q_1 = 100$		$Q_1 = 150$		$Q_1 = 200$	
	x_c	R_c	x_c	R_c	x_c	R_c
100	2.0	187.4235	2.3	259.2703	2.5	329.2593
150	2.0	189.2602	2.3	260.5939	2.5	330.3077
200	2.0	191.0969	2.3	261.9175	2.5	331.3561
250	2.0	194.7704	2.3	264.5647	2.5	333.4530
300	2.0	198.4439	2.3	267.2120	2.5	335.5498
400	2.0	202.1173	2.3	269.8592	2.5	337.6466

Table 2: The critical Rayleigh numbers and the wave numbers of the associated disturbances for the onset of instability as stationary convection for various values of Q_1.

Q_1	$T_{A1} = 0$		$T_{A1} = 2000$		$T_{A1} = 6000$	
	x_c	R_c	x_c	R_c	x_c	R_c
20	1.6	46.3411	5.5	277.2780	8.4	543.9253
40	2.0	77.5500	2.0	251.6312	7.5	529.6470
60	2.3	106.8679	2.0	233.0730	1.6	481.3190
80	2.5	135.1525	2.1	233.5286	1.7	430.0211
100	2.7	162.7387	2.3	246.9746	1.8	408.6656
140	3.1	216.5092	2.7	281.4301	2.1	405.1923

Table 3: Critical Rayleigh numbers and the wave numbers of the associated disturbances for the onset of instability as stationary convection for various values of F1.

F_1	$Q_1 = 0$				$Q_1 = 10$			
	$T_{A1} = 0$		$T_{A1} = 500$		$T_{A1} = 0$		$T_{A1} = 500$	
	x_c	R_c	x_c	R_c	x_c	R_c	x_c	R_c
0.3	0.4	9.7412	3.3	121.3369	1.0	32.8000	2.7	118.4836
0.5	0.4	11.6620	2.8	118.4081	0.9	35.9723	2.3	116.6769
0.7	0.4	13.5828	2.4	116.9902	0.9	38.8683	2.0	116.2168
1.0	0.4	16.4640	2.1	116.2354	0.8	42.9120	1.9	116.6277
1.3	0.4	19.3452	1.9	116.3986	0.7	46.8153	1.6	117.6984
1.7	0.4	23.1868	1.6	117.1955	0.7	51.5879	1.4	119.7011

III. STABILITY OF THE SYSTEM AND OSCILLATORY MODES

Now to determine under what conditions the principle of exchange of stabilities (PES) is satisfied (i.e. is real σ is real and the marginal states are characterized by σ=0) and the oscillations come into play, we multiply equation (14) with W* and integrate over the range of z and making use of equations (15)-(18) together with the boundary conditions (20) and get

$$\sigma I_1 + I_2 + FI_3 - \frac{gaka^2}{\nu\beta}(I_4 + H\sigma^* p_1 I_5) + d^2[\sigma I_6 + I_7 + FI_8] + \frac{\mu_e \eta d^2}{4\pi\rho_o \nu}(I_9 + \sigma^* p_2 I_{10}) + \frac{\mu_e \eta}{4\pi\rho_o \nu}(I_{12} + \sigma^* p_2 I_{11}) = 0$$

where,

$I_1 = \int(|DW|^2 + a^2|W|^2)dz, \qquad I_2 = \int (|D^2W^2| + 2a^2|DW|^2 + a^4|W|^2)\text{dz},$

$I_3 = \left(\int |D^2W|^2 + 3a^2|D^2W|^2 + 3a^4|DW|^2 + a^6|W|^2\right)dz,$

$I_4 = \int (|D\Theta|^2 + a^2|\Theta|^2)\, dz, \qquad I_5 = \int |\Theta|^2 dz,$

$I_6 = \int |Z|^2 dz \qquad I_7 = \int (|DZ|^2 + a^2|Z|^2)\ dz,$

$I_8 = \int (|D^2Z|^2 + 2a^2|DZ|^2 + a^4|Z|^2)\, dz,$

$I_9 = \int (|DX|^2 + a^2|X|^2)dz, \qquad I_{10} = \int |X|^2 dz,$

$I_{11} = \int (|DK|^2 + a^2|K|^2)dz, \qquad I_{12} = \int (|D^2K|^2 + 2a^2|DK|^2 + a^4|X|^2)dz.$

and σ^* is complex conjugate of σ. The integrals $I_1 - I_{12}$ are all positive definite. Putting $\sigma = i\sigma_i (\sigma^* = -i\sigma_i)$ in equation (30) and equating imaginary parts, we obtain

$$\sigma_i \left[I_1 + \frac{gaka^2}{\nu\beta}(I_4 + Hp_1I_5) + d^2I_6 - \frac{\mu_e\eta d^2}{4\pi\rho_o\nu}p_2I_{10} - \frac{\mu_e\eta}{4\pi\rho_o\nu}p_2I_{11}\right] = 0 \qquad (31)$$

It is clear from equation (31) that σ_i may be zero or non-zero, which implies that modes may be non-oscillatory or oscillatory. In the absence of magnetic field and rotation, equation (31) reduces to

$$\sigma_i \left[I_1 + \frac{gaka^2}{\nu\beta}(I_4 + Hp_1I_5) + d^2I_6\right]=0 \qquad (32)$$

The terms in the bracket are positive definite. Thus $\sigma_i = 0$ which means that the oscillatory modes are not allowed and the principle of exchange of stabilities is satisfied in the absence of rotation and magnetic field.

IV. CONCLUSION

In this section, the effect of magnetic field and rotation has been considered on the thermal stability of a couple-stress fluid. The effect of various parameters such as magnetic field, rotation and couple-stresses has been investigated analytically as well as numerically. The main results from the analysis are as follows: In order to investigate the effects of magnetic field, rotation and couple-stresses, we examine the behavior of $\frac{dR_1}{dQ_1}, \frac{dR_1}{dT_{A_1}} and \frac{dR_1}{dF_1}$ analytically. It is found that rotation has stabilizing effect on the system. The magnetic field couple-stresses has a stabilizing effect in the absence of rotation whereas in the presence of rotation it has a stabilizing effect if $T_{A_1}(I + x) < \{[I + F_1(I + x)](I + x)^2 + Q_1\}^2$ and destabilizing effect if $T_{A_1}(I + x) < \{[I + F_1(I + x)](I + x)^2 + Q_1\}^2$. The principle of exchange of stabilities is satisfied in the absence of rotation and magnetic field.

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Study of Flexibility Among Boys and Girls of Secondary School in Terms of Different Aspects of Flexibility

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ABSTRACT

In this present investigation we studied about flexibility among Boys and Girls of Class VIII of Secondary School" in Bihar, India with special reference to West Champaran District. The objectives and hypotheses, method and the material chosen to accomplish the requirements of the study are discussed in this paper.

Keywords : Creativity, Flexibility, Mental Health.

I. INTRODUCTION

The purpose of this study was to investigate differences for boys and girls in terms of the relation between different aspects of flexibility. A sample of 50 boys and 50 girls' studying in two secondary schools of West Champaran district was randomly selected. I had personally met the participants and administered the tool. Torrance Test of Creative thinking (Verbal Form A) designed by E. P. Torrance (1968) was used. Mean S.D.S and T-test were calculated to analyse the data. Students of VIII class belonging to different secondary schools located in West Champaran district in Bihar state constituted the population for the study. Among West Champaran revenue district, the schools located in urban and rural areas were selected at random from each sub-division and 2 schools each from rural and urban areas were selected at random from each subdivision. Five boys and five girls were selected at random from each of the school, thus giving a total of 600 subjects for the study, equally distributed between the two sexes, two localities and two schools of each locality. The distribution of the sample of the subjects in different sub-groups is presented in table.

II. OBJECTIVES

The following objectives are setup for the present study.

- To find out whether boys and girls differ in their creativity.
- To find out whether children were belonging to rural and urban localities differ in their creativity.
- To examine whether students of different school of class VIII of study are significantly related to creativity.

- To examine whether high and low perceived school environment, mental ability and mental health of students with regard to their creativity.

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- To examine whether high and low perceived school environment, mental ability and mental health of students with regard to their creativity.

IV. HYPOTHESES

a: There would be significant difference with respect to flexibility scores (verbal) of creativity of boys and girls.

b: There would be significant difference with respect to flexibility scores (verbal) of creativity of students belonging to rural and urban localities.

c: There would be significant difference with respect to flexibility scores (verbal) of creativity of students of different school of study.

4. METHODOLOGY

Sample: A sample of 50 boys and 50 girls studying in two secondary schools of West Champaran district was selected on random basis for the study. The sample was equal on age and socio-economic status.

Design of the Study: In the present study descriptive survey method was used.

Instrument of the Study: Torrance Test of Creative Thinking (Verbal TTCT: Thinking Creatively with Words Form A) designed by E.P. Torrance (1968) was used. The test is appropriate for the kindergarten level (age 6) through the graduate level and beyond, and can be individual or group administered. It requires 30 to 45 minutes of working time. Translated into over 35 languages, the Torrance Test of Creative Thinking is a test in which anyone could respond to—regardless of previous experience. This test is recommended as the best standardised measure to use because of the preponderance of evidence of reliability and validity over time and in different cultures.

V. FLEXIBILITY

Table -1: Mean and SDs Flexibility Scores of different sub groups

Category		N	Mean	SD
Gender	Boys	300	66.37	24.49
	Girls	300	53.84	23.98
Locality	Rural	300	57.68	24.78
	Urban	300	62.52	25.06
Class of Study	VIII	200	57.78	25.72
	IX	200	59.43	24.23
	X	200	64.10	24.65

Table 1 shows the mean flexibility scores of different sub groups of the subjects on verbal test. It may be seen from the table that as in the case of the fluency,for flexibility also boys scored better than girls. The mean scores of boys were 66.37while that of girls was 53.84. In case of locality, urban students (M=62.52)

scored better than rural students (M=67.68) as in the case of fluency component. The mean score of 8th, 9th and10th class were 56.78, 59.43 and 64.10 respectively. This shows that 8thclass students scored least while the students of 10th class students scored the highest. To examine the differences between the mean scores of the subjects belongingto different gender, localities and class of study, the flexibility scores of different subgroups were further analyzed by analysis of variance and results obtained arepresented in table 2.

Table-2: Results of ANOVA of the Flexibility Scores on Verbal Tests.

Source of Variance	Sum of Squares	df	Mean Sumof Squares	F
Gender (A)	2353.61	1	2353.61	41.68 **
Locality (B)	3513.84	1	3513.84	6.22 *
Class of Study (C)	5500.90	2	2750.45	4.87 *
AXB	1404.54	1	1404.54	2.49 @
AXC	1840.20	2	920.10	1.63 @
BXC	7151.79	2	3575.89	6.33 **
AXBXC	22.69	2	11.35	0.20 @
WSS	332047.60	588	564.71	
Total	375019.17	599		

** Significant at 0.01 level, * Significant at 0.05 level @ Not Significant

Hypothesis -a

There would be significant difference with respect to flexibility scores (verbal) of creativity of boys and girls.

Hypothesis 2a predicted that there would be significant difference with respect to fluency scores (verbal) of creativity of boys and girls. It could be seen from the table that the F value for gender was 41.68, which was significant at 0.01 levels. This indicates that there was significant difference between boys and girls with regard to the flexibility score as measured by the verbal tests. The mean scores of boys (M= 66.37) and girls (M=53.84). Presented in table 2 shows that boys were higher than that of girls. Hence, the hypothesis stating that there would be significant difference with respect to fluency scores (verbal) of creativity of boys and girls is accepted. Based on the results obtained, the first hypothesis stating that there would be significant difference with respect to flexibility scores (verbal) of creativity of boys and girls is accepted.

Hypothesis -b

There would be significant difference with respect to flexibility scores (verbal) of creativity of students belonging to rural and urban localities.

The F value for locality (F=6.22< 0.05). An observation of the mean scores presented in table IVreveals that urban students (M=62.52) scored better than rural students(M=57.68) on the component as was the case of fluency. This shows urban subjects were more creative than rural children as measured by the flexibility component of verbal tests. The hypothesis2b stating that there

would be significant difference with respect to flexibility scores (verbal) of creativity of students belonging to rural and urban localities is accepted as warranted by the results.

Hypothesis -c

There would be significant difference with respect to flexibility scores (verbal) of creativity of students of different class of study.

Considering the class of study, the F value obtained was 4.87 which were significant at 0.05 level, indicating a significant difference between the flexibility scores of the subjects belonging to different classes. The mean score of 8th, 9th and 10th class were 56.78, 59.43 and 64.10 respectively. This shows that 8th class students scored least while the students of 10th class students scored the highest. Each group differs significantly from the others. 8th class students scored the least, while the students of 10th class scored somewhat highest than 9th class students and the 9th students falling in between 8th and 10th class students.

The F value of the interaction between gender and locality was not significant. This shows that the gender effect on the creativity of the children was independent thelocality to which they belong. The F value of the interaction between sex and class of study was not significant. This shows that the gender effect on the creativity of the children was independent of the class to which they belong and the vice versa.

The F value for the interaction between locality and class of study was significant at 0.01level. An examination of mean scores of the subjects classified according to two variables shows that irrespective of their locality and sex, students of VIII class were the least score, while students of X class scored the highest mean in the group. It may be seen from the table however, that though the direction of the difference between the means was more for the both sexes. This shows that the magnitude of difference from class to class was not similar. A similar phenomenon was observed in case of fluency component also as discussed earlier. The F value (AXBXC) for three factor interaction was not significant, indicating that the effect of any two variables taken at a time was independent of the level of third variable.

VI. CONCLUSION

Creativity is the act or ability to create something new through imaginative skills. It is a mental process involving the generation of new ideas. The present investigation is an attempt to study the impact of mental health, mental ability and school environment on creativity among High school students. In addition to study the impact of gender, locality of residence, class of study etc., on creativity. There is significant difference between high and low creative students on their mental health. High creative students were found to be good mental health than low creative groups. This was true for all the sub groups without any exception. High creative students were found to be more intelligence than low creative groups. This was true for all the sub groups without any exception. High creative students were found to be good perception towards school environment than low creative groups. This was true for all the sub groups without any exception. Size of the family of the subjects was not shown any significant effect with regard to their creativity. Type of family of the subjects was shown significant effect on their creativity. Students from nuclear family were better creativity than the students from nuclear family. There is no significant difference between order of birth of the subjects on their creativity.

Due to hectic schedule and dual career system, parents are sparing less time to identify creative ideas of their own children. An awareness of the importance of parent child relationship should be explained to parents during parent teacher meeting. Teachers, legislators and mass media communications can also do this job. The school takes care of only physical health and provides necessary physical

exercise to children. No attention is been paid to promote the cognitive styles of children through co-curricular activities. Schools are the second home to child and facilitate to promote new concepts and ideas. Learning environment is influenced by the creativity of the students. The students are free from problems, the classroom is conducive for effective teaching and learning purposes, it definitely influences the students to promote new ideas and skills. Through schooling and its associated activities students are to be creative, constructive and co-operative with co- age group.

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Fake Reviews Detection Using Supervised Machine Learning

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ABSTRACT

With the ongoing evolution of E-commerce platforms, online evaluations are increasingly seen as a critical aspect in establishing and maintaining a positive reputation. Furthermore, they play an important role in end-user decision making. A positive evaluation for a target object typically draws more customers and results in a significant rise in sales. Deceptive or phoney evaluations are now intentionally generated in order to build a virtual reputation and attract potential clients. Identifying bogus reviews is thus an active and ongoing research topic. Detecting phoney reviews is dependent not only on the primary elements of the reviews, but also on the reviewers' behaviour. This research suggests using machine learning to detect bogus reviews. In addition to the review features extraction approach, this research utilises different features engineering techniques to extract distinct reviewer behaviours. The study examines the performance of machine learning classifiers KNN, Naive Bayes (NB), and Logistic Regression using a genuine Yelp dataset of restaurant reviews. In terms of accuracy, the results show that Logistic Regression surpasses all other classifiers. The results reveal that the algorithm is more capable of distinguishing between genuine and false reviews.

Keywords: Machine learning, fake, reviews, Logistic Regression

I. INTRODUCTION

Reviews have become the primary source of information for clients looking to make a judgement regarding services or items. For example, when customers decide to book a hotel, they read reviews about previous customers' experiences with the hotel's services. They select whether or not to reserve a room based on the feedback from the reviews. If they get great feedback from the reviews, they will most likely book the room. As a result, past reviews have become incredibly reputable sources of information for the majority of individuals in various online services. Since reviews are regarded real forms of exchanging input about positive or negative services, any attempt to manipulate such evaluations by providing misleading or inauthentic content is deemed dishonest behaviour, and such reviews are labelled as phoney. This example makes us wonder what if not all of the published reviews are truthful or genuine. What if any of these testimonials are false? As a result, detecting fraudulent reviews has become,

and continues to be, an important and necessary study topic.

The advent of social media has blurred the barrier between genuine content and advertising, resulting in an increase in false endorsements across the industry. Fake online reviews and other false endorsements are frequently used to promote things on the internet. Consequently, the FTC is now using its Penalty Offense Authority to remind advertisers of the law and deter them from breaking it. By mailing a Notice of Penalty Offenses to over 700 businesses, the FTC is informing them that they might face hefty civil penalties—up to $43,792 per violation—if they use endorsements in ways that contradict previous FTC administrative actions.

"Fake reviews and other forms of deceptive endorsements cheat consumers and undercut honest businesses," said Samuel Levine, Director of the FTC's Bureau of Consumer Protection. "Advertisers will pay a price if they engage in these deceptive practices."

The Notice of Penalty Offenses allows the agency to seek civil penalties against a company that engages in activity that it is aware has been declared illegal in a previous FTC administrative ruling, other than a consent order.

The Notice filed to the corporations lists a variety of behaviours that the FTC has previously judged to be unfair or deceptive in administrative cases. These include, but are not limited to, falsely claiming a third-party endorsement; misrepresenting whether an endorser is an actual, current, or recent user; using an endorsement to make deceptive performance claims; failing to disclose an unexpected material connection with an endorser; and falsely claiming that endorsers' experience represents consumers' typical or ordinary experience.

Companies receiving the notice represent an array of significant corporations, leading advertisers, leading merchants, leading consumer goods manufacturers, and important advertising agencies. A full list of the businesses receiving the Notice from the FTC is available on the FTC's website. A recipient's presence on this list does not in any way suggest that it has engaged in deceptive or unfair conduct.

In addition to the Notice, the FTC has created multiple resources for business to ensure that they are following the law when using endorsements to advertise their products and services, which can be found on the FTC's website.

To that end, this work employs a number of machine learning classifiers to detect phoney reviews based on the text of the reviews as well as various derived reviewer attributes. We test the classifiers on a genuine corpus of reviews collected from open source websites. In addition to using natural language processing on the corpus to extract and feed review features to classifiers, the research uses multiple features engineering techniques on the corpus to extract diverse reviewer behaviours. The research compares the influence of extracted reviewer features when they are taken into account by classifiers. The research examines the results of the extracted features in the absence and presence of the extracted features in two distinct language models, TF-IDF. The results show that the created characteristics improve the detection of false reviews.

The Internet's rapid expansion has altered many of our daily routines. Ecommerce is one of the fastest growing sectors. Generally, e-commerce sites allow customers to write feedback about their services. These reviews might be utilised as a source of information. Companies, for example, can use it to make design decisions for their products or services, whereas potential customers can use it to determine whether or not to buy or use a product. Unfortunately, the relevance of the review is misunderstood by certain parties that strive to fabricate fake reviews, either to boost the popularity or to discredit the product. The goal of this project is to detect phoney product reviews by using a review's text and rating properties.

The rapid growth of the Internet influenced many of our Machine learning approaches can make a significant contribution to detecting bogus web

content reviews. In general, web mining approaches use a variety of machine learning algorithms to identify and extract important information. Content mining is one of the web mining duties. Opinion mining is a traditional example of content mining in which a classifier is trained to analyse the features of the reviews as well as the sentiments to determine the sentiment of the text (positive or negative). Detecting phoney reviews is typically dependent not only on the type of reviews but also on specific features that are unrelated to the content. Text and natural language processing NLP are commonly used in the development of review features. Fake reviews, on the other hand, may necessitate the development of additional information related to the reviewer themselves, such as review time/date or writing styles. Thus, the successful detection of phoney reviews is dependent on the building of relevant reviewer features extraction.

Detecting phoney reviews is typically dependent not only on the type of reviews but also on specific features that are unrelated to the content. Text and natural language processing NLP are commonly used in the development of review features. Fake reviews, on the other hand, may necessitate the development of additional information related to the reviewer themselves, such as review time/date or writing styles. Thus, the successful identification of bogus reviews is dependent on the development of relevant features extraction.

II. RELATED WORKS

R. Barbado, O. Araque, and C. A. Iglesias: The importance of online evaluations on businesses has expanded considerably over the last year [1], and they are now critical to determining business performance in a wide range of industries, from restaurants to hotels to e-commerce. Unfortunately, some people utilise unscrupulous methods to promote their internet reputation, such as generating fictitious reviews of their businesses or competitors. Previous research has focused on the detection of fraudulent reviews in a variety of sectors, including product or business reviews in restaurants and hotels. Despite its economic importance, the consumer electronics business domain has yet to be adequately researched. This paper evaluates a feature framework for detecting false reviews in the consumer electronics market. Four contributions are made: I Using scraping techniques, construct a dataset for classifying fake reviews in the consumer electronics domain in four different cities; (ii) define a feature framework for fake review detection; (iii) develop a fake review classification method based on the proposed framework; and (iv) evaluate and analyse the results for each of the cities under consideration. We achieved an 82 percent F-Score on the classification challenge, and the Ada Boost classifier was statistically demonstrated to be the best by the Friedman test.

Tadelis: Online markets have become widespread, with billions of people frequenting sites like eBay, Taobao, Uber, and Airbnb [2]. The success of these marketplaces is linked not just to the simplicity with which buyers and sellers may discover each other, but also to the trust that these marketplaces assist to create through reputation and feedback systems. I begin by quickly discussing the fundamental concepts underlying the importance of reputation in fostering trust and trade, and then provide an overview of how feedback and reputation systems function in online marketplaces. The literature on the implications of reputation and feedback systems on online marketplaces is then described, and some of the difficulties with bias in feedback and reputation systems as they currently exist are highlighted. I explore how to solve these issues in order to enhance the practical design of online marketplaces, as well as possible future research prospects.

M. J. H. Mughal Web data mining has evolved into a simple and crucial platform for obtaining meaningful information. Users choose to upload and download data from the World Wide Web [3]. Discovering informative knowledge and patterns is becoming

more difficult and time consuming as the amount of material on the internet grows. It is difficult to extract knowledgeable and user-requested information from unstructured and inconsistent data on the internet. To retrieve meaningful information from the web, there are numerous mining techniques in use (hyperlinks, contents, web usage logs). Web data mining is a data mining specialty focused on the internet. There are three types of web data Web structure mining, web content mining, and web usage mining are all types of mining. All of these strategies, tools, methodologies, and algorithms are used to discover knowledge from massive amounts of data on the internet.

C. C. Aggarwal Users can now express their opinions regarding entities [4, individuals, events, and subjects] in a variety of formal and informal settings, thanks to the recent proliferation of social media. Reviews, forums, social media posts, blogs, and discussion boards are some examples of such environments. The computational analytics connected with such text are defined as the problem of opinion mining and sentiment analysis.

A. Mukherjee, V. Venkataraman, B. Liu, and N. Glance Online reviews have evolved into an important decision-making resource [5]. However, its use brings with it a curse: misleading opinion spam. In recent years, there has been a lot of interest in bogus review identification. Most review sites, however, still do not publicly filter bogus reviews. Yelp is an exception, having begun moderating reviews in recent years. The algorithm used by Yelp, on the other hand, is a trade secret. We try to figure out what Yelp is up to by studying its filtered reviews in this paper. Other review hosting sites will benefit from the results in their filtering efforts. Filtering can be divided into two types: supervised and unsupervised learning. There are two sorts of features used: linguistic features and behavioural features. We shall utilise a supervised strategy in this work because we can train using Yelp's filtered reviews. Existing supervised learning techniques all rely on phoney reviews rather than reviews regulated by a commercial website. Recently, it was demonstrated that supervised learning employing linguistic n-gram features performs remarkably well (with greater than 90% accuracy) in spotting crowdsourced fraudulent Amazon Mechanical Turk reviews (AMT). We put these current research methodologies to the test and evaluated their efficacy using real-world Yelp data. Surprisingly, the behavioural aspects outperform the language features. A unique information theoretic methodology is proposed to determine the precise psycholinguistic difference between AMT assessments and Yelp reviews in order to examine (crowdsourced vs. commercial fake reviews). We discover something intriguing. This research and testing results lead us to believe that Yelp's filtering is acceptable, and that its filtering method appears to be associated with anomalous spamming activities.

III. METHODS AND MATERIAL

Proposed system:

In this paper, we propose this application that can be considered a useful system since it helps to reduce the limitations obtained from traditional and other existing methods. The objective of this study to develop fast and reliable method which detects and estimates anaemia accurately. To design this system is we used a powerful algorithm in a based Python environment with Django frame work.

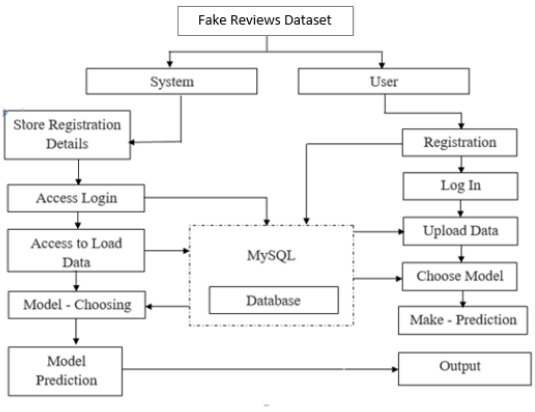


Figure 1 : Fake reviews dataset block diagram

IV. Implementation

1. Naive Bayes:

A Naive Bayes classifier is a probabilistic machine learning model that's used for classification task. The crux of the classifier is based on the Bayes theorem.

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

Using Bayes theorem, we can find the probability of **A** happening, given that **B** has occurred. Here, **B** is the evidence and **A** is the hypothesis. The assumption made here is that the predictors/features are independent. That is presence of one particular feature does not affect the other. Hence it is called naive.

Let's look at an example to better comprehend it. I've attached a weather training data set and the matching goal variable 'Play' (suggesting possibilities of playing). Now we must decide whether or not to play based on the weather. Follow the steps below to complete it.

Step 1: Make a frequency table out of the data collection.

Step 2: Create a Likelihood table by calculating probabilities such as Overcast probability = 0.29 and Playing probability = 0.64.

Weather	Play
Sunny	No
Overcast	Yes
Rainy	Yes
Sunny	Yes
Sunny	Yes
Overcast	Yes
Rainy	No
Rainy	No
Sunny	Yes
Rainy	Yes
Sunny	No
Overcast	Yes
Overcast	Yes
Rainy	No

Frequency Table		
Weather	No	Yes
Overcast		4
Rainy	3	2
Sunny	2	3
Grand Total	5	9

Likelihood table				
Weather	No	Yes		
Overcast		4	=4/14	0.29
Rainy	3	2	=5/14	0.36
Sunny	2	3	=5/14	0.36
All	5	9		
	=5/14	=9/14		
	0.36	0.64		

Step 3: Apply the Naive Bayesian equation to each class to determine the posterior probability. The outcome of prediction is the class with the highest posterior probability.

Problem: If the weather is sunny, the players will play. Is this correct?

We can solve it using the posterior probability method outlined above.

P(Yes | Sunny) = P(Yes | Sunny) * P(Yes) / P(Yes) (Sunny)

P (Sunny |Yes) = 3/9 = 0.33, P (Sunny |Yes) = 5/14 = 0.36, and P (Yes) = 9/14 = 0.64.

P (Yes | Sunny) = 0.33 * 0.64 / 0.36 = 0.60, indicating a higher likelihood.

A similar strategy is used by Naive Bayes to forecast the probability of distinct classes based on various attributes.

This approach is commonly used in text classification and multi-class situations.

• Predicting the class of test data set is simple and quick. It also excels at multi-class prediction.

• When the assumption of independence is met, a Naive Bayes classifier outperforms other models such as logistic regression and requires less training data. • It performs well with categorical input variables as opposed to numerical inputs (s). The normal distribution is assumed for numerical variables (bell curve, which is a strong assumption).

Applications of Naive Bayes Algorithms:

Real-time Prediction: Naive Bayes is a quick-learning classifier. It may thus be used to make real-time forecasts.

This algorithm is very widely recognised for its multi class prediction feature. In this case, we can forecast the likelihood of many target variable classes.

Text classification/ Spam Filtering/ Sentiment Analysis: Naive Bayes classifiers have a greater success rate than other algorithms in text classification (owing to better results in multi class issues and independence rule). As a result, it is commonly utilised in Spam filtering (determining spam e-mail) and Sentiment Analysis (in social media analysis, to identify positive and negative customer sentiments)

Recommendation System: Naive Bayes Classifier and Collaborative Filtering together builds a Recommendation System that uses Machine learning and data mining techniques are used to filter

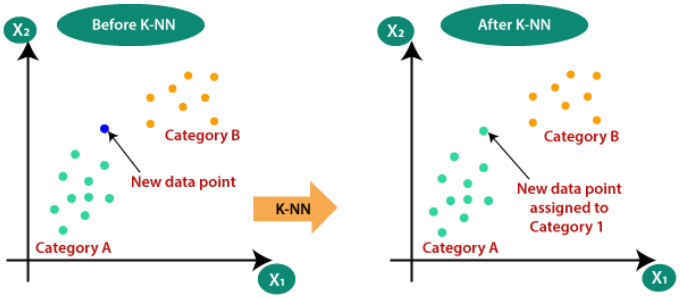
unknown information and forecast whether or not a user will want a certain resource.

KNN:

- K-Nearest Neighbour is a simple Machine Learning algorithm that relies on the Supervised Learning technique.
- The K-NN method assumes similarity between the new case/data and existing cases and assigns the new case to the category that is most similar to the existing categories.
- The K-NN method maintains all available data and uses similarity to classify a new data point. This means that when fresh data arrives, it may be quickly sorted into a well-suited category using the K- NN algorithm.
- The K-NN algorithm can be used for both regression and classification, but it is primarily employed for classification.
- K-NN is a non-parametric algorithm, which implies that it does not make any assumptions about the underlying data.
- It is also known as a lazy learner algorithm since it does not instantly learn from the training set; instead, it saves the information and performs a classification operation on it.
- **Example**: Assume we have an image of a critter that resembles a cat or a dog and we want to know whether it is a cat or a dog. So, because it works on a similarity measure, we may utilise the KNN method for this identification. Our KNN model will look for similarities between the new data set and the photographs of cats and dogs and place it in either category depending on the most similar attributes.

What is the purpose of the K-NN Algorithm?

Assume there are two categories, A and B, and we get a new data point x1, and we want to know which of these categories this data point belongs to. We require a K-NN algorithm to solve this type of problem. We can quickly determine the category or class of a dataset using K-NN. Consider the illustration below:

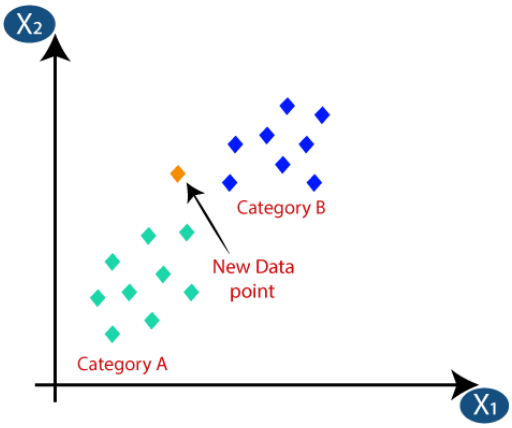


What is the mechanism of K-NN?

The following algorithm explains how K-NN works:

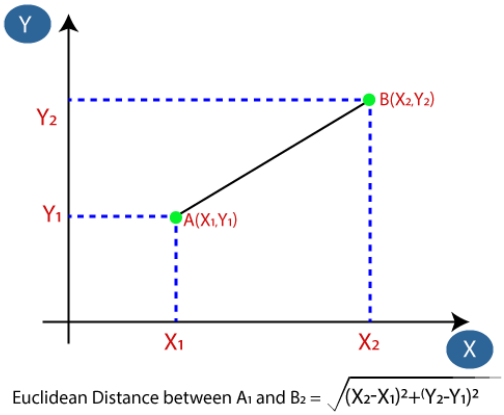
Step 1: Determine the number K of neighbours.
Step 2: Determine the Euclidean distance between the K neighbours.
Step 3: Determine the K nearest neighbours based on the Euclidean distance.
Step 4: Count the number of data points in each category among these k neighbours.
Step 5: Assign the new data points to the category with the highest number of neighbours.
Step 6: Our model is completed.

Assume we have a new data point that has to be assigned to the appropriate category. Consider the following illustration:



To begin, we will select the number of neighbours, so k=5.

The Euclidean distance between the data points will then be computed. The Euclidean distance is the distance between two locations studied in geometry. It can be computed as follows:



We obtained the nearest neighbours by computing the Euclidean distance, which yielded three nearest neighbours in category A and two nearest neighbours in category B. Consider the following illustration:

As we can see, the three closest neighbours are all from category A, thus this new data point must be from that as well.

In the K-NN Algorithm, how should the value of K be chosen?

Here are some considerations to make while determining the value of K in the K-NN algorithm:

- Because there is no specific way to discover the ideal value for "K," we must experiment with different values to find the best one. The most popular K value is 5.
- A very low K value, such as K=1 or K=2, might be noisy and cause outlier effects in the model.
- High K values are preferable, although they may cause problems.

KNN Algorithm Advantages:

- It is easy to deploy,
- It is resistant to noisy training data.
- If the training data is large, it may be more effective.

It is always necessary to determine the value of K, which can be difficult at times.

• Because the distance between the data points for all training samples is determined, the computation cost is significant.

Logistic Regression:

In the early twentieth century, the biological sciences adopted logistic regression. It was afterwards employed in a variety of social scientific applications. When the dependent variable (target) is categorical, logistic regression is utilised.

For example,

To predict whether an email is spam (1) or (0)

Whether the tumor is malignant (1) or not (0)

Consider a scenario where we need to classify whether an email is spam or not. If we use linear regression for this problem, there is a need for setting up a threshold based on which classification can be done. Say if the actual class is malignant, predicted continuous value 0.4 and the threshold value is 0.5, the data point will be classified as not malignant which can lead to serious consequence in real time.

From this example, it can be inferred that linear regression is not suitable for classification problem. Linear regression is unbounded, and this brings logistic regression into picture. Their value strictly ranges from 0 to 1.

Purpose and examples of logistic regression:

Logistic regression is one of the most commonly used machine learning algorithms for binary classification problems, which are problems with two class values, including predictions such as "this or that," "yes or no" and "A or B."

The purpose of logistic regression is to estimate the probabilities of events, including determining a relationship between features and the probabilities of particular outcomes.

One example of this is predicting if a student will pass or fail an exam when the number of hours spent studying is provided as a feature and the variables for the response has two values: pass and fail.

Organizations can use insights from logistic regression outputs to enhance their business strategies so they can achieve their business goals, including reducing expenses or losses and increasing ROI in marketing campaigns, for example.

An e-commerce company that mails expensive promotional offers to customers would like to know whether a particular customer is likely to respond to the offers or not. For example, they'll want to know whether that consumer will be a "responder" or a "non responder." In marketing, this is called propensity to respond modeling.

Likewise, a credit card company develops a model to decide whether to issue a credit card to a customer or not will try to predict whether the customer is going to default or not on the credit card based on such characteristics as annual income, monthly credit card payments and number of defaults. In banking parlance, this is known as default propensity modeling.

Uses of logistic regression:

Logistic regression has become particularly popular in online advertising, enabling marketers to predict the likelihood of specific website users who will click on particular advertisements as a yes or no percentage.

- Logistic regression can also be used in:
- Healthcare to identify risk factors for diseases and plan preventive measures.
- Weather forecasting apps to predict snowfall and weather conditions.
- Voting apps to determine if voters will vote for a particular candidate.

Insurance to predict the chances that a policy holder will die before the term of the policy expires based on certain criteria, such as gender, age and physical examination.

Banking to predict the chances that a loan applicant will default on a loan or not, based on annual income, past defaults and past debts.

Logistic regression vs. linear regression:

The main difference between logistic regression and linear regression is that logistic regression provides a constant output, while linear regression provides a continuous output.

The outcome, such as a dependent variable, has a finite number of possible values in logistic regression. However, the output of linear regression is continuous, which means it can take any of an unlimited number of values.

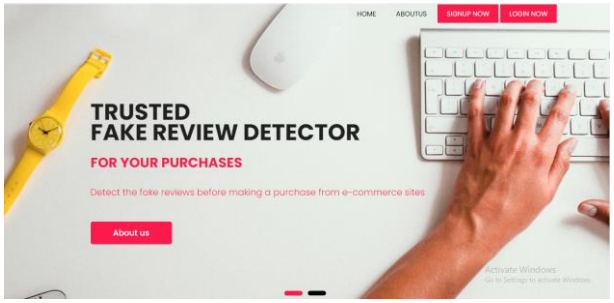
When the answer variable is categorical, such as yes/no, true/false, or pass/fail, logistic regression is utilised. When the response variable is continuous, such as time, height, or weight, linear regression is used.

For example, given data on the time a student spent studying and that student's exam scores, logistic regression and linear regression can predict different things.

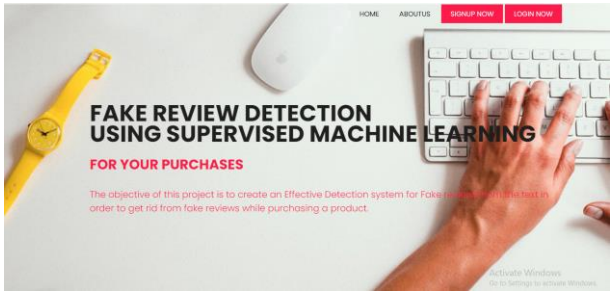
With logistic regression predictions, only specific values or categories are allowed. Therefore, logistic regression can predict whether the student passed or failed. Since linear regression predictions are continuous, such as numbers in a range, it can predict the student's test score on a scale of 0 -100.

V. RESULTS AND DISCUSSION

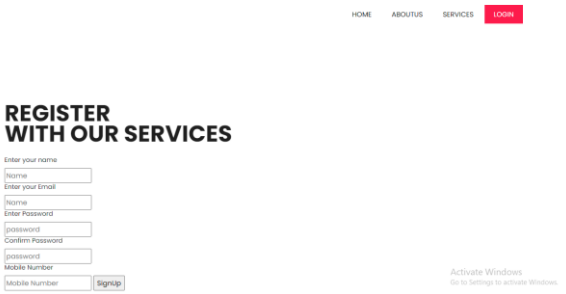
The following images will visually depict the process of our project.



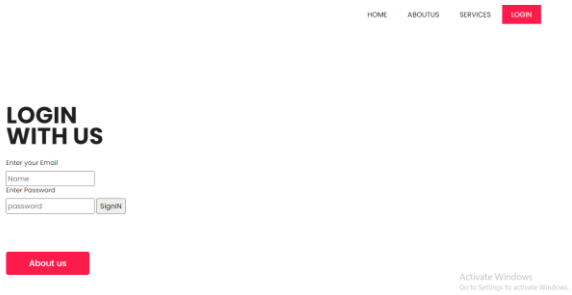
Home page: In this home page we can see the logo designing of our website and here we are detecting the fake reviews from the review entered by the user.



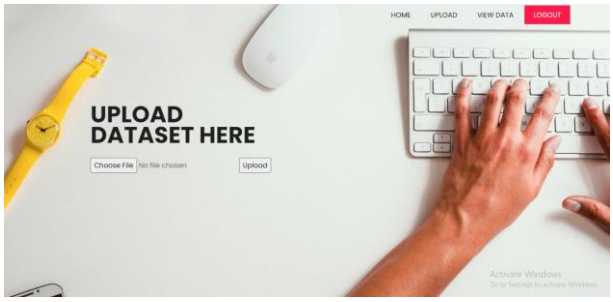
About page: This is about page, here the application describes what main objective of this project is.



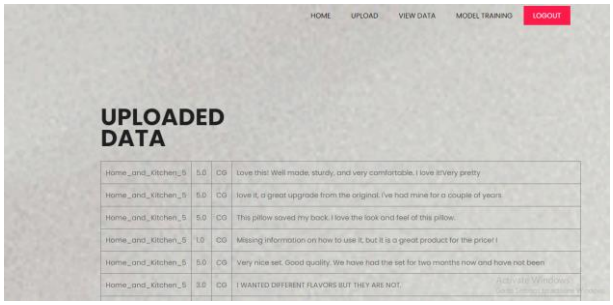
Registration page: Registration page in which user need to register to start.



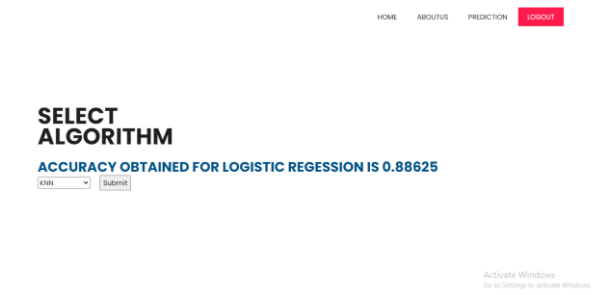
Login page: In this login page, user need to enter valid credentials in order to enter.



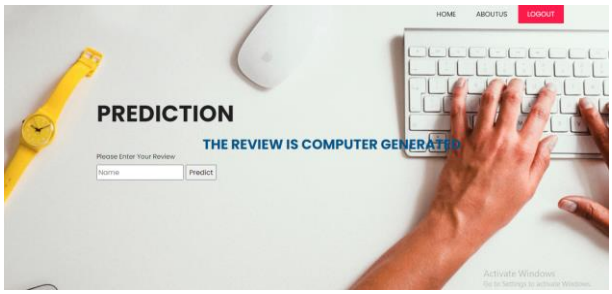
Upload page: In this upload Page in order to upload the dataset.



View data page: In this user views the data which he was uploaded to the system.



Model training page: In this model training page, training of your model takes place and display the model's accuracy



Prediction page: In this prediction page, user need to enter the required fields in order to get the response from the data whether the review is computer generated or original.

VI. CONCLUSION

We have successfully developed a system to detect fake reviews in this application. This is created in a user-friendly environment with Python programming and Django framework. The system is likely to gather data from the user in order to determine whether the review is fake or not.

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A Novel Model Selection Framework for Forecasting Agricultural Commodity Prices using Time Series Features and Forecast Horizons

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ABSTRACT

The oscillations of agricultural commodity prices have abundant impact on people's daily lives and also the inputs and outputs of agricultural production. To take proper decisions one should require an accurate forecast of commodity prices. Accuracy of crop price forecasting techniques is important because it enables the supply chain planners and government bodies to take appropriate actions by estimating market factors such as demand and supply. In emerging economies such as India, the crop prices at marketplaces are manually entered every day, which can be prone to human-induced errors like the entry of incorrect data or entry of no data for many days. In addition to such human prone errors, the fluctuations in the prices itself make the creation of stable and robust forecasting solution a challenging task. To forecast prices more adaptively, this study proposes a novel model selection framework which includes time series features and forecast horizons. Twenty-nine features are used to depict agricultural commodity prices and three intelligent models are specified as the candidate forecast models; namely, artificial neural network (ANN), support vector regression (SVR), and extreme learning machine (ELM). Both random forest (RF) and support vector machine (SVM) are applied to learn the underlying relationships between the features and the performances of the candidate models. Additionally, a minimum redundancy and maximum relevance approach (MRMR) is employed to reduce feature redundancy and further improve the forecast accuracy. The trial that's what results exhibit, firstly, the proposed model determination system has a superior figure execution contrasted and the ideal competitor model and basic model normal; besides, highlight decrease is a useful way to deal with further work on the exhibition of the model determination structure; and thirdly, for bean and pig grain items, various disseminations of the time series highlights lead to an alternate determination of the ideal models.

Keywords : Time series analysis data, crop prediction model, agricultural commodity, price forecasting, forecast horizons.

I. INTRODUCTION

India is an agriculture-based country where 54.6% of the total workforce is engaged in agricultural and allied sector activities, accounting for 17.1% of the country's Gross Value Added (GVA). Hence, it becomes important for the government bodies associated with agriculture to estimate market factors and take suitable actions to benefit the farmers. Therefore, having a robust automated solution, especially in developing countries such as India, not only aids the government in taking decisions in a timely manner but also helps in positively affecting the large demographics. The price of crops is one such market factor that requires the attention of the government. Accurate crop price forecasting can be useful for the government to take proactive steps and decide various

policy measures such as adjusting MSP (Minimum Support Price) so that farmers get a decent price for their produce, restricting the export price by imposing an MEP (Minimum Export Price), so that exporters are forced to sell locally, thus bringing down the crop prices. At the same time, it will also be useful for the farmer for making better decisions like when to sell their produce or when to harvest the crop. The crop prices are affected due to several factors such as the area under cultivation for a particular crop, supply projection, government policies, consumer demands, supply chain aspects of producers for agriculture-based products, etc. Additionally, weather conditions also play an important factor since the majority of agricultural production in India is rainfed. Therefore, the study of fluctuations in agricultural crop prices is interesting as well as an important problem to solve from the government's perspective. Apart from the above-stated reasons, agricultural crop price forecasting is quite challenging due to many factors such as data quality issues, unreliability in future weather predictions, high fluctuation present in the historical crop price, crop price variations across neighboring marketplaces, etc. Moreover, the manually recorded data is prone to human-induced errors such as no data or wrong data entered for a certain day. Considering ML/DL based models, with a new price data arrival every day, updating the models might cause stability issues because of quality issues associated with the crop price data. Since the 1990s, feature-based model selection has been applied to time series forecasting. For instance, Prudêncio and Ludermir [8] used decision tree to select between two models to forecast stationary time series.

II. LITERATURE SURVEY

This section presents all the relevant methodologies belonging to three main domains, statistical, machine learning, and deep learning, applied in the prediction of agricultural prices. Dairi et al. (2021) state that in this era, many advances have been seen in artificial intelligence (AI), especially in deep learning (DL), an important part of AI. DL extracts relevant characteristics of the data automatically.

Table 1. Forecasting agricultural commodity prices using intelligent models

Commodity	Forecast Model	Authors
Xu, et al. [8]	Sugar	BP Neural Network
Jha, et al. [9]	Oilseed	Time delay Neural Network
Zhang, et al. [10]	Tomato	Wavelet Neural

		Network
Xiong, et al. [11]	Cotton, Corn	VECM-MSVR, SSVR
Ayankoya, et al. [12]	Grain commodities	BP Neural Network
Cai, et al [13]	Pork	EMD-SVR
Adya, et al. [6]	Sugar, cotton, corn, soyabean, coffee	MSS-ANN
He, et al. [14]	Soyabean	APSO-SVR
Li, et al. [15]	Potato	Dynamic Chaotic Neural Network
Wang, et al. [16]	Corn	SSA-ELM
Xiong, et al. [5]	Cabbage, pepper, cucumber, green bean and tomato	STL-ELM, TDNN, SVR-ELM

As the deep learning-driven methods do not depend on feature engineering, it benefits other ML methods. Nassar et al. (2020), while comparing the achievement of deep learning price prediction models with eight statistical as well as bench mark machine learning models, on the time series datasets of Vegetables, Fruits and Flowers, demonstrated that deep learning models, LSTM and CNN-LSTM are efficient in precise prediction of Fresh Produce prices for up to three weeks advance. Sabu and Kumar (2020) used time-series and machine learning models for predicting the monthly prices of are cannot in Indian Kerala state and found that LSTM neural network was good. Weng et al. (2019), while finding the suitability of ARIMA and Deep Learning models on different data sets, daily, weekly, and monthly, identified the deep learning method as the standard agricultural goods prices forecast. In the context of development of effective models, authors Ribeiro, M. H. D. M, & dos Santos Coelho (2019) used RF, GBM, and XGB while adopting SVR, MLP and KNN as baseline models and ranked the models as 1. XGB, 2.GBM, 3. RF, 4.MLP, 5. SVR and 6. KNN and finally concluded that that the ensemble approach was found to be doing good in the investigation of price sequences data.

The literature provides a number of methods to forecast the prices of agricultural commodities, including statistical methods and intelligent methods. Statistical methods are the most popular methods for forecasting a time series. For instance, Darekar and Reddy [1] predicted the cotton price of major producing states in India with auto-regressive integrated moving average model (ARIMA). Xu et al. [2] used an exponential smoothing model (ETS) to forecast the carrot price in China. Evans and Nalampang [3] employed a multivariate regression model to forecast the price trend of U.S. avocado. In recent years, as agricultural commodity price series become more volatile, powerful AI models with favorable self-learning capability have emerged to handle with the complex price forecasting task.

III. RELATED WORK

In another study by Chen et al. (2019), the noise of the cabbage data was reduced using Wavelet Analysis (WA). LSTM model then was applied on the fine-tuned normalized data which was found to be producing better results in achieving accuracy. While providing a concise summary of major deep learning techniques, Zhu et al. (2018) showed that DL methods such as CNN, RNN and GAN, are gaining momentum to help researchers in agriculture price forecast. Rasheed et al. (2021) analysed the wheat prices dataset with LSTM technique. Their study presented that LSTM was performing significantly when compared to other conventional machine learning and statistical time series models. The study also stated that deep learning is fairly a new direction in agriculture.

Table 2. Related works

Name of the authors	Name of the commodities	Deep Learning Models used for prediction	Results
R L et al. (2021)	Cottonseed, Castor seed, Rape mustard seed, Guar seed, soybean seed	LSTM Base line models: ARIMA, TDNN	The LSTM model provided a better forecast.
Ouyang et al. (2019)	Cotton, Sugar, bean, bean II, soya bean oil, cardamom, strong Wheat, Corn, Coffee, cocoa, Frozen orange juice	LSTNet Base Line Models: CNN, RNN, ARIMA, VAR	The LSTNet performed better results over the r baseline methods on average.
Kurumatani K. (2020)	Cabbage, Tomato, Lettuce	LSTM (Recurrent neural network)	The LSTM performed the best result.
Jin et al. (2019)	Chinese cabbage, Radishes	LSTM	The optimum performance was obtained by the LSTM.
Prakash & Farzana, (2019)	Tomato	LSTM	The LSTM is one of the most effective models for dealing with nonlinear patterns in prediction.
Chen et al. (2021)	Chicken, Chili, Tomatoes	LSTM Baseline models: ARIMA, SVR,Prophet, XGBoost	Among the five baseline models, the LSTM was forecasted to produce the best results.

To the best of our knowledge, forecast models perform differently at each forecast horizon; hence horizon is an important factor in choosing the optimal forecast model. However, this factor is seldom considered in previous studies. Moreover, the datasets used in previous studies were mainly M3, NN3, and NN5, which contain few agricultural time series. Therefore, there is still a research gap in constructing a model selection framework for forecasting agricultural commodity prices.

It can be seen from Table 2 that various kinds of models are widely used for different agricultural

commodity forecasting tasks. According to the `no free lunch' theory [7], there is no single model suitable for all the commodities. When facing a new type of agricultural commodity, it is not easy for people to identify which is the optimal model for this specific forecasting task. Of course, decision makers can compare the performance of several commonly used forecasting techniques
and configure out the most favorable one. However, training various models is a time-consuming process. Obviously, a fast and automatic algorithm is needed to identifying the most suitable forecasting method for agricultural commodities. In the past 30 years, the model selection approach has been used extensively for choosing the optimal model for various types of input data. That is to say, the underlying relationships between the features of the input data and the performance of a candidate algorithm will be discovered by learners through numerous training samples.

IV. PRPOSED WORK

To the best of our knowledge, forecast models perform differently at each forecast horizon; hence horizon is an important factor in choosing the optimal forecast model. However, this factor is seldom considered in previous studies. Moreover, the datasets used in previous studies were mainly M3, NN3, and NN5, which contain few agricultural time series. Therefore, there is still a research gap in constructing a model selection framework for forecasting agricultural commodity prices. In this study, we propose a model selection framework which involves both time series features and forecast horizons for forecasting agricultural commodity prices. Within this framework, twenty-nine features are extracted according to the periodicity, nonlinearity, and complexity of agricultural commodity price time series. Intelligent forecast models (i.e., ANN, SVR, and ELM) are specified as the candidate models. The relationships between these features and the performances of the candidate models are learned by classifiers, which include RF and SVM. Feature reduction (the minimum redundancy and maximum relevance method) is also utilized to reduce feature redundancy and improve the forecast accuracy of the model selection framework. We test the effectiveness of considering the forecast horizon as the input feature and apply the feature reduction strategy to improve the performance of the classifier. Finally, we use principal component analysis to analyze the relationship between different commodities and the corresponding optimal forecast models.

The main contributions of this study are as follows. We propose a model selection framework for forecasting agricultural commodity price time series based on time series features and forecast horizons. We verify that the minimum redundancy and maximum relevance method can effectively reduce the redundancies between the features and is a workable approach to improving the performance of the classifier.

V. MODEL SELECTION

Meta-learning has been employed for algorithm recommendation tasks for some time and, since 2004, it has also been investigated in the area of time series forecasting [8]. In this special case of meta-learning, the aspect of interest is the relationship between data features and algorithm performance [32]; a classier is usually applied to learn that relationship. Three main steps are involved in this research; namely, feature extraction, feature selection, and classification.

In Step 1, twenty-nine time series features are extracted, including complexity features, linearity features, and stationarity features. The optimal forecast model for the time series is specified by comparing the forecast errors of the three candidate models at each horizon. Hence, both horizon information (horizon features) and the optimal model

for the corresponding horizon will be recorded in the classification sample.

In Step 2, feature reduction is performed using an MRMR approach, with the aim of reducing feature redundancy and improving the generalization capability of the classier. The ranking of the Mutual Information (MI) values of all the features will be obtained by the MRMR algorithm, and the ultimate features selected will be generated by the backward search method.

In Step 3, the classifiers proposed in the study are constructed by two popular machine learning approaches; i.e., SVM and RF. Additionally, there are different schemes or developing the model selection framework, which involve a naïve classifier (abbreviated as MSN), a classifier with forecast horizon features (abbreviated as MSH), and a classifier with the reduced features (abbreviated as MSH-FR). Therefore, we have a total of five competing classifiers in this study; i.e., MSN-SVM, MSN-RF, MSH-SVM, MSH-RF, and MSH-FR-RF. Details of these classifiers (including the reason for excluding MSH-FR-SVM) are provided. The forecast performance of the model selection framework is subsequently evaluated by two criteria; i.e., the mean absolute percent error (MAPE) and the improvement ratio (IR). The classification performance is estimated by classification accuracy (ACC). Finally, principal component analysis is applied to analyze the relationship between commodities and the optimal forecast model.

The implications of the selected features are shown as follows.

1) Complexity features quantify chaos and measure the long-range dependence in a time series.
2) Linearity features are important to determine the selection of models.
3) Stationarity features measure the stationarity of a time series.
4) Periodicity features provide indications on periodicity and seasonality of time series.
5) Model-based features, which characterize a time series by cutting a forecast model, are the parameters in the exponential smoothing model.
6) In other features, peak and trough capture oscillating behavior of time series. Spikiness captures the oscillating behavior of the residue of a time series by STL. Trend features characterize a time series by its degree of trend.
7) Horizon features are four binary numbers related to forecast horizons. They are marks for the corresponding optimal models at four forecast horizons.

VI. FORECAST MODEL

Due to the complexity and nonlinearity features of an agricultural commodity price time series, three workable and widely used AI models in agricultural commodity price forecasting are considered as the forecast models in this paper: artificial neural network (ANN); support vector regression (SVR); and extreme learning machine (ELM). The details are as follows.

Table 3. Statistical description of features of time series

Feature	Mean	Standard deviation	Minimum	Maximum
entropy	0.5166	0.0957	0.4119	0.9278
trend	0.9541	0.0671	0.4798	0.9996
spike	<0.0001	<0.0001	<0.0001	0.0006
linearity	11.9004	3.3175	-5.5354	14.5444
curvature	-1.2945	2.5414	-7.3815	9.9994
e_acf1	0.5132	0.2032	-0.1416	0.8261
e_acf10	0.4758	0.3017	0.0097	1.1692
seasonality	0.2865	0.1564	0.0651	0.7934
peak	6.2414	3.5058	1.0000	12.0000
trough	5.4502	2.9288	1.0000	12.0000
lumpiness	0.0465	0.3184	<0.0001	6.2433
stability	0.9519	0.1177	0.3253	1.0567
hurst	0.9978	0.0130	0.7774	1.0000
unitroot_kpss	3.4473	1.0446	0.1328	4.4699
unitroot_pp	-7.1267	11.7038	-150.8649	0.9937
nonlinearity	0.5168	0.8131	0.0006	6.0814
x_acf1	0.9607	0.0598	0.3962	0.9940
x_acf5	4.1279	0.7502	0.6259	4.7992
diff1_acf1	0.0687	0.2885	-0.5432	0.6454
diff1_acf5	0.1384	0.1258	0.0018	0.9829
diff2_acf1	-0.4133	0.1779	-0.7716	0.0658
diff2_acf5	0.2601	0.1400	0.0593	0.9266
seas_acf1	0.7122	0.2070	-0.2120	0.9091
x_pacf5	0.9940	0.1088	0.2805	1.2651
diff1x_pacf5	0.1386	0.1128	0.0018	0.5100

ANNs are data-driven flexible models which are capable of approximating a large class of nonlinear problems. One of the classic neural networks is the back-propagation neural network (BPNN), which includes feedforward and backpropagation. It is well known for its error learning algorithm in adjusting weights and bias. In general, a BPNN with a single hidden layer can generate the desired accuracy for a time series forecasting application [4]. SVR is originally proposed by Vapnik and based on the structured risk minimization principle. It performs nonlinear mappings through the application of kernels, which include nonlinear and linear kernels. It has been applied to forecast complex time series in industry, agriculture and aviation. ELM is a single hidden layer feedforward neural networks proposed by. Unlike traditional learning algorithms in feedforward neural network, where parameters are tuned iteratively, the Moore-Penrose generalized inverse is applied to determine the output weights in ELM [6], thus requiring little time for training. This advantage has been applied to classification tasks and regression tasks in numerous studies.

Table 4. The reserved features after feature reduction

Category	Features
Periodicity features	x_acf5, seas_pacf, x_acf1, diff1x_pacf5, x_pacf5, seas_pacf, seasonality, diff2_acf5
Stability features	unitroot_pp, stability, unitroot_kpss, lumpiness
Linearity features	linearity, curvature, nonlinearity
Complexity features	hurst
Model-based features	alpha, beta
Horizon features	h1, h3, h6, h12
Other features	trend, peak, trough

Table 5. Forecast performance of the MSN in terms of MAPE.

	h=1	h=3	h=6	h=12	average
ANN	3.4988	7.7901	10.5496	12.8591	8.6744
SVR	4.1948	10.0278	12.9542	14.6353	10.4530
ELM	4.2058	8.1399	10.6749	14.6674	9.4220
SMA	3.6617	8.0175	10.4539	12.6093	8.6856
MSN-RF	3.7114	7.8813	10.3578	12.7189	**8.6673**
MSN-SVM	3.7969	7.8901	10.3106	13.0068	8.7511

Table 6. Forecast performance of the MSH and MSH-FR in terms of MAPE.

	h=1	h=3	h=6	h=12	average
ANN	3.4985	7.7772	10.5583	12.8583	8.6731
SVR	4.1918	10.0144	12.9646	14.6332	10.451
ELM	4.2061	8.1293	10.6854	14.6664	9.4218
SMA	3.6610	8.0038	10.4634	12.6104	8.6847
MSH- RF	3.4901	7.4729	9.8113	12.6254	8.3499
MSH- SVM	3.5738	7.7456	10.1239	12.5543	8.4994
MSH-FR-RF	3.4877	7.4733	9.8148	12.5562	**8.3330**

Statistical descriptions of all the features are listed in Table 4. These statistical values indicate that the features have different magnitudes; thus, normalization should be employed before classification. The correlation diagram based on mutual information (MI) is shown in Figure 4. The dark point at the top right-hand corner represents the maximum MI value of all the twenty-nine features. After feature reduction, twenty-five features including twenty-one time series features and four horizon features remained. In general, the average MI of each pair of two features has been reduced by 7.45%. The details of the selected features are listed in Table 5. Four horizon features have been retained, which demonstrates that the forecast horizon features are important for the performance of the classifier.

The model selection experiments for forecasting agricultural commodity prices were conducted using the research design described above. Accordingly, the forecast performances of all the candidate models and the model selection frameworks were evaluated using the two accuracy measures MAPE and IR, and the classification performance was estimated using ACC. Table 6 and Table 7 show the forecast performances in terms of MAPE. The last column labeled ``average'' shows the average performances of the models across all four forecast horizons. In order to illustrate intuitively the advantage of the model selection framework, we compare the performance of each selection framework to the optimal single model ANN. The results are shown in Table 8. Table 9 shows the classification performances of the three model selection frameworks in terms of ACC.

Table 7. Forecast performance of MSN, MSH and MSH-FR in terms of IR.

		h=1	h=3	h=6	h=12	average
MSN	RF	-6.0749	-1.1702	1.8187	1.0905	0.0818
	SVM	-8.5193	-1.2833	2.2655	-1.1482	-1.1482
MSH	RF	0.2423	3.9126	7.0746	1.8111	3.7259
	SVM	-2.1518	0.4066	4.1141	2.3644	2.0026
MSH-FR	RF	0.3089	3.9078	7.0417	2.3499	**3.9212**

Table 8. Classification performance of the MSN, MSH and MSH-FR in terms of ACC.

	RF	SVM
MSN	55.78%	53.90%
MSH	61.39%	56.49%
MSH-FR	61.85%	———

Focusing on the model selection framework, Table 6 shows that the average forecast error of MSN-RF is 8.6673 compared to 8.6744 for ANN. This result demonstrates the superiority of the model selection framework, which can reduce effectively the risk in model selection, thus yielding a smaller forecast error. Regarding the two strategies used for improving the performance of MSN, Table 7 shows the performance of MSH and MSH-FR. Both MSH-RF and MSHSVM perform well across four forecast horizons compared to ANN. This may indicate that the performance of MSH is better than that of MSN. As for MSH-RF, the average forecast error is 8.3499, yielding a smaller forecast error compared with MSH-SVM. It can be seen from Table 8 that the average IR of MSH-RF is 3.7259, which is greater than that of MSN. Moreover, it can also be seen from Table 8 that the classification accuracy of MSH-RF is higher than that of MSN. These results verify the superiority of using different forecast horizons as the input features of the classifier. This method can not only improve the forecast accuracy of model selection by using the data on forecast model performance at different forecast horizons, but can also improve the classification performance of the model selection.

It can be seen from Table 6 that the average MAPE of SMA is 8.6856, which is only on average larger than the optimal candidate model (ANN,8.6744). That is to say, SMA can avoid performing the worst result of forecasting and reduce the risk of model selection. Compared to SMA, MAPEs of MSN-RF and MSN-SVM are lower at h=3 and h=6, which indicates that the model selection framework is competitive for SMA. It can also be seen from Table 7 that the average MPAE of SMA is 8.6847 which is only larger than ANN. The MAPEs of MSH-RF and MSH-SVM are almost lower than SMA at each forecast step. It demonstrates the superiority of the model selection framework, which is more effective than SMA in reducing the risk of model selection.

Table 1. A summary of the forecast results for several benchmark forecasting methodologies

Models	Forecast Horizon	RMSE*	MAPE (%)
Proposed Method	Yearly	14.37	4.12
ARIMA	Yearly	60.25	33.45
EMD-ARIMA	Yearly	35.23	25.12
ANFIS	Yearly	24.09	16.35
Persistence	Yearly	68.23	51.15
Proposed Method	Monthly	08.03	3.12
ARIMA	Monthly	45.35	12.19
EMD-ARIMA	Monthly	22.23	8.59
ANFIS	Monthly	14.17	8.51
Persistence	Monthly	55.34	18.24

In order to verify this assumption, we perform a principal component analysis (PCA), following the method proposed by Kang [56]. The first two principal components of the bean and pig grain price time series are plotted into a feature space as shown in Figure 6. The x-axis refers to the first principal component and the y-axis refers to the second principal component. The red points represent the bean price time series which take ELM as the optimal model across all the forecast horizons. The blue points represent the pig grain price time series which identifies SVR as the optimal model across all the forecast horizons. It can be seen that the zone of red points is separated from the zoo of blue points. This phenomenon indicates that the features of those two categories are quite different from each other. Therefore, different distributions of the time series features can be regarded as the main reason for the different model selection results.

VII. CONCLUSION

In this paper, we proposed a model selection framework for forecasting agricultural commodity prices using both time series features and forecast horizons. Generally, three main steps were involved in the proposed model selection framework, i.e., feature extraction, feature reduction and classification. By and large, three primary advances were engaged with the proposed model selection framework, i.e., include extraction, highlight decrease and arrangement. First and foremost, we separated 29 time series highlights of agrarian product costs. Besides, we utilized the base overt repetitiveness and greatest importance technique to decrease highlight overt repetitiveness and work on the presentation of the model determination structure. At long last, five classifiers were built to confirm the exhibitions of various model choice systems. Also, the connection between various products and the ideal model was assessed by head part investigation. Comparative with existing examinations, this study shifts the adequacy of the model determination system in picking the most reasonable gauging models. With rural ware cost series as exploration tests, a few intriguing ends can be made in view of the exact outcomes. First and foremost, taking into account the figure skyline as one of the elements can work on the presentation of both grouping and conjecture, which exhibits the gauge skyline ought to be considered as a significant calculate model determination task. Besides, MRMR can additionally work on the exhibition of the model choice system, which shows a useful element decrease technique ought to be taken advantage of in model determination for expanding the speculation capacity of classifiers.

The proposed model selection framework could be improved according to the accompanying viewpoints. In the first place, the proposed strategy could be utilized as a compelling model determination apparatus for other figure objects. Second, a few

strong classifiers, for example, AdaBoost and Bayesian organizations could be used to additionally further develop the grouping capacity. Third, this concentrate just considers three well known estimate models in the space of gauging rural product costs; notwithstanding, different strategies could likewise be acquainted with make the structure more functional.

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Machine Learning Techniques for the Detection of Distributed Denial of Service Attacks in the SDN

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ABSTRACT

A network architecture known as a "software-defined network" (SDN) is used to digitally construct and design hardware components. The network connection settings can be changed dynamically. Because the link is fixed in the conventional network, dynamic change is not feasible. SDN is a wonderful strategy, but DDoS assaults can still happen. The DDoS assault poses a threat to the internet. The machine learning algorithm can be used to stop DDoS attacks. The DDoS assault is when several systems work together to simultaneously target a certain host. In SDN, the infrastructure layer's devices are managed by software from the control layer, which sits in the middle of the application and infrastructure layers. We provide a machine learning method called Decision Tree in this research to identify malicious communications. Our test results demonstrate that the Decision Tree determines whether or not the assault is safe.

Keywords : SDN, attacks, DDoS, Decision Tree.

I. INTRODUCTION

A distributed denial-of-service (DDoS) attack is a malicious attempt to obstruct a server, service, or network's regular traffic by saturating the target or its surrounding infrastructure with an excessive amount of Internet traffic. By using several hacked computer systems as sources of attack traffic, DDoS assaults are made effective. Computers and other networked resources, like as IoT devices, can be exploited machines. When viewed from a distance, a DDoS assault resembles an unexpected traffic congestion that blocks the roadway and keeps ordinary traffic from reaching its destination. Networks of Internet-connected devices are used to carry out DDoS assaults.

These networks are made up of computers and other gadgets that have been infected with malware, allowing an attacker to remotely manipulate them (such as IoT gadgets). These particular gadgets are known as bots (or zombies), and a botnet is a collection of bots. Once a botnet has been created, the attacker may control an attack by giving each bot remote commands. Each bot in the botnet sends queries to the IP address of the victim's server or

network while that server or network is being targeted by the botnet. This might overload the server or network and result in a denial-of-service attack on regular traffic. It might be challenging to distinguish attack traffic from regular traffic because each bot is an actual Internet device.

An abrupt slowdown or unavailability of a website or service is the most evident sign of a DDoS assault. However, since several factors, including a real increase in traffic, might result in performance concerns, more research is often needed. You may identify some of these telltale symptoms of a DDoS assault using traffic analytics tools, unusual spikes in traffic to a single page or endpoint, suspicious quantities of traffic coming from a single IP address or IP range, or a deluge of users with the same device, geographic area, or web browser version. Unusual traffic patterns, such as spikes at unusual times of day or patterns that seem abnormal (such as a spike every ten minutes),Depending on the type of assault, there are other, more precise indications of DDoS attacks.

By separating the control from data plane devices, the developing paradigm of "software defined networking" overcomes the limits of traditional network design. The data plane, control plane, and application plane are the three planes that make up SDN. In accordance with the controller's decision, the data plane carries the network traffic. The routing tables are computed by the control plane to determine the traffic flow. Apps like load balancers, firewalls, and quality of service (QoS) applications are managed by the application plane.By separating the network control and forward functions, the SDN design enhances network performance. Multiple routers throughout the network will be under the control of control programmes operating in a conceptually centralised controller.

Applications only have access to the complete network's information through the SDN. Integration of many apps aids in load balancing and intrusion detection during periods of heavy traffic. The application instructs the controller to modify the data plane in order to fix any anomalies that are found. On routers spread throughout the network, the control and data planes both function, and the devices have open interfaces that can be managed by software.

Multiple devices can be configured simultaneously in an SDN framework. Device configuration for networks is done at the application layer. The brain of the SDN architecture is the control layer (control plane), which is composed of the same controller. API is used to communicate between these two levels. A common protocol is used by the infrastructure layer (data plane), which connects the controller and network devices.

A good security system is necessary to analyse and identify suspicious communications since the controller handles a large quantity of traffic. We provide a machine learning-based method for detecting malicious SDN activity by analysing the traffic properties.

II. RELATED WORKS

DDoS Attack Detection Method Based on Improved KNN with the Degree of DDoS Attack in Software-Defined Networks: Since decades, the Distributed Denial of Service (DDoS) assault has significantly decreased network availability, and there is still no reliable solution against it. But the newly developed Software Defined Networking (SDN) offers a fresh perspective on how to rethink the security against DDoS attacks. In this work, we provide two approaches for spotting DDoS attacks in SDN. One approach uses the DDoS attack's intensity to determine its level. The alternative technique finds the DDoS assault using the enhanced K-Nearest Neighbors (KNN) algorithm based on Machine Learning (ML). Theoretical analytical findings and

actual findings on datasets demonstrate that our suggested approaches are superior to previous ways at detecting DDoS attacks.

A survey on distributed denial of service (DDoS) attacks in SDN and cloud computing environments: SDNs (software defined networks) and cloud computing have recently gained significant traction among academics and business. The security risks have, however, made it difficult for these revolutionary networking models to gain general acceptance. Attackers have increased their attacks as a result of advancements in processing technology, such as the evolution of Denial of Service (DoS) attacks into distributed DoS (DDoS) attacks that are seldom detected by traditional firewalls. We outline the current state of DDoS assaults in SDN and cloud computing situations in this study. In particular, we concentrate on the examination of the cloud computing and SDN architecture. In addition, we review ongoing research projects and challenges in recognizing and countering DDoS assaults.

Semi supervised K-means DDoS detection method using hybrid feature selection algorithm: The goal of a distributed denial of service (DDoS) assault is to overload a website with traffic from several sources in an effort to render it unavailable. As a result, it is essential to provide an efficient technique for identifying DDoS attacks among heavy data flow. The current approaches, however, have several drawbacks, such as the necessity for huge quantities of labelled data for supervised learning methods and the poor detection rate and high false positive rate of unsupervised learning algorithms. This study provides a semi-supervised weighted k-means detection technique to address these problems.To discover the best feature sets, we first provide a Hadoop-based hybrid feature selection method. To address the issue of outliers and local optimality, we next suggest an enhanced density-based initial cluster centers selection approach. Then, in order to identify assaults, we provide the Semi-supervised K-means technique employing hybrid feature selection (SKM-HFS). Finally, we do the verification experiment using data from the DARPA DDoS dataset, CAIDA "DDoS assault 2007" dataset, CICIDS "DDoS attack 2017" dataset, and real-world dataset. The findings of the experiment show that the suggested approach performs better than the benchmark in terms of detection performance and strategy for order preference by comparison to an ideal solution (TOPSIS) evaluation factor.

Detection of distributed denial of service attacks using machine learning algorithms in software defined networks: A new and promising networking technology called Software Defined Networking (SDN) separates the data and control planes and has centralized control over the network. With this new method, lower-level functionality is abstracted, and network managers may programmatically initiate, control, modify, and manage network behaviour. The primary benefit of SDN, centralized control, can occasionally also pose a serious security risk. The attacker would get access to the whole system if he were to successfully hack the central controller.The controller is extremely susceptible to Distributed Denial of Service (DDoS) assaults, which cause the system resources to be depleted and result in the controller's services not being available. Early detection of assaults on the controller is essential. For this, several algorithms and methods have been developed. SDN networks, however, have received little research attention. One such method is to categorize the connections into genuine and fraudulent ones using machine learning techniques. To identify suspicious and damaging connections, we employ two machine learning methods, the Support Vector Machine (SVM) classifier and the Neural Network (NN) classifier.

DDoS Attack Identification and Defense using SDN based on Machine Learning Method: As a new network paradigm, SDN (Software Defined Network) has generated a lot of attention. SDN security is crucial as a result. DDoS attacks, also known as distributed denial of service attacks, have plagued the Internet. In some SDN-applied settings now, like the university network, it poses a danger. We provide an SDN framework to recognize and resist DDoS assaults based on machine learning in order to reduce the DDoS attack on the campus network. The traffic collecting module, DDoS attack identification module, and flow table delivery module are the three components that make up this system.To get ready for traffic identification, the traffic collecting module gathers traffic characteristics. The controller collects the network traffic characteristics from statistics flow table data and utilizes the support vector machines (SVM) approach to identify the attack traffic while installing a DDoS attack detection system using the flexible and multi-dimensional features of SDN network architecture. The flow table delivery module then dynamically modifies the forwarding policy in response to the traffic identification result to defend against DDoS assaults. KDD99 dataset is used in the experiment. The experiment's findings demonstrate how well the DDoS assault detection technique works.

A two level security mechanism to detect a DDoS flooding attack in software-defined networks using entropy-based and C4. 5 technique: A secure system and/or an accurate intrusion detection system (IDS) are now necessities for many businesses and/or governments in order to protect their network services and the user's private data. One of the difficult issues in network security is creating a reliable detection system for distributed denial of service (DDoS) attacks. DDoS attacks use several cracker-hijacked bots to disrupt the target server's network service by flooding it with numerous packets. Many businesses' and/or governments' servers have fallen prey to the assaults. It is quite challenging to identify the crackers in such an assault since they merely send a command using several bots from another network, and then promptly exit the bots after the command executes. The suggested approach entails employing network packet analysis to identify DDoS attack patterns and machine learning techniques to analyse the patterns in order to create an intelligent detection system for DDoS assaults. With the help of a support vector machine with a radial basis function (Gaussian) kernel, we constructed the detection system in this study after analysing a sizable number of network packets given by the Centre for Applied Internet Data Analysis. DDoS assaults are accurately detected by the detection system.

III. METHODS AND MATERIAL

Proposed system:

We suggest this application, which may be seen as a valuable system since it aids in reducing the constraints brought about by conventional and other existing ways. The goal of this study is to provide an efficient and dependable approach for precisely detecting DDoS impacts. In a Python-based environment, we developed a potent algorithm to design this system.

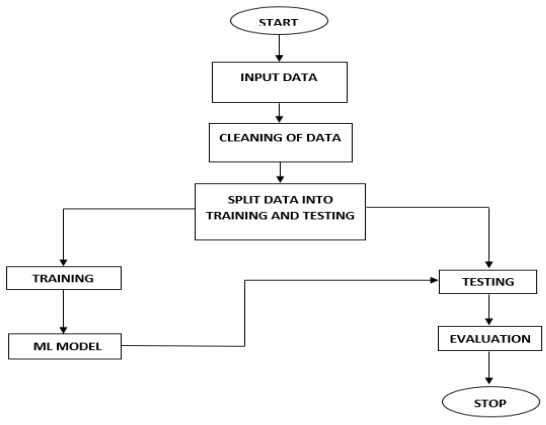


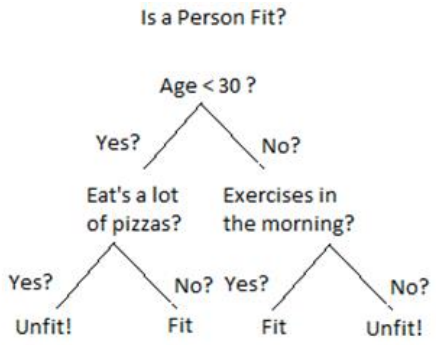
Figure 1: Block diagram

Implementation

The project has implemented by using below listed algorithm.

1. Decision Tree:

The most effective and well-liked technique for categorization and prediction is the decision tree. A decision tree is a tree structure that resembles a flowchart, in which each leaf node (terminal node) bears a class label, each internal node implies a test on an attribute, and each branch shows the test's result.



Simple Decision Tree

By dividing the source set into subgroups based on an attribute value test, a tree may be "trained". It is known as recursive partitioning to repeat this operation on each derived subset. When the split no longer improves the predictions or when the subset at a node has the same value for the target variable, the recursion is finished. Decision tree classifier design is suitable for exploratory knowledge discovery since it doesn't require any parameter configuration or domain understanding. High dimensional data may be handled via decision trees. Decision tree classifiers are often accurate. A popular inductive method for learning classification information is decision tree induction.

The strengths of decision tree methods are:

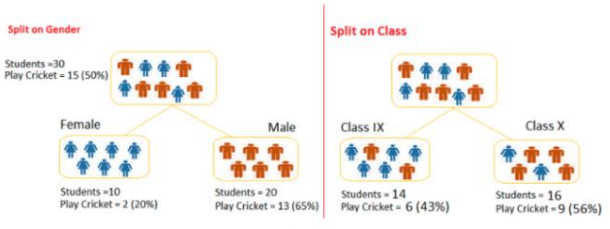
- Decision trees are capable of producing clear rules.
- Decision trees can accomplish categorization with little computational effort.
- Continuous and categorical variables may both be handled by decision trees.
- Decision trees clearly show which fields are most crucial for categorization or prediction.

The weaknesses of decision tree methods:

- When it comes to estimating assignments where the objective is to forecast the value of a continuous characteristic, decision trees are less suitable.
- Classification issues with multiple classes and a dearth of training samples make decision trees vulnerable to mistakes.
- Training a decision tree can be costly computationally. A decision tree's growth requires extensive computing work. Each potential splitting field at each node must first be sorted in order to determine which split is optimal. Some algorithms employ combinations of fields, hence it is necessary to look for the best combining weights. Due to the necessity of creating and comparing several candidate sub-trees, pruning algorithms can also be costly.

Summary

A non-parametric supervised learning technique for classification and regression is called a decision tree (DT). Decision trees use a series of if-then-else decision rules to learn from data and approximate sine curves. The decision criteria are more complicated and the model is more accurate the deeper the tree.



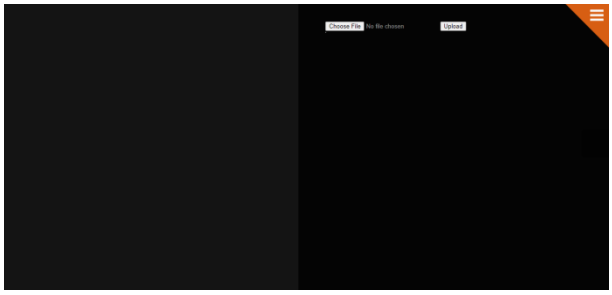
Splitting is done on various factors

IV. RESULTS AND DISCUSSION

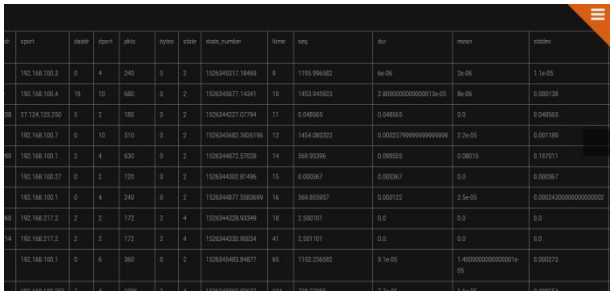
The following screenshots are depicted the flow and working process of project.

Home Page: In our project, we are detecting the whether the network is DDos attacked or not and this is our home page.

Upload page: Here user needs to upload the dataset.



Upload (View data): Uploaded data is visible in this particular tab.



Input files: User need to enter his inputs here.

Detection page gives output as the network is safe for the particular inputs submitted.

V. CONCLUSION

In this application, we have successfully created a system to identify DDoS assaults. This is made in a user-friendly setting using Flask and Python programming. In order to identify whether or whether the network is under attack, the system is likely to collect data from the user.

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A Comprehensive Study on Optical, Electrical and Photophysical Properties of Nanoscale Semiconductor

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ABSTRACT

Semiconductors are very interesting and attractive class of material due to its wide applications in electronic, optoelectronic and energy conversion devices. Energy band gap and characteristic features of both valence and conduction bands determine unique and novel electronic and optical properties of semiconductors. The physical properties of semiconductor can be easily tuned by reduction of size to nanometer scale, changing morphology and also by doping with appropriate elements. The research work will be focused on preparation of nano scale semiconductor by colloidal synthesis and characterization of these samples by optical and electrical studies. Photophysical properties of nanocomposite are also studied like H2 generation from water, pollutant dye degradation and carcinogenic Cr(VI) reduction from water under irradiation of solar simulator light. In following section a brief outline of optical and electrical properties in nano scale semiconductors are discussed.

Keywords : Atoms, Semiconductors, Carcinogenic, Nanomaterial, Morphology and Nanoscale

I. INTRODUCTION

Semiconductors materials are widely used elemental components in modern technological accessories. Size reduction in semiconductor crystal is a unique opportunity to tune electronic and optical properties compare to bulk state. The atoms resides at surface of nanomaterial are coordinatively unsaturated hence behave differently from saturated bulk atom. Size reduction to nanoscale limit in modern era is the fascinating and emerging field of science and engineering that are evolving at a very fast pace [1]. The growing demand of size reduction in integrated circuit chip also boosted to fabricate various type of nanostructures. Nanotechnology or Nanoscale science is a new world of scientific domain below 100 nanometer dimension deviate from bulk counterpart. Nanomaterials are exploring in various fields at recent times such as soar cells, smart windows, transparent conducting glasses, gas sensors, biosensors, humidity sensors, ultra violet sensor, nonlinear optical devices,8 catalysis, photocatalytic hydrogen generation, photocatalytic CO_2 reduction, SERS (surface enhance Raman spectroscopy) detection, photonic band gap materials, lasers, magnetic imaging, electrical storage devices, cancer cell detection, photothermal therapy in tumor cell destruction etc. Now in recent aliovalent doped degenerate semiconductor nanocrystals (NCs) are addressed considerable attention for localized surface plasmon resonance (LSPRs) absorption, optical bandgap enhancing, multiple emission centers and high carrier concentration with excellent visible light transparency

[2]. Depending on nanoparticles size, dopant concentration and dopant distribution can be varied to tune plasmon absorption in wide optical spectral range from visible to far-infrared regions. Choice of tuning plasmon band in wide spectral range results in the controlled coupling of the LSPR to other physical signatures or the enhancement of optical signals in the NIR range, sensing application by LSPR tracking, energy production from the NIR plasmon resonance or bio-medical applications in the biological window.

The brilliant physicist Richard Feynman originally used the phrase "nano-technology" in his inspirational speech "There's Plenty of Room at the Bottom," which he delivered on December 29, 1959, at a meeting of the American Physical Society at Caltech. Nanotechnology, as defined by Professor Norio Taniguchi of Tokyo Science University in 1974, is primarily the processing, separation, consolidation, and deformation of materials by one atom or by one molecule [3]. Dr. K. Eric Drexler, who addressed the technological significance of nanoscale phenomena and devices in speeches and the books The Coming Era of Nanotechnology (1986) and Nanosystems: Molecular Machinery, Manufacturing, and Computation (1988), explored the fundamental concept of nanoscience in the 1980s in much more detail [4]. Early in the 1980s, two significant inventions the development of the scanning tunnelling microscope and the emergence of cluster science boosted interest in nanoscience and nanotechnology (STM).

The atomic force microscope (AFM) was invented in 1986. This was the turning point for the scientists to fabricate miniature structures. Gradually scientists were achieved more miniature structures from micron to nano dimensions. Nanostructures samples are grown by two techniques: “top down” and “bottom up” approach. In “top down” method nanostructures are fabricated from bulk entities without any precious control over atomic level [5]. There are few methods in “top down” method like attrition, ball milling and lithography where no options of uniform particle size formation. Besides this in bottom up approach it is possible to fabricate nanomaterials through atom by atom or molecule by molecule deposition. This gives a precious control over the size, morphology, structure, chemical composition, homogeneity and defects states. Gradual increasing demand in application of nano materials a variety numbers of technique have been reported in literatures [6]. successful synthesis of nanomaterials in physical routes mainly addressed RF magnetron sputtering, Physical and chemical vapour depositions, metal organic chemical vapor deposition (MOCVD), atomic layer deposition (ALD), ultrasonication etc. Chemically semiconducting and metal nanostructures synthesis can be performed by sol-gel, hydrothermal / solvothermal, single-source precursors, surface-functionalization, spray pyrolysis, ion layer gas reaction (ILGAR) methods. Similarly DNA, Virus and mesoporous materials have been prepared by different biosynthesis and biotemplate processes [7]. However due to limitations over controlled synthesis of vapour and solid-phase approaches are often unsuitable. Thermal decomposition of precursors in solution mode /colloidal technique is the modern efficient wet chemical route for synthesis of monodisperse well crystalline nanoparticles. Inkjet printing, roll-to-roll casting, and spin coating are just a few of the solution-based devices producing tools that may benefit directly from using stable liquid suspensions. Due to their very high throughput and cheap cost of fabrication, these methods are highly sought after in the large-scale device manufacturing industry.

II. NANOPARTICLE: NUCLEATION AND GROWTH

Thermal decomposition method or colloidal technique is an organometallic solution based nanoparticles synthesis protocol discovered at late 1990 decade and developing on. Simple decomposition of organometallic salt such as metal-carbonyl complex, metal-long chain fatty acid salt in a non-polar solvent medium in presence of some capping agent which must contain a binding group (neutral/positive or negatively charged head) at high temperature can create mono disperse nanoparticles of different materials [8].

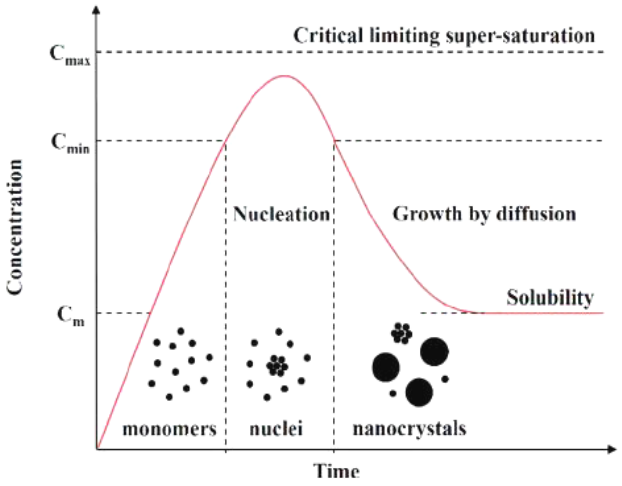


Figure.1: Evolution of monomer concentration vs time according Lamer's theory of burst nucleation.

Colloidal semiconductor nanocrystals (CS-NCs) are produced by controlled synthesis and surface chemical engineering and have the persuasive advantages of cheap cost, wide scale solution processing, and customizable optoelectronic characteristics.

Theory: According to the Lamer model, the fundamental strategies of reaction mechanisms consist of two steps, namely the nucleation stage and the crystal development stage, as illustrated in Figure 1. Following the dispersion of reactant precursors in the appropriate solvents, the chemical reaction between the precursors produces monomers [9]. When the concentration of synthesised monomers approaches supersaturation, they will either aggregate or self-nucleate to form nuclei [10]. The growth process will continue until the monomer concentration falls below the critical limit, as seen in Figure 1, due to the continuous aggregation of monomers on these recently produced nuclei. It should be mentioned here that it may be possible new nuclei formation during growth of nanocrystals, these are result in widening of size distribution.

The theory's underlying premise is that the thermodynamic system seeks to reduce Gibbs free energy or raise entropy. The spherical nanocluster's Gibbs free energy may be written as

$$\Delta G = -\frac{4}{3}\pi r^3 |\Delta G_V| + 4\pi r^2 \gamma \quad (1)$$

where r is the radius, $|\Delta GV|$ is the difference in the Gibbs free energy per unit volume and γ is the surface energy per unit area i.e. the energy needed to create a surface of unit area. There are two words for Gibss free energy[11]. The first term has a negative expression, and a typical finding is a reduction in free energy. It refers to a monomer's attachment to the cluster. The second term is a positive word that indicates an unfavourable rise in the energy surface after a monomer's bonding [12]. The rivalry between the loss in volume energy and the rise in surface energy is what causes the change in Gibbs free energy caused by the arrangement of a link between a cluster and a monomer. By equating the first derivative of equation.1. to zero, we get the critical radius of monomer $rc=2\gamma/|\Delta GV|$. If the positive surface energy increases to the higher, then the total system tries towards dissolution and the growth is unfavorable. Above *rc* negative energy term survived, growth is favorable phenomena.

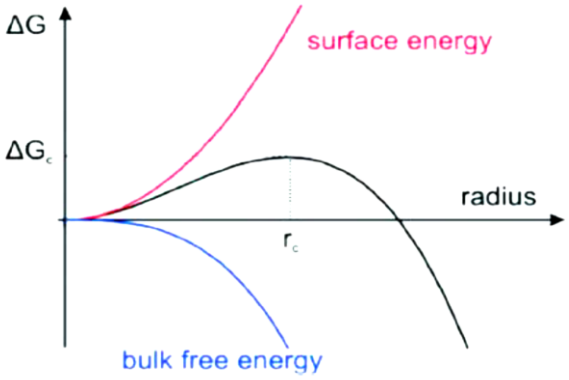


Figure.2: Evolution of the Gibbs free energy of a cluster versus its size (black curve). The evolution of the two terms in the Gibbs free energy equation is also shown: the volume (or bulk) energy (blue curve) and the surface energy (red curve). The critical radius rc and the activation energy ΔGc are also presented.

Figure.2. depicts the evolution of Gibbs free energy of a cluster. In figure ΔGc corresponds to barrier energy at *rc* . In reaction chamber when the energy barrier is overcome and critical radius is achieved then stable cluster nuclei form in solution [13]. Theses nuclei may commit further growth via heterogeneous nucleation. When nucleation is started nanoparticles formation always try to reduce surface energy. Previously at 1874 Gibbs proposed that the shape of the crystal is depend on minimization of total surface energy *i.e* there should be a option of facet dependency [14]. In 1901 Wulff assumed that surface free energy of a crystal depends on the preferential facet (facet belong to lowest surface energy) orientation.

A. Wulff Construction Method of Facets

The simplest case in isotropic phase it turns out as a sphere, but in other case where different complex shape may be evolved due to other low energy facets. An elementary construction method allows us to determine the preferred shape of nanocrystals as developed by Wulff popularized by Wulff construction method [15]. For evolution of low energy facet it is needed to know the energy of a particular facet per unit area in the direction normal to the atomic plane (*hkl*). The corresponding energy roughly proportional to the number of broken bonds on the surface: due to tiny inter atomic distances between atoms on the facets with high coordination factor *i.e* little bit less dangling bonds per unit area result in lowering surface energy with respect to other facet with more dangling bonds [16]. When the energy of particular orientation of facet is known one can plot the plane normal to (hkl) at a distance $c.\gamma hkl$ (where C is a constant) of the origin of crystal symmetry axes. The same method applied for all other planes. From here we get information about nanocrystals shape. Figure.3. depicted an example of the Wulff construction for a orthorhombic structure , where $\gamma 100 = \gamma 110 = 1/2\gamma 010$ except all other planes have higher surface energy [17]. Here the equilibrium shape in this structure is rod-like prism, which is experimentally proved aragonite CaCO3. Shape of nano particle not only depends on thermodynamic equilibrium but also there have kinetic effects on effect. Indeed, depending on growth rate nanoparticles can be arrested by ligands in intermediate state where local energy is minimum [18]. In supersaturated condition nucleation holds for a fraction of a microsecond to a few milliseconds. Here may be an option for reorganization of atoms after nucleation though it is not sufficient for the structure to locate the absolute energy minimum, thus the nanoparticles are arrested in a metastable condition and lead to the final shape of nanoparticles. Hence the growth sequence may be dramatically altered by influence of ligands. Indeed ligands can capable to cap specific facets, slowing down the growth of the passivated facets compared to other one [19]. If the growth in same crystallographic directions is hindered result in rod or plate like morphologies can obtained. This is called chemical positioning. The character of ligand is very much important: it can be organic or inorganic and its tiny change leads to a complete different result. For evidence from previous literature wurtzite CdS or CdSe/CdS nanocrystals can be synthesized with rod, tetrapod, or plate like shapes [20] depending on ligand and the synthesis conditions. Use of phosphonic acid as ligand hindered the nanocrystals growth perpendicular to the wurtzite C axis, result in rod shaped morphology [21]. In as synthesized nanoparticles synthesis polar headed ligand tightly binds nanoparticle surface by electrostatic interaction lead to the colloidal stability of particle. At later section a details discussion of surfactant in nanocrystal synthesis are presented.

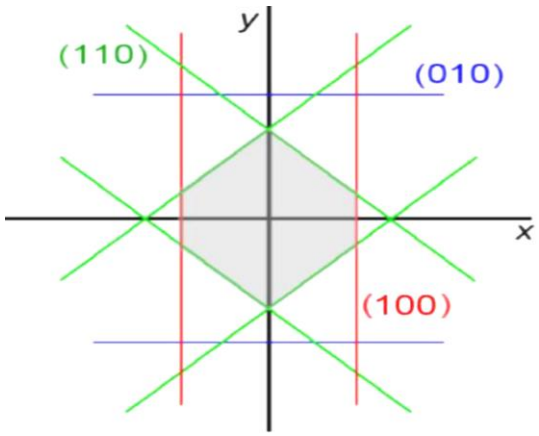


Figure.3: Example of Wulff construction for an orthorhombic structure. The equilibrium shape is shown in gray and comprised in the lines corresponding to the low-energy facets.

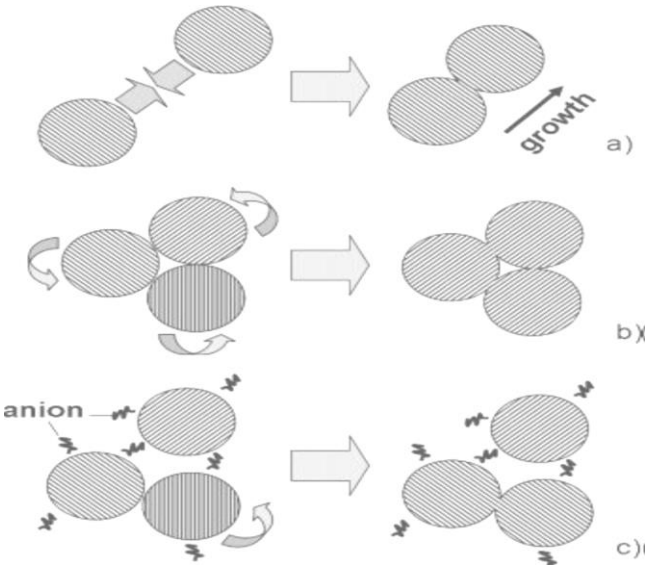


Figure.4: (a) Coalescence in a well-dispersed system: the event is caused by an effective collision, and the growth direction is determined statistically.(b) Coalescence in an agglomerated system: the event can occur at any point of the particles' surfaces provided the crystallographic conditions are favorable. (c) Coalescence in an

agglomerated system with dispersed organic anions acting as steric agents: the event depends on the contact between particles.

B. Oriented Attachment Process

Frequently when the nuclei are present in solution they can grow via addition of precursor or by self assemblies among themselves. In 1998 Penn and Banfield first reported the anisotropic growth of TiO2 nanoparticle via oriented attachment (OA) process [22]. In this type orientation same types of crystallographic planes are coalescence or fused to each other to minimize surface energy or to decrease of number of unsatisfied surface bonds. Apart from this OA can occur between nano particles belongs to different structures. The only criterion is two daughter nanocrystals have facet with similar symmetry [23]. Main steps of OA are depicted in Figure.4. The nanocrystals must first disperse and come into close proximity to one another. The direction of the NCs is hence not necessarily coherent, and OA is prevented since the diffusion may be assimilated to a random walk process controlled by Brownian motion. In order for the NC to align with its neighbour and reduce the grain–grain boundary energy, the NPs must rotate. Finally, a new crystal is produced by the attachment of NCs and the desorption of ligands at the interface. The diffusion of NCs seems to be the limiting stage, according to kinetic studies.

C. Hot Injection and Non Injection Method

To achieve the good size distribution in nanoparticles synthesis one of the most promising method is thermal decomposition method. For a balanced size distribution, the following issues are crucial: Precursor content and reactivity, solvent, surfactant, and pH effects, as well as (a) reaction temperature and time (b) injection temperature of the reactant in the event of a hot injection procedure. Work with narrow size distribution is quite difficult [24]. A tight relationship exists between size distribution and the kinetics of the nucleation and growth processes. It is conceivable for nucleation and growth to proceed independently or simultaneously during the response time [25]. This causes a poor size distribution because to the contemporaneity of the nucleation and growth mechanisms. A successful strategy to achieve a restricted size distribution is to separate nucleation from growth. When using this process, precursors are often injected into the solvents at high temperatures, which is followed by a drop in reaction temperature to separate nucleation and growth (hot injection method). Murray and colleagues used this technique for the first time in 1993 to synthesise Cadmium chalcogenide nanocrystals [26]. The hot injection method has already extended to synthesized of metal oxide nanocrystals. In 1999 this method was first adapted by [4]. for the purpose of TiO2 nanocrystal synthesis. Here rapid injection of titanium alkoxide in hot precursor solution holding TiCl4, Trioctyl phosphine oxide (TOPO) and heptadecan , followed by at a constant temperature at 300° C for 5 minutes produce spherical anatase nanocrystals bellow 10 nm. The hot injection method also reported for other metal oxide in different literature [27]. For ZnO nanocrystals injecting sodium hydrochloride into the ethanolic solution of zinc acetate at 80°C, for CeO2 injecting cerium benzoylacetonate solution into the OLAM (Oleylamine) solvent at 250°C, for ZrO2 (injecting zirconium(IV) isopropoxide into a mixture of ZrCl4, TOPO and heptadecane at over 300°C, and for WO3 injecting tungsten(V) ethoxide into a mixture containing oleic acid (OLAC) and trioctylamine at 315°C .

Unlike hot injection method non injection can be a good option of nanocrystals synthesis if nucleation and growth is controlled by slowly heating up the solution in presence of required precursors. It is necessary precursors have negligible reactivity at low temperature but have proper reactivity at elevated temperatures [28]. Gradually when the solution is heated up to a certain temperature, a burst of nucleation is happened followed by growth mechanism. Compared to hot injection method this method is far simpler for avoiding injection procedure at particular temperature. For example in 2005 Cao and co-workers synthesized CdSe and CdTe nanocrystals in good size distribution by this method. In this research work both non injection method and hot injection method are applied in synthesis of ZnO, TiO2 and CdO nanocrystals.

D. Role of Surfactant in Thermal decomposition Method

It is very genuine fact that the surfactant has a crucial role in controlling the shape, size, nucleation, growth, and decomposition of organometallic precursors. The surfactant sometimes acts as an „activating agent“. Normally the decomposition of metal oleate or stearate occurs at much lower temperature in presence of surfactant than their pure stage [29]. In situ formed

complex between metal-carboxylate and surfactant plays a significant role for nucleation of oxide nanocrystals, shape and often stabilizing a particular facet. In colloidal oxide nanocrystal synthesis process, long chain saturated or unsaturated amine (Oleylamine, octadecylamine, dodecylamine, hexadecylamine, Tri-octyl amine), long chain mono or di-alcohol (1-octadecanol, decanol, hexadecyl- 1,2-diol), Trioctyl phosphine oxide (TOPO), Trioctyl phosphine, many saturated and unsaturated fatty acid (stearic acid, palmetic acid, oleic acid etc) etc. are widely used as surfactant and activating agent.

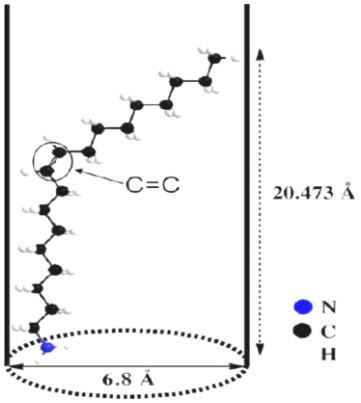


Figure.5: Chemical structure of oleylamine

Oleylamine (OLAM) is an attractive and broadly used surfactant in colloidal nanocrystals synthesis. It acts as activating agent, capping agent, reducing agent at elevated temperature as well as solvent. Figure.5. shows the chemical structure of oleylamine containing a double bond which is often involved in co-ordination with metal ion in solution or in crystalline nanoparticles and a primary amine group which is able to do a nucleophilic attack at electrophillic centre such as carbonyl group [30]. This molecule has a boiling point above 340 °C and below which nucleation of most of oxide nanocrystals takes place.

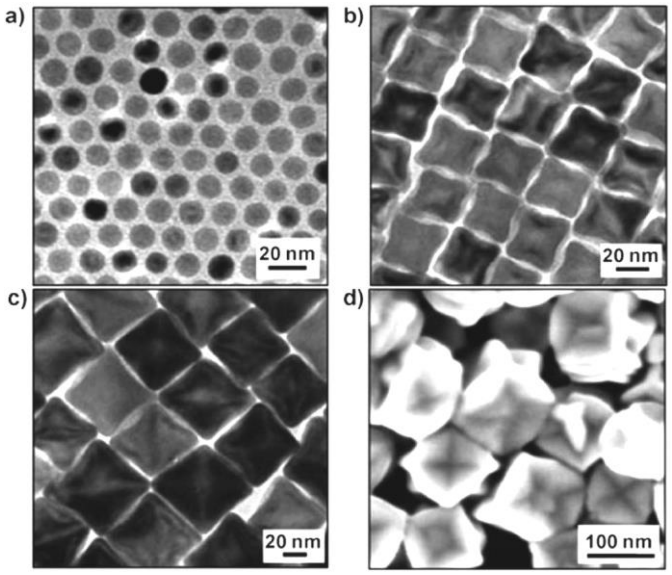


Figure.6: TEM images of different shaped FeO nanocrystals. Relative amount of oleic acid and OLAM determined facet stabilization of the final product

In instance, the generated nanoparticles' shape and crystallinity might vary dramatically even though octadecylamine and OLAM have identical basicity and affinities to metals thanks to their NH2 functional groups [31]. As an example, consider the creation of Au decahedra in the presence of OLAM or octadecylamine (ODA), where it was postulated that ODA's absence of a C=C bond would restrict its coordination with gold chloride (AuCl), leading to altered geometries. Cobalt acetylacetonate [$Co(acac)_3$] was used as a precursor, and OLAM was effectively used in a "triple role" (solvent, surfactant, and reductant) in the production of hexagonal and cubic CoO nanocrystals [32]. The oxygen in CoO is thought to have come from the precursor's acetylacetonate ligand given that the reactions took place in an inert environment. Fe(acac)3 underwent reductive breakdown in an oleic acid/OLAM combination to produce size- and shape-controlled FeO nanoparticles (Figure.6). It was suggested that the final morphology of the particles was determined by the differential in binding between oleate and OLAM on the crystal surfaces [33]. The generation of -Fe_2O_3 tetrapods using a ternary surfactant combination was explained using the same justification (Oleic acid, OLAM, and hexadecanediol). In a simple heating approach employing iron(III) acetylacetonate as a metal source, Fe3O4 (magnetite) nanocrystals in the range of 7–10 nm were also generated using OLAM as a reducing agent, stabiliser, and cosolvent with benzyl ether. Achieving the right ratios of OLAM, oleic acid, and

hexadecanediol produced Fe_3O_4 nanoparticles that were around 4 nm in size and easily formed self-assembled monolayers and multilayers when hexane was evaporated. Other ferrite nanocrystals with the general formula MFe_2O_4 (M = Fe, Co, Mn) were also synthesised using this method. It was shown that the creation of the desired particles required the combined use of oleic acid and OLAM, while oleic acid alone would result in a viscous red-brown product that was challenging to purify and describe [34]. However, OLAM alone only produced a very little amount of iron oxide nanoparticles. Using surfactants with various hydrocarbon structures, such as OLAM on the one hand and adamantaneamine, adamantanecarboxylic acid, and trioctylamine on the other, star-like cubes and flower-like magnetite nanoparticles were created by the pyrolysis process [35]. The linear structure of OLAM was thought to affect the particle development mode by attacking the electropositive carbonyl carbon of an intermediate iron complex more readily than the bulky adamantyl groups of adamantaneamine (or the comparable bulky groups of trioctylamine). Additionally, it has been shown that the molar ratio of OLAM to iron oleate is essential for the development of octahedral ferromagnetic Fe_3O_4 NPs.

On the other hand, a successful aminolytic reaction between zinc carboxylates and OLAM in coordinating or noncoordinating solvents led to the production of ZnO nanostructures in a variety of morphologies, including nanorods, nanotetrahedrons, and nanosquamas. Depending on the form and severity of their structural flaws, these nanostructures revealed intriguing optical characteristics such as acute band-edge emission or wide deep-trap emission [36].

Long chain saturated alcohol is another important group of surfactants which are widely used in colloidal nanocrystal synthesis. The activity of R-OH is quite similar with the amines. Nucleophilic OH group can attack the carbonyl centre of metal fatty acid complex easily but at much slower rate than the amine groups. The alcoholysis synthesis procedure has been studied by mainly Xiogang Peng and his co-workers [37]. They studied in details of synthesis of ZnO and In2O3 nanoparticles and effect of side reaction in nanocrystal morphology. This synthesis procedure with the variation of synthetic condition widely studied by other groups and us also. The synthetic procedure is found to be effective for doping and generation of plasmon in aliovalent doped transparent conducting oxide.

III. NANOCOMPOSITE

Due to its capacity for the direct exploitation of solar energy in the creation of solar fuels such as hydrogen and hydrocarbon fuels as well as for the degradation of different pollutants, semiconductor-based photo catalysis is attracting a lot of interest. Solar energy driven photo-catalyst has potential to initiate or accelerated specific oxidation and reduction (redox) reaction [38]. Under irradiation of solar light electron and hole pair are generated in photo-catalyst. The major drawbacks of these kind of catalysis are the short lifetime of photo generated electron hole pair and limited visible-light absorption [39]. To overcome these serious drawbacks the most widely used strategy is to develop photocatalytic nanocomposite. Different types of nanocomposites are fabricated between semiconductor-semiconductor, semiconductor–metal, semiconductor–carbon group and the multi component hetero junction. Typically in nanocomposite different semiconductors with unequal band structure commit to band alignment or band bending.

E. Band Position of Composite

Band offset position of different semiconductor and metal nanoparticles in composite system leads to different types hetero junction conventionally a straddling gap (type-I), staggered gap (type-II), broken gap (type-III) and more promising Z scheme type. In type-I hetero photocatalyst under excitation of light energy electrons and holes are accumulated at the CB and VB of semiconductor B (Figure.7a). The major inaccuracy of this type composite, both electron and hole reside at same semiconductor results in short life time of exciton pair, hence the redox potential energy is reduced in this type catalyst [40]. For type II catalyst system (Figure.7b) the CB and the VB levels of semiconductor A are higher than the corresponding levels of the other semiconductor B. Excitation energy higher than band gap potential result in electron transfer from A to B and holes are migrated from B to A. As the exciton pair resides in different semiconductor here is a chance for enhancement of lifetime in electron hole pair. Enhancement in lifetime triggered the redox reduction potential energy.

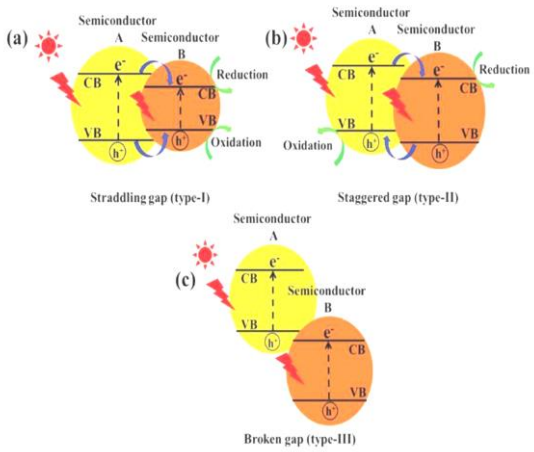


Figure.7: Schematic presentation of the three different types of separation of electron– hole pairs in the case of conventional light-responsive heterojunction/nanocomoposite photocatalysts: a) type-I, b) type-II, and c) type-III heterojunctions.

Hence type II composite is more favorable than type-I. The architecture of type-III heterojunction (Figure.7c) photocatalyst is likewise type-II composite where the staggered gap become so extreme that the bandgap bending is unfavourable [41]. Hence exciton pair separation becomes hard. Because of its suitable structure for the spatial separation of electron-hole pairs in the conventional heterojunction used in the aforementioned conventional nanocomposite, type-II heterojunction is clearly the most effective conventional heterojunction to be used for enhancing photocatalytic activity. Previous literature of different type-II composites are such as SnO2/TiO2, BiVO4/CeO2, ZnO/CdS, BiVO4/WO3, g-C3N4–WO3. In order to enhance the redox reaction efficiency noble metal nanoparticle are decorated on the surfaces of composite. Since semiconductor-metal nanocomposites show a change in the Fermi level to greater negative potentials, they have been exploited as photocatalysts extensively [42]. Such a change in the Fermi level improves the composite system's energetics and increases the effectiveness of the interfacial charge-transfer mechanism. Although type-II nanocomposite may separate electron hole pairs when excited, the ultrafast electron-hole recombination rate in semiconductor prevents the boost in electron-hole separation across a type-II heterojunction that is required [43].

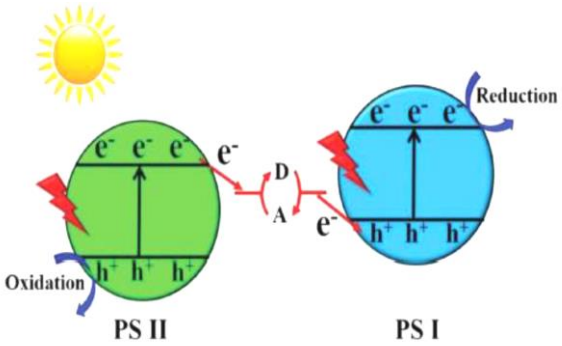


Figure.8: Schematic illustration of electron–hole separation on the conventional Z-scheme photocatalytic system under light irradiation.

Since from the beginning a array of different types of nanocomposite scheme are discussed, there are still remaining some inefficiency such as limited region of visible light photo absorption, inaccuracy in enhancing electron–hole separation, inadequate redox potential energy to drive the redox reaction. In 1979 Bard Z-scheme photo catalyst was proposed to handle the above mentioned problems [44]. Conventional Z scheme photocatalyst system holds two different semiconductor: photocatalyst I (PS I) , photocatalyst II (PS II) and an acceptor/donor (A/D) pair(Figure.8). During photo catalysis photo generated electrons are migrated from CB of PS II to VB of PS I via an A/D pair as shown in Figure.8, via following redox reactions:

$$A + e^- \rightarrow D$$

$$D + h^+ \rightarrow A$$

Here, A is converted into D by a reaction with photogenerated electrons from PS II's CB. The photogenerated holes from the VB then oxidise the D into A. As a result, electron-hole pairs spatially separate on PS I, which has a larger reduction potential, and congregate on PS II, which has a higher oxidation potential [45]. This allows for the achievement of the best possible redox ability. A direct Z-scheme (Figure.9) approach for photocatalysis, which combines two distinct semiconductors without the need of an electron mediator, was suggested by J. G. Yu in 2013. With the exception of the system's lack of need for rare and costly electron mediators, the fundamental process is the same as that of a typical Z-scheme.

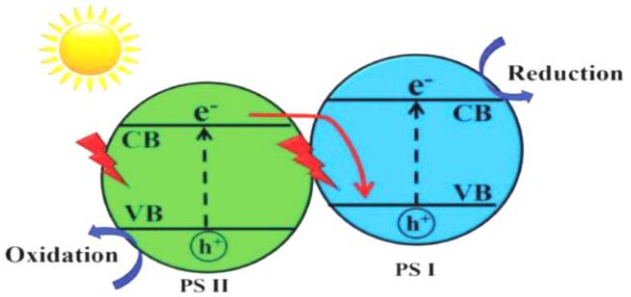


Figure.9: Schematic presentation of electron-hole separation in direct Z-scheme system.

Due to the electrostatic attraction between electrons and holes, the direct Z-scheme heterojunction photocatalyst has a physical advantage over type-II heterojunction photocatalyst in terms of charge transfer [46]. Due to the electrostatic attraction between the electrons and the holes in this situation, the migration of photogenerated electrons from the CB of the PS II to the photogenerated hole-rich VB of the PS I is made simpler. The electrostatic repulsion between electrons makes it difficult for photogenerated electrons to migrate from the CB of semiconductor A to the photogenerated electron-rich CB of semiconductor B in reverse for traditional type-II heterojunction photocatalysts. Previous literature among different material like CdS–WO3, Fe2O3-FeS2, g-C3N4-TiO2, Ag2CrO4-graphene oxide committed Z scheme pathway in photocatalysis.

IV. SURFACE PLASMON

Surface plasmon resonance (SPR) exploits the coherent electron oscillations that are driven at the frequency of the incident electromagnetic field. Electric component of electromagnetic wave vector excites free electrons to have collective oscillation shown in Figure.10. Collective oscillation results in propagation of electromagnetic surface mode at the interface of metal and surrounding dielectric medium [47]. Surface plasmon resonance addresses couplings of electromagnetic field to the kinetic motion of free charge carriers. Indeed the challenge is plasmonic propagation loss [48].

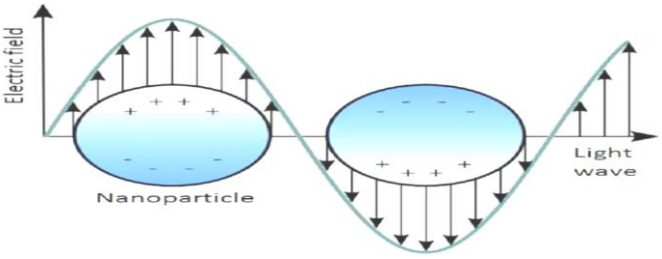


Figure.10: Schematic presentation of the collective oscillation of electrons in metal nanoparticles by excitation of electromagnetic wave.

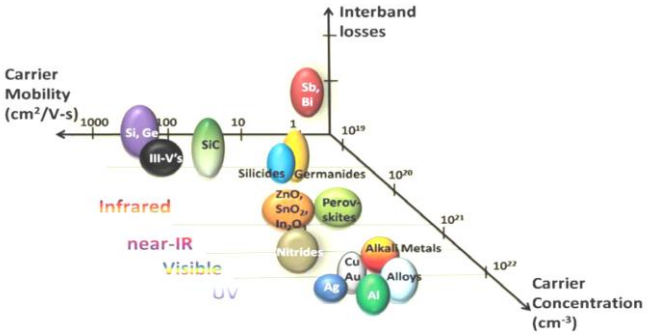


Figure.11: Conclude oxide semiconductor maintain optimum carrier concentration, mitigation loss and carrier mobility.

While presence of negative real part of permittivity in noble metal causes sub wavelength confinement and also have significant large imaginary component of permittivity results in long range plasmonic propagation loss. So it is needed a material which allows sub wavelength optical confinement and loss mitigation simultaneously. Figure.11. demonstrates the classification of materials on the basis of two important parameters that determine the optical properties of conducting materials: the carrier density and carrier mobility [49]. Higher carrier nobilities interpret to lower material losses. From Figure.11. it is convenient that degenerately doped semiconductors are best conductive plasmonic material.

Different types of chemical doping viz. aliovalent substitution doping in oxide semiconductor (mainly transparent conducting oxide (TCO)), vacancy dopping and interstitial doping results excess charge carrier density. In nanoscale regime surface Plasmon resonance is resulting as localized surface plasmon resonance (LSPR) [50]. Excellent achievement in colloidal synthesis of nano TCO material soundly improves the tunability of LSPR. Excitation of LSPR in nanocrystals (NCs) results in strong optical absorption , scattering and strong electromagnetic near field enhancement around the nanocrystals9 those can be tuned in a wide range of optical spectrum from visible to far infrared

region by tuning dopant concentration, post synthetically treatment via chemical oxidation reduction, electrochemical, and photochemical control. Due to remarkable optical absorption, scattering and strong electromagnetic near field enhancement utilize in molecular-specific imaging and sensing, photo diagnostics, and selective photo thermal therapy.

A. Theory of surface Plasmon

The charge carriers are displaced by incoming electromagnetic energy with respect to the nuclei in noble nano metal. Excitation of LSPR by a coherent electric field creates a resonance at a particular wavelength and results in strong surface plasmon absorption band, intense light scattering and an enhancement of coherent electromagnetic field [51]. SPR can be tuned in doped semiconductor by the variation of aliovant dopant concentration, nanoparticles size, shape and surrounding dielectric medium. Traditional noble metals like gold, silver, and platinum may display LSPR in the visible to near-infrared range. Some TCO materials as a result of noble metals cause plasmon resonance in the NIR and MIR because of decreased quantized plasma energy. Drude-Lorentz theory can quantitatively explain how the free carrier concentration in TCO NCs correlates with the plasmon absorption band energy and intensity. There are two decay paths for the surface plasmon energy. One channel is manifested by scattering-loss spectra and other is absorption band cross section. So the total extinction cross section is sum of scattering cross section (Csca) and absorption cross section (Cabs) can be written as:

$$C_{ext} = C_{abs} + C_{sca} \quad (2)$$

Extinction is totally depended on the polarizibility(α) of the nanoparticles. i.e. it includes the dielectric function of metal.

B. Drude Theory

Drude used the kinetic gas hypothesis to explain the thermal and electrical properties of metals. Since he believed that electrons could easily move between collisions, elastic scattering, and phonons or lattice defects. Arnold Sommerfeld updated Drude's theory in this case and adopted the notion that conduction band electrons alone are responsible for determining electrical and optical characteristics [52]. The Drude-Lorentz-Sommerfeld model now describes how metal is excited by an external electric field. Conduction electrons' freedom of movement inside the bulk of a metal is used to assess its optical qualities, and interband excitation is a possibility if an electromagnetic wave has a higher energy than the material's band gap. In a real-world situation, the existence of an electric field causes an electron to move, r, which is connected to a metal's dipole moment, er, through the equation μ = er. Here, the positive ion core binds the electron displacement, causing Coulomb attraction to function as a restoring force for the electrons. The cumulative action of every single electron in the conduction band is what is responsible for the macroscopic changes in optical and electrical characteristics. Given that the number of electrons per unit volume, n, determines the macroscopic polarisation, P = nμ. Now the electric displacement D is related to this macroscopic polarization by

$$\mathbf{D}(\mathbf{r}, t) = \varepsilon_0 \mathbf{E}(\mathbf{r}, t) + \mathbf{P}(r, t) \quad (3)$$

We also have from electro statistic

$$\mathbf{D} = \varepsilon_0 \varepsilon \mathbf{E} \quad (4)$$

Combine equation (3) and (4) by assuming isotropic medium, the dielectric constant can beexpressed as:

$$\varepsilon = 1 + |P| / \varepsilon 0 |E| \quad (5)$$

Amount of displacement r and macroscopic polarization $\boldsymbol{P}$ can be found out by solving the equation of motion of the electrons that are perturbed by an external electromagnetic field. While in case of bulk metal damping constant (γ) is proportional to the Fermi velocity v_F and inversely proportional to the bulk mean free path l_∞ ($\gamma = v_F/l_\infty$). At a starting point we can consider the electric field of an electromagnetic wave travelling in X direction with propagation direction along Z axis. Now we consider that

$$\bar{E}_z = \bar{E}_0 \varepsilon^{i\omega t} \quad (6)$$

By applying Drude-Sommerfeld model equation of motion of an electron with mass m_e and charge e is governed by

$$m_e \partial x^2/\partial t^2 + m_e \gamma \partial x/\partial t + m_e \omega_0^2 x = -e\bar{E}_0 e^{i\omega t} \quad (7)$$

Where E_0, ω and ω_0 are the amplitude, the frequency of the applied electric field and induced frequency of oscillating electron. The solution of equation (7) is

$$(t) = -e\ \bar{E}_0 e^{i\omega t}/me(\omega_0^2 - \omega^2 - i\gamma\omega) \quad (8)$$

Microscopic dipole moment P is connected to the polarization p with carrier density n in conduction band by

$$P = n.p = -n.e.x \quad (9)$$

By combining equation (5),(6) and (7) leads to

$$\varepsilon(\omega) = 1 + n_e^2/\varepsilon_0 m(\omega_0^2 - \omega^2 - i\gamma\omega) = 1 - n_e^2\ \omega_p^2/\varepsilon_0 m_e (\omega_0^2 - \omega^2 - i\gamma\omega) \quad (10)$$

Where

$$\omega_p^2 = n_e^2/\varepsilon_0 m_e \quad (11)$$

ωp is the volume plasma frequency with vacuum permittivity $\varepsilon 0$. In lattice environment scenario it might be change *me* by *m**, the lattice electron effective mass. Finally the frequency dependent dielectric function can be expressed as:

$$\varepsilon(\omega) = \varepsilon'(\omega) + i\varepsilon''(\omega) = 1 + \omega_p^2(\omega_0^2 - \omega^2)/[(\omega_0^2 - \omega^2)^2 + \gamma^2\omega^2 + i\omega_p^2\gamma\omega\ [(\omega_0^2 - \omega^2)^2 + \gamma^2\omega^2] \quad (12)$$

In conduction band scattering of electrons with electrons (*e-e*), lattice defect(*e-d*) and phonon(*e-p*) results in damping of collective oscillation. At free electron theory damping constant is depicted by the inverse of the scattering time of the electron:

$$\gamma = \tau^{-1} = \tau_{e-e}^{-1} + \tau_{e-d}^{-1} + \tau_{e-ph}^{-1} \quad (13)$$

For the bulk electron-phonon term is denominating one hence γ should be a constant. In case of small particles due to size reduction surface acts as an additional scatter where mean free path of electrons becomes comparable to the size of particles. In nano dimension these interactions of the conduction electrons with particle surface dominate which result in a reduced effective mean free path of electrons. According to Drude model the damping constant γ can be expressed as in term of particle radius such as :

$$(R) = \gamma_0 + A.v_F/R \quad (14)$$

Where γ0 is the bulk damping constant *vF* is the velocity of the conduction electrons at the Fermi energy, and A includes details of the scattering processes.

C. Mie Theory

Gustave Mie published the first description of the discovery about the light scattering by spherical metal structures within the context of electrodynamics in 1908. By selecting the proper boundary condition and using numerous expansions of the electric and magnetic field, he was able to solve the Maxwell equation while taking into account the particle size and optical material functions of the particle and the surrounding medium as input factors.

It is possible by Mie theory to get an understanding of light scattering by structures with other regular shapes, such as cylinders with arbitrary radius and ellipsoids with any size. Now for the particles much smaller than the incoming electromagnetic effect *i.e.*, $R << \lambda$ then cross-sections for scattering, extinction and absorption can be expressed as:

$$C_{ext}^{Mie} = 2\pi/k^2 \sum(2n + 1)\ R(a_L + b_L) \quad (15)$$

$$C_{Sc}^{Mie} = 2\pi/k^2 \sum(2n + 1)\ \{|aL|^2 + |bL|^2\} \quad (16)$$

$$C_{abs}^{Mie} = C_{ext}^{Mie} - C_{Sc}^{Mie} \quad (17)$$

Where $k = 2\pi/\lambda$ and a_L and b_L are the scattering cross section coefficient. These are the particle size parameter (α) depended index which are governed by

$$\alpha = 2\pi r/\lambda \quad (18)$$

$$a_L = [m\psi(m\alpha)\ \psi'(\alpha) - \psi L'(m\alpha)\ \psi_L(\alpha)]/[m\psi(m\alpha)\ n_L'(\alpha) - \psi_L'(m\alpha)\ n_L(\alpha)] \quad (19)$$

$$b_L = [\psi(m\alpha)\ \psi'(\alpha) - m\psi L'(m\alpha)\ \psi_L(\alpha)]/[\psi(m\alpha)\ n_L'(\alpha) - \psi_L'(m\alpha)\ n_L(\alpha)] \quad (20)$$

Where ψ_L and n_L are represents the Riccati-Bessel functions and prime indicates the first derivative of function. Here $m = n/n_m$, n is a complex number as metallic particle have absorbing and its refractive index nm is the real refractive index of liquid surrounding medium. Here L is the summation index of admitted the spherical multipole excitations in the particle. In case of small particles for dipole scattering resonance, only the term *l*=1 is applied in Mie theory and other higher order term *l = 2* to quadrupolar fields and so on are neglected. So in dipolar field approximation C_{ext}^{Mie} for spherical particle simplified as:

$$C_{ext}^{Mie} = \{[18\pi V\varepsilon_m^{3/2}]/\}\ [\varepsilon''(\omega)/\{(\varepsilon'(\omega) + 2\varepsilon m)^2 + \varepsilon''^2(\omega)\}] \quad (21)$$

εm is the dielectric constant of surrounding medium , ε_ω is the dielectric constant of spherical particle. *V* is the volume of spherical particle. C_{ext} has admitted a resonance when $(\varepsilon'(\omega) + 2\varepsilon m)^2 + \varepsilon''^2\omega$ is minimum. When $(\varepsilon''(\omega))$ is also very small then at resonance.

$$\varepsilon'(\omega) = -2\varepsilon_m \quad (22)$$

D. Influence of dopant concentration on LSPR

Charge carriers are seen as virtually free, non-interacting "quasi-particles" in the traditional Drude model, only interacting with lattice nuclei, vacancies, and dopant ions by immediate impact. This is the fundamental concept that links the free carrier density with SPR absorption. As can be shown in Figure, the charge carrier density in the NCs is related to the LSPR frequency. 12. The Drude approximation of the dielectric function of a material with free charge carriers is shown in equation (11). In equation (11), meff is the effective mass of the charge carriers, p is the bulk plasmon frequency, is a damping frequency, n is the density of free charge carriers, e is the charge of the electron, and 0 is the vacuum permittivity (electrons or holes). Free carriers provide a large LSPR absorption peak in the IR to mid-IR region in alliovalent doped TCO materials. Using the LSPR absorption peak and the Drude theory, one may correlate the quantity of doping in the pure sample with the concentration of free carriers in the doped TCO material. However, the application of this straightforward methodology may be limited by issues like the polydisparity of NCs and non-uniform elements distribution. Here Figure.12. depicts the plasmon absorption band position in energy scale with carrier concentration.

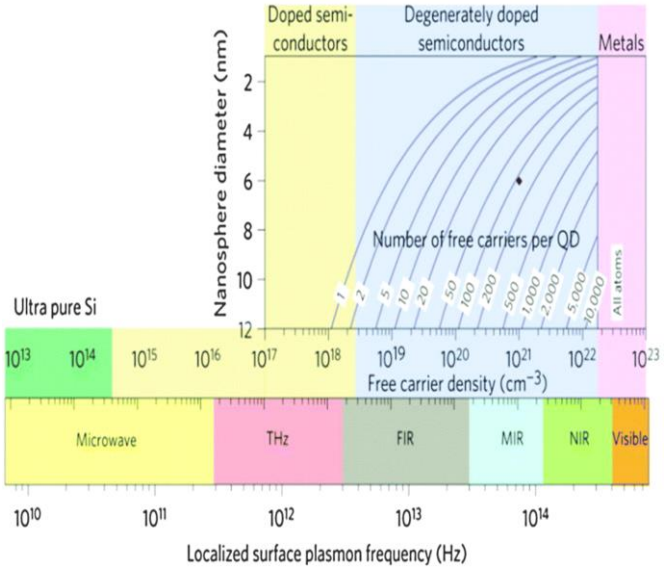


Figure.12: LSPR frequency is associated with the charge carrier density in the NCs.

E. Influence of nanoparticle size on the LSPR

Mie's theory provides the total extinction coefficient of tiny metallic particles (equation 21). Only the dipole term is believed to contribute to the absorption for nanoparticles considerably smaller than the wavelength of the absorbed light (approximately 25 nm for gold particles) (dipole approximation). In quasi-static regime where incoming light wavelength much larger than particle size ($R << \lambda$) *i.e* electron-surface scattering becomes important. The extinction cross section in Mie theory becomes independent of the particle volume, is contradictory with observations found experimentally for small metallic nanoparticles. Since the mean free route of the conduction electron has a higher mean free path when the particle size is smaller, electron scattering at the nanoparticle surface plays a greater role in such tiny particles. In this situation, as particle size decreases, plasmon resonance will expand and move to the red. According to equation 14 of the Drude free electron model, the plasmon resonance bandwidth in this limit is inversely proportional to the particle radius. Hence carriers are scattered elastically from surfaces rapidly, results in incoherence between scattered waves. *S. Link et al.* shown size dependence of the plasmon absorption band as depicted in Figure.13.

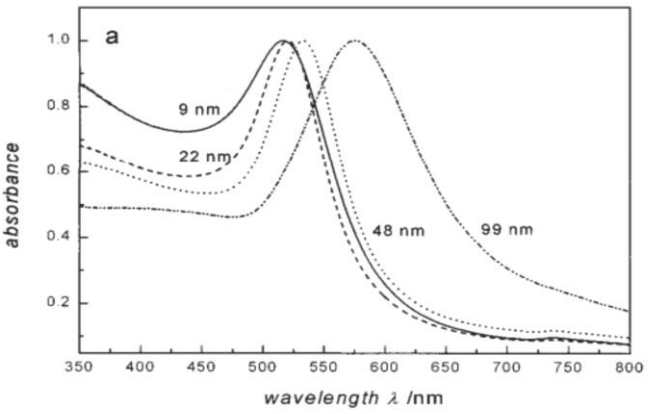


Figure.13: Size effects on the LSPR absorption in spherical gold nanoparticles. The UV-vis absorption spectra of colloidal solutions of gold nanoparticles with diameters varying in between 9 and 99 nm reveal that the absorption maximum red-shifts with increasing particle size.

F. Solvent effect on the LSPR absorption peak

Equation governs the relationship between the dielectric function of the material and the refractive index of the surrounding medium (22). It is proven by equation (22) that the plasmon resonance is dependent on the

surrounding medium's refractive index n ($n^2 = \varepsilon$ m). The plasmon frequency decreases as the dielectric constant gradually rises because the Columbic restoring force of the electron cloud of nanoparticles decreases. The experimentally determined LSPR absorption peak for solvent change is shown in Figure 14. As the solvent's refractive index rises, the LSPR absorption peak is seen to move to the red. Refractive index sensitivity may beneficial for biosensing applications.

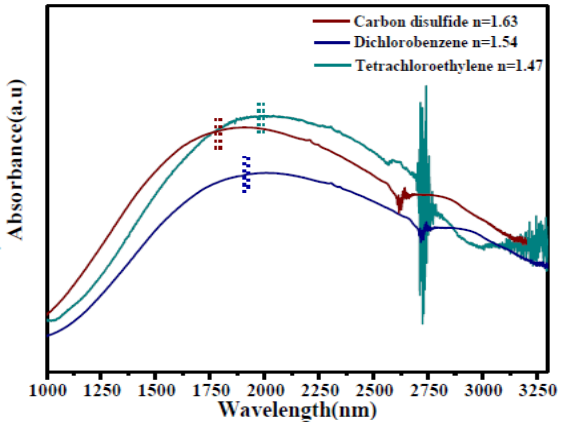
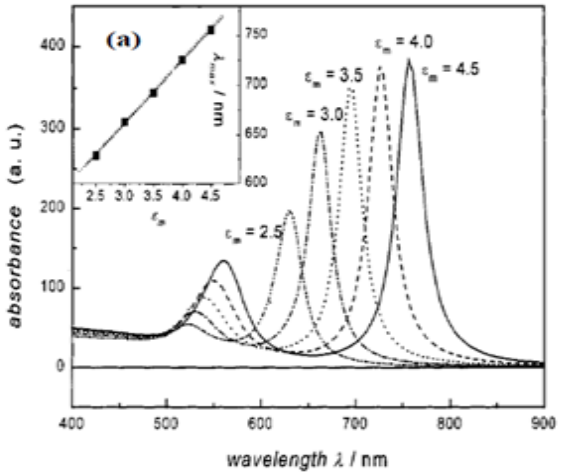


Figure.14: Red-shift of LSPR with increased refractive index.

G. Shape dependency on LSPR absorption

The complicated dielectric function of the material, the surrounding medium (m), and the size and form of the nanoparticles all affect the LSPR absorption wavelength.



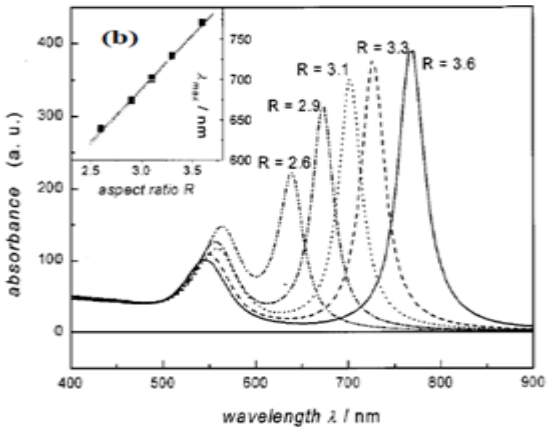


Figure.15: Using eq. 23, (a) calculated the absorption spectra of long ellipsoids whose medium dielectric constant m varied. A fixed aspect ratio of 3.3 was used. The maximum of the longitudinal plasmon band, estimated from the predicted spectra as a function of the medium dielectric constant, is shown in the inset. (b) Equation 26 was used to calculate the absorption spectra of extended ellipsoids with various aspect ratios R. The value of the medium's dielectric constant was set at 4. The maximum of the longitudinal plasmon band as derived from the computed spectra is shown as a function of aspect ratio in the inset.

Anisotropy that is shape dependant significantly affects the LSPR absorption pattern. Since spherical particles have strong symmetry, the excitation of the LSPR in the Mie approximation is independent of the polarisation of excitation. According to R. Gans, the Mie theory may be expanded in the quasi-static regime, where R , by combining the depolarization factors for the particle's three axis in order to account for the contribution of the light polarisation in various modes for the axes of the spectrum. Nanoparticles with variable forms need a computational technique for solving Maxwell's equations using numerical tools, such as the discrete dipole approximation, boundary element method, and finite difference in the time domain method (FDTD) (DDA).

However, electromagnetic wave polarisation plays a great significance for regular structures like nanorods since there are two primary directions of collective oscillation that can be determined, such as parallel to the main axis of the rod or perpendicular to it. The extinction spectrum of previously published gold nanorods revealed two bands, corresponding to oscillations longitudinally (L-band) and perpendicularly to the long axis (transverse or T-band) of the nanorod. Now according to Mie Gans modification extinction cross section (*Cect*) represented as:

$$C_{ext}=[2\pi V\varepsilon_m{}^{3/2}]/\,3\lambda\sum(1/Pj^2)\varepsilon''(\omega)/\{(\varepsilon(\omega)+[1-P_J]\varepsilon_m/P_J)2+\varepsilon''^2(\omega) \quad (23)$$

Pj are the depolarization factors for the three axes *x*, *y* and *z* for three dimensional system (*j* = *A*, *B*, and *C* of the nanoparticle with *A* > *B* = *C*). Depolarization factors are represented as:

$$Px=[1-e^2]/e^2\,[1/2e\{\ln(1+e/1-e)\}-1] \quad (24)$$

$$Py=Pz=\{(1-Px)/2\} \quad (25)$$

Where e is geometric factor appeared in equation (24) defined as

$$S=(1-1/R^2)^2 \quad (26)$$

R is the aspect ratio of nanoparticles. From equation (23) it is clear that two distinct perpendicular bands are arise along with the principal long axis band. Multiple plasmonic bands are studied in differ aspect ratio for gold nanoparticles using equation.23. (Figure.15.)

V. BANDGAP VARIATION IN NANOSCALE SEMICONDUCTORS

Physical properties of bulk crystal depends only its chemical composition only. When bulk material is scale down to nanoscale regime results in quantum confinement effect in semiconductor materials. Quantum confinement leads in an increase in the excitonic transition band gap energy and a blue shift in the absorption and luminescence band energy when the size of the material is equivalent to the Bohr exciton radius. There are essentially three types of low-dimensional systems: two-dimensional (2D) systems, which include thin films, layer structures, quantum wells, and superlattices; one-dimensional (1D) systems, which include semiconductor wires and solids in which linear chain-like structures can be recognised. Finally, zero-dimensional (0D) systems, which include clusters, quantum dots (QDs), and colloids. Excitons are constrained in all three spatial dimensions in the case of QDs. Due to the extraordinarily acute density of states (DOS) that QDs have at the nanoscale, they exhibit numerous different electrical behaviours from bulk low-dimensional semiconductors. The DOS ($\rho(E)$) of nanocrystals simultaneously evolves from continuous levels into discrete states as the dimensionality is decreased from 3D to 0D as described by the relationship $\rho(E) = E^{D/2}-1$ where *D* = dimensionality and energy is measured from the bottom of the conduction band for electrons and from the top of the valence band for holes. In the three-dimensional system, $\rho(E)$ is a smooth square-root function of energy. In the case of *d* = *2* and *d* = 1, a number of discrete subbands appear due to the quantum confinement effect. A schematic representation of broken symmetry and the functional form of the density of states in 1D, 2D, 3D, and 0D is shown in Figure 16. It is reasonable to handle with the simplest three-dimensional potential well, which is a spherical potential box with infinite deep potential and electrons and holes have isotropic effective masses, in order to reveal the main quantum confinement effect within the framework of the effective mass approximation (EMA). Here, two different forms of confinement come into play: weak confinement and forceful confinement. In this context, Brus provided the first theoretical estimate of the fluctuation in band gap energy via EMA. Electronic interactions between electrons and electron holes in tiny semiconductor crystallites: The Size Dependence of the Lowest Excited Electronic State,". Here size dependent bandgap energy expressed as :

$$E(qd)=E_{bulk}+h^2/8R^2\,(1/m_{e^*}+1/m_{h^*}) -1.786e^2/4\pi\varepsilon_0\varepsilon_r R \quad (27)$$

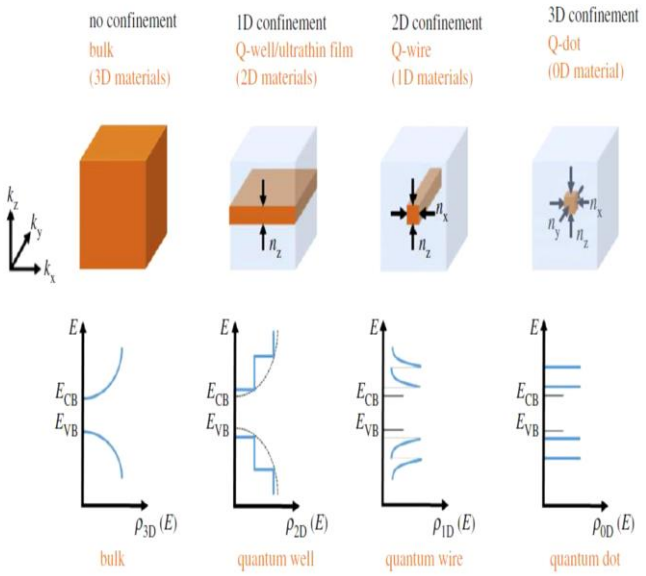


Figure .16: Schematic illustration of broken symmetry and functional form of the density of states in 1D, 2D and 3D confined materials

Where *Eg(qd)* = band gap energy of quantum dot; *E*bulk = band gap energy of bulk semiconductor; *R* = radius of quantum dot; *me**= effective mass of excited electron; *mh**= effective mass of excited hole; *h* = Planck's constant , ε0 = permittivity of vacuum *εr* = relative permittivity. the first term on the right side of the equation. The second additive term of the equation, which is represented by the additional energy due to quantum confinement and has an R-2 dependence on the band gap energy, stands for the columbic interaction energy, with the exciton having an R-1 dependency. Equation (27) represents the band gap energy of bulk materials (often neglected due to high dielectric constant of semiconductor material). According to a prediction made by L. Irimpan, the band gap of ZnO nanocrystals ranges from 3.5 to 4 eV in the range of 4.5 to 18 nm in particle size.

A physical scenario of propagating wave through crystal lattice with lattice constant *a* can be described by Bragg refection. Bragg condition in lattice environment satisfied.

$$\boldsymbol{k} +)^2 = k^2 \qquad (28)$$

The wave numbers k_1, k_2 differing by a value

$$k_1 - k_2 = 2\pi n/\text{a} \qquad (29)$$

where n=±1, ±2, ±3…….

Hence the magnitude of k values contain the intervals $-\pi/a < k < +\pi/$, $\pi/a < k < +3\pi/a$, $3\pi/a < k < +5\pi/a$,…….

Width of the Brillouin zone is $2\pi/a$ each. In this type periodic potential dispersion curve has discontinuities at point

$$kn = \pi n/\text{a} \quad \text{where n=±1, ±2, ±3} \qquad (30)$$

At this value of k the propagating wave function results in standing wave that leads to multiple reflection from periodic structure. At each value of *kn* two standing waves exist with different potential energy values. The difference in energy values between the standing waves is responsible for an energy gap. For two consecutive values of *n* a forbidden energy interval exists where no propagating wave exist. Typically different zone exist in *k* space between $-\pi/a < k < +\pi/a$, $-2\pi/a < k < +2\pi/$, …. and so on. So the energy spectra dispersion curve has discontinuities at

$$k_n = \pi n/\text{a}, \text{ where n= ±1, ±2, ±3 ..} \qquad (31)$$

Standing waves for different n values arise multiple reflections from the periodic structure. The region in *k* space between $-\pi/a$ and $+\pi/a$ is called the first Brillouin zone (BZ). The different parabolic branch may folded back into first Brillouin zone as depicted in Figure.17.

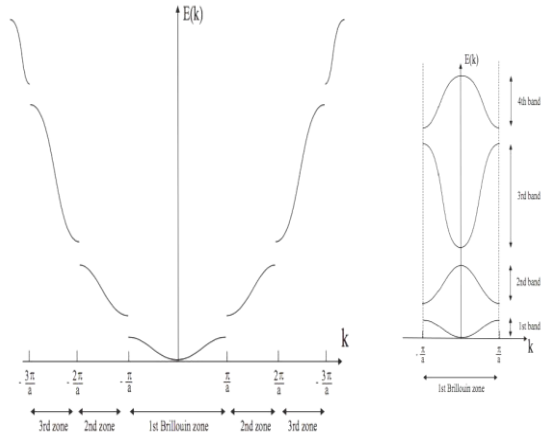


Figure.17: (a) The E versus K diagram showing 2π displacements of several sections of allowed energy bands. (b) The E versus K diagram in the reduced-zone representation.

Bragg reflection at $k=\pm\pi/$ produces standing waves. Probability The average potential energy should be lower than for a freely moving wave due to the distribution of electron density in periodic potential, which is either concentrated at positive ion cores or distributed across ion cores and resulting in an increase in potential energy. The energy gap in crystals is caused by the energy difference between the standing waves. In the region of energy space known as the bandgap, the greatest occupied energy level in the conduction band (CB) and the lowest unoccupied energy level in the valence band (VB) are energetically separated by the bandgap energy Eg. An electron from VB to CB is excited over a certain threshold frequency, leaving a hole in the VB in its wake. The bandgap energy may be probed by absorption spectroscopy.

VI. EFFECTIVE MASS OF ELECTRONS AND HOLES

Electrons and holes are quasi-particles associated with quasi-momentum. The typical value of quasi-momentum is governed by

$$p = \hbar k = 2\pi\hbar/a \qquad (32)$$

Equation (32) has direct consequence of translation symmetry of periodic lattice. Although for free particle one can formulate the energy values in *k* space as

$$(k) = h^2k^{2/}2m^*(k) \qquad (33)$$

Where m^* is referred as effective mass. In case of each periodic potential there exist extrema in band structure. At center of Brillioun zone of a given extremum $E_0(k_0)$ can be written as

$$(k) = E_0 + (k - k_0)\,[dE/dK]\,\big|\,k=k0 + 1/2\,(k - k_0)^2\,[d^2E/dk^2]\,\big|\,k=k0 + \qquad (34)$$

If it is considered that the energy is measured from E_0 *i.e* E_0=0, and the wavenumber is measured from k_0 that is k_0=0 then at extrimum $[d(k)/dK]$=0

$$(k)=0.5k^2\{d^2E/dk^2\}\,|\,k=0+ \quad (35)$$

By neglecting higher order terms of k for near extremunm point from equation (34)

$$m*^{-1}=(1/\hbar^2)\{d^2E/dk^2\}\,|\,k=0=const. \quad (36)$$

Omitted terms of higher order than *k2* corresponds to the parabolic band of crystals. Equation (36) determines the electron effective mass. At $k = 0$ it can be taken as constant. Usually it is given as units of the vacuum electron mass *me.*

VII. QUASIPARTICLES: ELECTRON, HOLE AND EXCITON

When an electron in the conduction band undergoes primary elementary excitation by the absorption of energy over the bandgap, a nearby elementary quasiparticle hole is also generated. Using the idea of elementary excitation, we may think of the ground state of a crystal as a vacuuming condition, where neither an electron nor a hole are present, and the first excited state, where an electron and a hole are present in the conduction band and valence band, respectively. When a perturbation is applied, a transition is conceivable. The perturbed photonic absorption by the crystal lattice maintains energy momentum conservation.

$$\hbar\omega=E_g+E_{e\ kin}+E_{h\ kin} \quad (37)$$

$$\hbar k=\hbar k_e+\hbar k_h \quad (38)$$

As a result, the photon momentum is very minimal only because a vertical transition occurs. The opposite process, which is known as a downward radiative transition, is likewise capable of annihilating an e-h pair and producing a photon. Under an elementaryly excited environment, electrons and holes interact through Coulomb potential interaction to create an additional quasiparticle known as an exciton, which corresponds to the electron-hole pair's bound state that resembles hydrogen. A Hamiltonian may be used to describe the electron hole and exciton interaction in the current circumstance.

$$H=-\{\hbar^2/2m^*_e\}\nabla_e^2-\{\hbar^2/2m^*_h\nabla_h^2\}-\{e^2/[4\pi\varepsilon_0\varepsilon\,|\,r_e-r_h\,|\}\} \quad (39)$$

Which is the same Hamiltonian of hydrogen atom with masses m^*_e and m^*_h instead of m_o and M and ε is the dielectric constant of crystal. Hence similar to the hydrogen atom , exciton is characterized by the exciton Bohr radius as

$$a_{ex}=\{4\pi\varepsilon 0\varepsilon\hbar^2/\mu e^2\} \quad (40)$$

Where μ is the reduced mass of electron-hole pair $1/\mu=1/m_{h^*}+1/m_{e^*}$. Absolute value of Bohr excition radius for the common semiconductors in the range of few nanometer. Thus the excition is delocalized over several thousands of atoms in the lattice.

VIII. QUANTIZATION OF ENERGY STATES IN SEMICONDUCTOR NANOCRYSTALS

In general, the de Broglie wavelength and exciton Bohr radius of quasiparticles are longer than the lattice constant of the majority of conventional semiconductors. Given the abundance of atoms in crystallites, they may be regarded as macroscopic systems in terms of lattice characteristics. It should be remembered that quasiparticles are tied to an endless three-dimensional potential well on the path to nanocrystal creation. The energy of an exciton for quantization as follows

$$E_{l,}^{e,h}=\hbar^2\Phi_{l,n}^2/2m_e,h^*R^2 \quad (41)$$

Where $m_e,h^*$is the effective mass of electrons and holes , R is the radius of nanocrystal. $\Phi_{l,n}$ is the n*th* root of the spherical Bessel function. From equation (41) we can say size reduction of nanocrystals leads to energy difference enhancement between consecutive states. This event results in blue shifting of bandgap absorption edge.

IX. MOSS-BURSTEIN EFFECT

The carrier concentration in excess of critical Mott carrier density36 by doping in semiconductor nannocrystal often results in a widening of the intrinsic optical band gap *(Eg)*,is well known Burstein-Moss shift37 (Figure.18.). The Fermi energy (EF), which is present in the conduction band due to substantial n-type doping, is thought to be responsible for this phenomena (or in the valence band for p-type doping). This limits thermal or optical stimulation in the filled states. As a result, the band gap measured from the beginning of interband absorption increases (i.e. suffers "a blue shift"). The magnitude of the shift (*EΔBM*), under free-electron theory, prescribed as

$$\Delta E_{BM}=\hbar^2/2m^*\{(3\pi^2n_e)\}^{2/3} \quad (42)$$

Where m^* is the is the exciton pair reduced effective mass (μ) as $1/\mu=1/m_{h^*}+1/m_{e^*}$ and n_e is the carrier concentration.

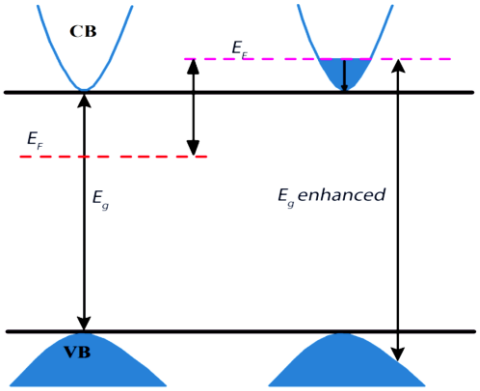


Figure.19. Bandgap (Eg) enhanced due to B-M.

X. ELECTRICAL PROPERTIES

Degenerately conduction band filling in semiconductor nanocrystals by aliovalent doping or vacancy doping enhance the carrier concentration. Typically when the carrier concentration exceeds Mott's critical density *nc* metallic conduction behavior arises in material. At ambient temperature, a highly doped semiconductor thin sheet exhibits metallic conductivity, and at low temperatures, a metal to semiconductor transition (MST) occurs. Due to the localization of carriers caused by disorder, which hampered the thin film's ability to transport metallic materials, semiconducting behaviour at low temperatures was seen in as-deposited thin films. This means that high carrier concentration, which is statistically occupied at lattice or interstitial sites, is caused by both aliovalent dopants and native point defects. In order to localise the delocalized degenerate electronic states at Fermi level, these defective states induce lattice disorders. In a degenerate semiconductor, the MST transition results from the prevalent presence of metallic conductance caused by the Mott criteria and Anderson localization caused by disorder. By employing back scattering in the semiconducting area and phonon-like scattering in the metallic region, it is possible to study MST-like transition.

MST like transport feature can be fitted by following equation:

$$(t) =\{1/[a_0+a_1T^{p/2}+a_2T^{1/2}]\}+bT^2 \qquad (43)$$

Where a_0 is related to the residual resistivity ρ0 ($a_0=1/\rho 0$), $a_1T^{p/2}$ p depends on the kind of interactions and p = 2 or 3 characterises the weak localization caused by the self interference of quantum wave functions backscattered on impurities. $a_2T^{1/2}$ refers to the Coulomb electron interactions that have been renormalized by self-interference effects, and explains the weak localization caused by the self interference of quantum wave functions backscattered on impurities, where p depends on the nature of the interactions. In fact, in these modifications, a component called bT2 is included to account for the effect of high temperature scattering. It has to be noticed that without quantum corrections $a_1 = a_2 = 0$, this expression reduces to the Boltzmann formulas.

XI. BASIC PRINCIPLES OF SEMICONDUCTOR PHOTOCATALYSIS

The function of a photocatalyst is to start or speed up a certain redox process (reduction and oxidation) in the presence of light energy in order to obtain promising results in photochemistry. When photons with energies larger than or equal to the bandgap are used to light the photocatalyst, one electron (ecb-) is transferred from the valance band to the conduction band, leaving a hole (hvb+), as shown in Figure 20. In fact, the excited electron and hole travelled to the semiconductor's surface. While holes in the VB should have a chemical potential energy of +1.0 to 3.5 V vs in NHE demonstrate significant oxidative potential, excited electrons should have a chemical potential energy of +0.5 to -1.5 V versus in normal hydrogen electrode (NHE) scale. In order to react with the electron donors (D) and electron acceptors (A) adsorbed on the surfaces of the semiconductor nanocrystals, excited ecb- and hvb+ may operate as a reductant and an oxidant, respectively.

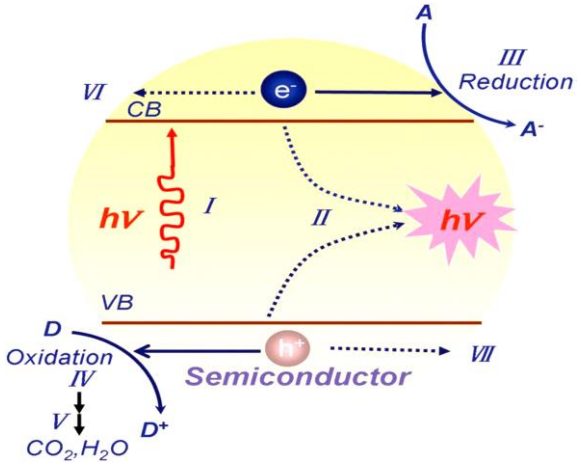


Figure.20: Schematic representation of how semiconductor photocatalysis works: (I) a photon forms charge carriers; (II) charge carriers recombinate to release heat; (III) a conduction-band electron initiates a reductive pathway; (IV) a valence-band hole initiates an oxidative pathway; (V) additional thermal (such as hydrolysis or a reaction with active oxygen species) and photocatalytic reactions yield mineralization products; and (VI).

The next step should be the excited state conduction-band electrons and valance band holes can recombine and loss its exited energy if the recombination is perturbed by scavengers or by crystalline defects then minimization of recombination results in increased efficiency in the usage of the photogenerated carriers for desired photoreaction. Indeed it is clear that only energetic enough electors and holes can reach the surface of semiconductor without recombination can stimulate the redox reaction. It is essential for successful surface reaction that the reduction and oxidation potential are more positive and negative than CB and VB level respectively as some standard redox reaction is given in Table .1.

Table.1. Standard redox potentials for some typical species:

Reaction	E^0(V) vs NHE at pH 0
$2H^+ + 2e^- \rightarrow H_2$ (g)	0
$O_2(g) + e^- \rightarrow O_2^-$ (aq)	−0.33
$O_2(g) + H^+ + e^- \rightarrow HO_2^\bullet$ (aq)	−0.046
$O_2(g) + 2H^+ + 2e^- \rightarrow H_2O_2$ (aq)	0.695
$2H_2O$ (aq) + 4 $h^+ \rightarrow O_2$ (g) + 4 H^+	1.229
$OH^- + h^+ \rightarrow {}^\bullet OH$	2.69
$O_3(g) + 2H^+ + 2e^- \rightarrow O_2$ (g) + H_2O	2.075
$CO_2 + e^- \rightarrow CO_2^-$	−1.9
$2CO_2(g) + 2H^+ + 2e^- \rightarrow$ HOOCCOOH(aq)	−0.481
$CO_2(g) + 2H^+ + 2e^- \rightarrow$ HCOOH(aq)	−0.199
$CO_2(g) + 2H^+ + 2e^- \rightarrow CO(g) + H_2O$	−0.11
$CO_2(g) + 4H^+ + 4e^- \rightarrow C(s) + 2H_2O$	0.206
$CO_2(g) + 4H^+ + 4e^- \rightarrow$ HCHO(aq) + H_2O	−0.07
$CO_2(g) + 6H^+ + 6e^- \rightarrow CH_3OH(aq) + H_2O$	0.03
$CO_2(g) + 8H^+ + 8e^- \rightarrow CH_4$ (g) + $2H_2O$	0.169
$2CO_2(g) + 8H_2O + 12e^- \rightarrow C_2H_4(g) + 12OH^-$	0.07
$2CO_2(g) + 9H_2O + 12e^- \rightarrow C_2H_5OH(aq) + 12OH^-$	0.08
$3CO_2(g) + 13H_2O + 18e^- \rightarrow C_3H_7OH(aq) + 18OH^-$	0.09
$H_2O_2(aq) + H^+ + e^- \rightarrow H_2O + OH^-$	1.14
$HO_2^\bullet + H^+ + e^- \rightarrow H_2O_2(aq)$	1.44
$H_2O_2(aq) + 2H^+ + 2e^- \rightarrow 2H_2O$	1.763

XII. FUNDAMENTALS OF WATER SPLITTING

The basics fundamental of water splitting as follows : The water molecule are reduced to from H_2 and oxidized to form O_2. The reduction and oxidation are mediated by electrons and holes, respectively. The redox potential of water is 1.23 V, i.e. H+/H2 is 0 V and O2/H2O is 1.23 V with respect to the normal hydrogen electrode (NHE).

Essential knowledge about CB and VB band energy level of semiconductor with respect to redox potential of H2O i.e. the CB edge should lower than the H2/H+ potential (0 V vs. NHE) and VB edge should be higher than O2/OH− (1.23 V vs. NHE) potential) is essential to meet the success in H2 production (Figure.21).

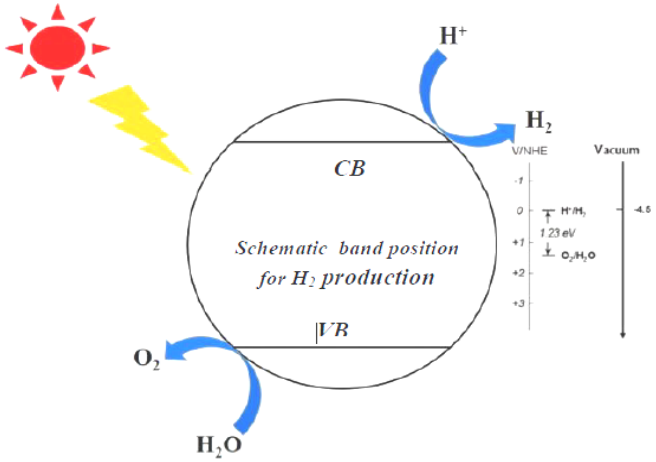


Figure.21: Bandgap position in NHE scale.

XIII. CONCLUSION

The most important outcome of the research results presented in the paper is an enhancement of photophysical properties of wide bandgap nanoscale semiconductors: Firstly, electronic and optical properties are modified by synthesizing semiconductor nanocrystals to introduce quantum confinement effect i.e. increase of band gap with reduction of size. The research work presented here, on preparation of nano scale semiconductor by colloidal synthesis and characterization of these samples by optical and electrical studies. Photophysical properties of nanocomposite are also studied like H2 generation from water, pollutant dye degradation and carcinogenic Cr(VI) reduction from water under irradiation of solar simulator light. In following section a brief outline of optical and electrical properties in nano scale semiconductors are discussed.

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Research on MSMEs in Indonesia: Bibliometric Analysis

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ABSTRACT

The micro, small, and medium-sized enterprises (MSMEs) of Indonesia are an essential component of the economy of Indonesia. The number of MSMEs in Indonesia has reached 64,2 million, and MSMEs are responsible for 60.6% of Indonesia's gross domestic product (GDP). The majority of the micro, small, and medium-sized enterprise community was forced to engage in creative problem solving and rapid adaptation or run the risk of going out of business. The purpose of this study is to create a bibliometric map of research activities conducted by MSMEs in Indonesia. This research counts and analyzes how many articles about micro, small, and medium enterprises (MSMEs) have been published in Indonesia during the past five years. Bibliometrics and Vosviewer with R-Tool are used for analysis, and the study dataset is seen using the Dimensions database. According to the findings of the research conducted, Tambunan's article titled "Recent evidence of the development of micro, small and medium enterprises in Indonesia," which was published in the Journal of Global Entrepreneurship Research, is getting a lot of attention. He is widely regarded as the most accomplished author in this field. The VOSviewer study reveals that there are six key clusters that have been developed. It is interesting to note that the largest cluster can be located in Covid ; this indicates that research on MSMEs in Indonesia is only relevant while the pandemic is active.

Keywords: MSMEs, VOSviewer, R-Tool, Global Entrepreneurship Research

I. INTRODUCTION

Micro, small, and medium-sized businesses all play an important part in the overall economy of a country, according to the dominant framework that governs research on the financing of small businesses. Micro, small, and medium-sized businesses (also known as MSMEs) play a significant part in contributing to the expansion of regional and national economies. The lack of capital is the most significant challenge faced by the several varieties of MSMEs that can be found all over Indonesia. The rapid expansion of the financing business provided by FinTech companies is currently providing an alternative that all levels of society can access through financial inclusion. This is one way to socialize the financial sector specifically to make it easier for the public to gain access to financial services[1].

The majority of micro, little, and medium-sized enterprises (MSMEs) in Indonesia are still utilizing e-commerce platforms that are solely concerned with sales and are not yet equipped with strong connections management with their customers after the transaction. There are a high number MSMEs in Indonesia currently[2]. MSMEs help open employment opportunities, contribute to the income of the state in the form of taxes, and make a substantial contribution to GDP. The development MSMEs in Indonesia is unable to be maintained due to a basic issue. This issue is characterized by a lack of knowledge or insight into the process of operating a business, particularly around financial management[3].

There are a high number of MSMEs in Indonesia currently. MSMEs help open employment opportunities, contribute to the income of the state in the form of taxes, and make a substantial contribution to GDP. The development of MSMEs in Indonesia is unable to be maintained due to a basic issue. This issue is characterized by a lack of knowledge or insight into the process of operating a business, particularly in financial management[4].

The micro, small, and medium-sized enterprises (MSMEs) of Indonesia are an essential component of the economy of Indonesia. The number of MSMEs in Indonesia has reached 64,2 million, and MSMEs are responsible for 60.6% of Indonesia's gross domestic product (GDP). Increasing the competitiveness of products is possible through the implementation of standards; the fact that products produced by MSME have been standardized on products is evidenced by the fact that the products have been certified (Indonesian National Standard). There is a total of 101 MSMEs in Indonesia that have been granted product certification. This compares to the overall number of MSMEs in Indonesia, which is 64.2 million[5].

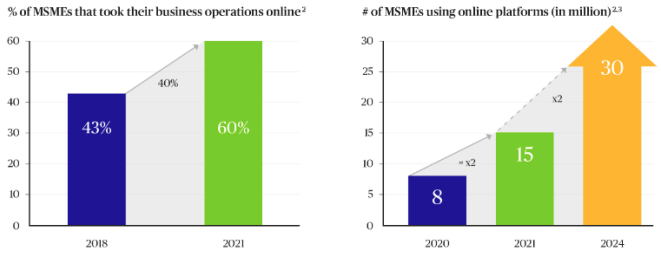

Figure 1. The speed and the extent of digital adoption among Indonesian MSMEs are evident[6]

Most of the micro, small, and medium-sized enterprise community was forced to engage in creative problem solving and rapid adaptation or run the risk of going out of business. During a period that was characterized by lockdowns and public movement restrictions, digitalization swiftly became a lifeline for a significant number of these small firms. MSMEs account for 99% of all firms in Indonesia and contribute 61% of the country's GDP. Accelerating the digitalization of this sector, which serves as the central pillar of the regional economy, has been identified as a crucial step toward improving the resiliency of domestic businesses and bolstering the efforts being made to recover from the epidemic. While the advent of digitization paves the way for new opportunities, it also brings with it significant threats to cybersecurity. This is especially true among owners of MSME, since they may have shifted their operations toward greater digitalization without fully comprehending the dangers and major business expenses involved[6].

Bibliometric research on Indonesian MSMEs are particularly interesting. The purpose of this study is to create a bibliometric map of research activities conducted by MSMEs in Indonesia. This research counts and analyzes how many articles about micro, small, and medium enterprises (MSMEs) have been published in Indonesia during the past five years. Bibliometrics and Vosviewer with R-Tool are used for analysis, and the study dataset is seen using the Dimensions database[7][8][9], [10].

Bibliometric research on MSMEs has been the subject of multiple published studies. A study presents a bibliometric Analysis study on the concept of ERP (Enterprise Resource Planning) management and integration in the MSMEs sector. The purpose of the study is to investigate how ERP implementation in managing transactions and business planning is integrated in real time, with the end goal of producing marketing strategies that have an impact on increasing business results MSMEs. The findings of the study point to the necessity of developing techniques that may be used to assist MSMEs in managing their business and financial reporting by utilizing an ERP system that is straightforward and easy to grasp[11].

According to findings from other studies, the development of the digital economy in Indonesia, particularly Micro, Small, and Medium Enterprises, is on the rise (MSMEs). The digital platform offers a solution for micro, small, and medium-sized enterprises (MSMEs) who are in danger because of the effects of the Covid-19 pandemic. Some initial steps toward reviving the nation's economy have been taken thanks to the participation of the Indonesian government and the business sector. These initiatives included the development of digital platforms such as e-commerce platforms, digital wallets, and numerous applications that support the distribution of products and services that have been widely utilized by various business actors. The findings of this study shed light on the most important aspects of the digital platform for the development of MSMEs in Indonesia. As a result of this study's findings, a method has been suggested that actors in the MSME sector might utilize to analyze the social impact of using digital platforms[12].

Despite this, there have not been many publications resulting from research on MSMEs in Indonesia. As a result, the purpose of this study is to contribute something new to the body of scientific knowledge, particularly concerning the growth of MSMEs in Indonesia and the challenges they face.

II. METHODS AND MATERIAL

A dataset taken from the Dimensions database, which is said to have coverage that is 30 percent more than that of other databases, was used in this investigation. A scientific database known as Dimensions was developed by Digital Science in the year 2018. Dimensions has more than 106 million published works, more than 3.7 million sponsored articles, more than 34 million patents, and more than 9 million citations of scientific literature. A published search index and linkages to all other organizations are included in the free version of the software. In spite of the fact that the epidemic is not yet over, "MSMEs AND Indonesia" are the keywords that will be employed in the period of 2018-2022.

When processing the results of the crawling of the Dimensions database, Bibliometrics is employed. Bibliometrics is a free and open-source research tool that can be used for quantitative research, including analytical methods to scientometrics and bibliometrics. This program allows you to map the scientific landscape to find research trends and gaps on any subject of your choosing[13].

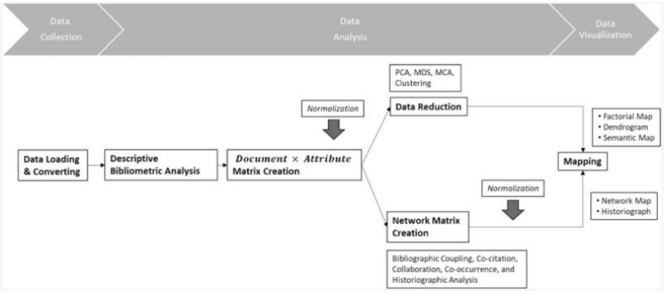

Figure 2. Utilizing Bibliometrics for the scientific mapping workflow[7]

Figure 2 demonstrates how the scientific mapping on Bibliometrics makes use of a dataset that was originally derived from the Dimensions dataset. This dataset was then translated. After that, the data analysis is crafted in the R programming language so

that it may be customized and so that it can serve a diverse array of statistical and graphical applications. In this study, the mapping process is made more efficient and straightforward by utilizing biblioshiny for the analysis[7].

Based on the results of the bibliometric mapping, subject areas and research trends are identified using the literature that is currently available. Bibliometric visualization will be performed with the assistance of VOSviewer, which will be used in the study process. VOSviewer conducts an analysis of the co-occurrence of keywords and the co-occurrence of authors in relation to the issue of MSMEs in Indonesia during the years 2018-2022 in order to determine the path that the current study will take[8].

III. RESULTS AND DISCUSSION

A dataset from the Dimensions database is created using the search terms "MSMEs AND Indonesia" and the time range of 2018 to 2022 as the parameters. Table 1 provides a concise summary of the most important aspects of this dataset.

Table 1. Important data information

Description	Results
Main Information:	
Timespan	2018:2022
Sources (articles-proceeding)	777
Documents	1144
Average years from publication	1.34
Average citations per documents	0.61
Average citations per year per doc	0.21
References	4260
Article	1144
Authors	
Authors	2831
Authors of single-authored documents	204
Authors of multi-authored documents	2627
Authors Collaboration:	
Single-authored documents	215
Documents per Author	0.40
Authors per Document	2.47
Co-Authors per Documents	2.72
Collaboration Index	2.87

Figure 3 shows the number of publications on a relevant topic in the last five years. The dataset recall began in 2018 with 64 articles. The most articles were published in 2021, with a total of 413 articles, but by mid-2022, the number of articles published had increased by more than half, suggesting that publications in 2022 may outnumber those in 2021.

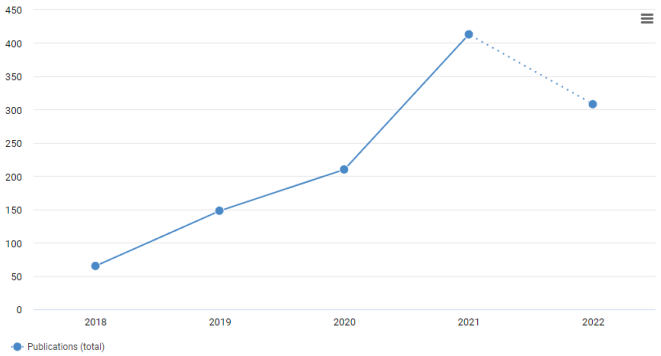

Figure 3. The visualization shows the number of publications published in each year.

According to the findings of the Bibliometrics study, the most important and prominent authors are connected with the term "MSMEs AND Indonesia". Tulus Tahi Hamonangan Tambunan is widely regarded as the most authoritative author on this subject. This indicates that the five names are quite useful in research concerning MSMEs, as shown in table 2.

Table 2. Top five author

No	Name	Organization	Publications	Citations	Citations Means
1	Tulus Tahi Hamonangan Tambunan	Trisakti University, Indonesia	7	74	10.57
2	Zulfi Chairi	Sumatera Utara University, Indonesia	5	1	0.20
3	Puji Handayati Handayati	State University of Malang, Indonesia	5	1	0.20
4	Abrista Devi	Universitas Ibn Khaldun Bogor, Indonesia	4	0	-
5	Agus Hermawan	State University of Malang, Indonesia	3	0	-

Based on the keywords, we also learned how often each article was cited. Table 3 below shows the top five articles in terms of citations, as determined by the bibliometric analysis.

Table 3. Articles with highest citation

No	Citation	Author	Title	Journal
1	43	Tambunan T[14]	"Recent evidence of the development of micro, small and medium enterprises in Indonesia"	Journal of Global Entrepreneurship Research
2	30	Hanggraeni D[15]	"The Impact of Internal, External and Enterprise Risk Management on the Performance of Micro, Small and Medium Enterprises"	Social and New Technology Challenges of Sustainable Business
3	21	Syapsan S[16]		
4	16	Tambunan TTH[17]	"The effect of service quality, innovation towards competitive advantages and sustainable economic growth: Marketing mix strategy as mediating variable"	Benchmarking: An International Journal
5	14	Tjahjadi B[18]	"The impact of the economic crisis on micro, small, and medium enterprises and their crisis mitigation measures in Southeast Asia with reference to Indonesia"	Asia & The Pacific Policy Studies
			"The Role of Green Innovation between Green Market Orientation and Business Performance: Its Implication for Open Innovation"	Journal of Open Innovation: Technology, Market, and Complexity

Analysis shows that Tulus Tambunan's paper on Journal of Global Entrepreneurship Research, "Recent evidence of the development of micro, small, and medium firms in Indonesia," has received a lot of attention, with a total of 43 citations. Descriptive statistics were used for this investigation. Evidence suggests that MSEs in Indonesia are preponderant, accounting for nearly all businesses although contributing just 58% to 61% of GDP (GDP). While the gender split between MSE owners varies by province, women control 42.84 percent of all MSEs. This rapid expansion of MSEs can mostly be attributed to the effects of poverty.

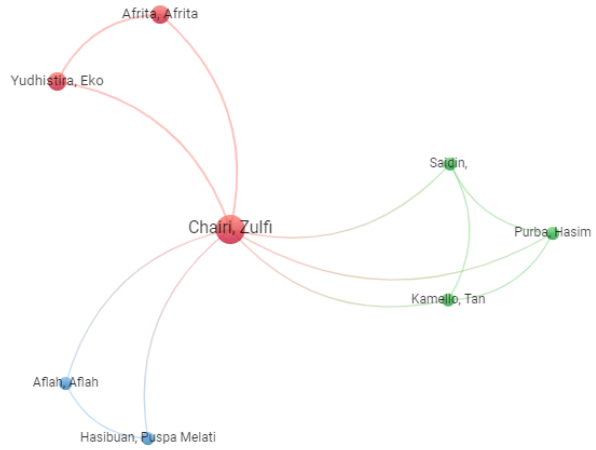

Figure 4. Co-Authorship Analysis

In the meantime, the results of the analysis of co-authorship showed that there were three different clusters totaling seven authors. Figure 4 is a representation of the bibliometric network that was constructed using the software VOSviewer. This representation shows that these three clusters led to a total of 15 writers being co-authors, and there were a total of 12 ties between them. The findings indicate that Zulfi Chairi assumed a central role in each of these three groups, contributing to the work of 9 other authors across 5 publications.

The VOSviewer study reveals six major clusters established with a focus on Covid, Performance, Micro, Study, UMKM, and use. The association strength normalization approach is used in this study. This method is used because both theoretical and empirical studies show that correlation data can be best adjusted using probabilistic measures. It strongly advocates the use of association forces in scientometric research[19].

The study trend of MSMEs in Indonesia during the past five years is visualized in Figure 5, which presents a depiction of the relationship between each cluster. Curiously, the largest cluster can be found in Covid, which means that study on MSMEs in Indonesia is only of interest while the pandemic is active. This is in line with the findings of a survey carried out by the Bank of Indonesia. The pandemic caused by the COVID-19 virus in Indonesia affected as many as 77.95 percent of the country's Micro, Small, and Medium Enterprises (MSMEs) in the year 2021. The decreased income of MSMEs was caused by the restricted social and economic mobility that occurred during the Covid-19 epidemic[20].

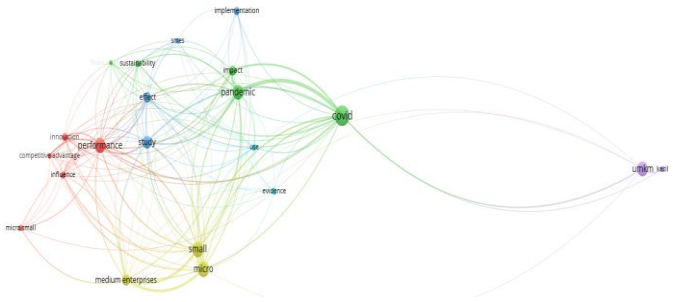

Figure 5. Research Trend MSMEs in Indonesia

IV. CONCLUSION

Bibliometric mapping of research on MSMEs in Indonesia carried out with Biblioshiny and VOSviewer resulted in the discovery of 1144 relevant articles published in 777 journals and proceedings between 2018 and 2022. Tulus Tahi Hamonangan Tambunan is widely regarded as the most accomplished author in this field. According to the findings of the research conducted, Tambunan's article titled "Recent evidence of the development of micro, small and medium enterprises in Indonesia," which was published in the Journal of Global

Entrepreneurship Research, is getting a lot of attention. The article has been cited 43 times. The VOSviewer study reveals that there are six key clusters that have been developed, with an emphasis on Covid, Performance, Micro, Study, UMKM, and use. It is interesting to note that the largest cluster can be located in Covid; this indicates that research on MSMEs in Indonesia is only relevant while the pandemic is active.

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Changing Scenario of Bad Assets in Public Sector Banks in India

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ABSTRACT

The Government of India has merged during last two years thirteen public sector banks (PSBs) into five leaving their total number to eleven in addition to State Bank of India which earlier witnessed merger of associate banks and Bhartiya Mahila Bank in it. This major restructuring has been undertaken by the government with the stated objective of making PSBs stronger and internationally competitive. The rationale is that bigger banks can face challenges of the modern day world, out of which raising of capital and upgradation of banking technology are the most important. This restructuring exercise came at a time when many of these PSBs faced challenges of survival because of huge rise in their bad assets (non-performing loans). But for massive recapitalization many of these banks would have faced insolvency like situation. The present circumstances are still too uncertain to guarantee a return of these banks to good financial health as these continue to face twin challenges of capitalization and reduction of non-performing loans commonly known as Non-Performing Assets (NPAs) in India.

Keywords : Restructuring , PSBs, Mergers, NPA, AQR, PCA, Recapitalization

1.INTRODUCTION

All countries require a robust banking system for their economic development. In our country too the various sectors of economy like agriculture, small and medium industry to large green field projects are all dependent upon banking system for their growth. The entrepreneurs in all sectors have equity of their own but it acts mostly as seed capital. The majority of funding of different new ventures is either done by equity investors or by the banks. The equity investors are shy of investing in new enterprises / industries because of risk of failure of the promoters having no previous track record. The alternative with the first generation of entrepreneurs is therefore to depend upon public sector banks for support as these banks still dominate the banking arena having more than sixty percent share in advances. Their share is high because of the developmental role assigned to them by the owner, the Government of India. It is necessitated to fulfil the objective of economic development of the nation. After many years of

independence banking system continued to be in the hands of big private business houses and these served their interest only. Finance was made available to only large manufacturing and trading houses in big cities. Large section of the society across the country did not have access to the credit supply from the banks.

The share of financing to Agriculture upto late sixties by the banks in India was negligible (around two percent) as compared to industry which was almost two third of the total credit outstanding of banks. The five biggest cities in the country like Ahmedabad , Mumbai , Delhi, Kolkata and Chennai accounted for almost half of the bank deposits and around sixty percent of the outstanding bank credit in 1969. This compelled the government to deliberate upon the role of scheduled commercial banks in development of Indian economy. It led to a belief that banks were not performing their desired role. As a result of the perception about non-supportive role of banking sector, Government of India nationalized 14 major commercial banks of the country in 1969. At the time of nationalization as many as 617 towns out of 2700 in the country were not covered by commercial banks (ShaktiKanta Das 2019). Opening of bank branches in rural areas was never thought of as a business development plan by the commercial banks. From this scenario of Indian banking one can understand well the need for nationalization of private banks to channelize their resources for economic development of the country.

After nationalization of the major banks, the hitherto neglected sectors of the economy were asked to be given preference and accordingly given the nomenclature of 'Priority Sector' by the Reserve Bank of India, regulator of the banking system in the country. Targets were given to all scheduled commercial banks to lend to priority sector. RBI also designated the bank having high concentration of branches in a district as a Lead Bank to make district credit plans for lending to agriculture, small scale industry and rural poor. Such banks were assigned the responsibility to monitor the progress of various institutions in achievement of targets allocated under district credit plans.

Satisfied with the progress of banks in fulfillment of targets under directed lending, government yet again brought six more banks in its fold in 1980. There was no looking back for banks and these continued to take the country to road of rapid industrialization and all around economic development. Banks moved from class banking to mass banking by accelerated opening of branches. They launched various schemes to attract deposits and while doing the major job of intermediation deployed their resources to needy at a higher rate of interest to make profits. A committee was formed in 1991 under the chairmanship of M. Narasimham for strengthening the financial sector in India and to bring about reforms in Indian economy. These reforms are popularly called LPG meaning Liberalization, Privatization and Globalization.

Early nineties are remembered always for transformation of the Indian economy and its integration with the global economy. Major financial reforms in the banking, capital markets and insurance sectors were initiated by the government which include issuing fresh licences for private sector banks, the deregulation of interest rates, reduction in phases of high statutory liquidity ratio (SLR) and opening of financial, capital and foreign exchange markets. The public sector banks now faced enormous competition by technologically better private sector banks in the area of customer service and better product rendering.

This competition forced merger of many small banks during the reform phase. These mergers resulted mainly due to inherent weaknesses in the banks that were merged like increase in bad loans, inadequacy of capital for credit growth, poor liquidity to keep the bank going and losing confidence of depositors whose hard earned money was at stake. These mergers were however aimed to make banks stronger with sound financials, good branch network, and efficient management with active and alert boards to keep abreast of ever changing

macroeconomic environment. The benefits that accrued to bigger banks after merger were the technological edge, competent staff, reduction in costs due to synergies between merging banks and the enhanced capacity to lend to top rated corporate in big volumes at a competitive pricing besides enhancement of normal operations.

Banks do not have their own money to lend. It is the depositors who trust the banks for keeping their valued savings intact and also to get interest. Banks keep it in Reserve Bank of India (central bank of the country) for statutory reserve requirements to safeguard public interest and also liquidity adjustments (the money is kept in Government of India or State government bonds). A major portion is lent to public by way of credit to industry, agriculture and retail loans. The banks have an important role in development of various sectors of Indian Economy. The financing of especially big sectors like Iron and Steel Industry, Power Generation, Ports, Roads, Airports, Telecom, Infrastructure, Tourism and Airlines in the service sector had a boost by big funding from banks. There was a large scale financing for the economic development of the country after the global financial crisis of 2008 at the behest of Government. Mainly public sector banks were entrusted this job for funding to the developmental projects in the absence of development finance institutions like Industrial Development bank of India (IDBI) and others which had become defunct due to government policy. PSBs did not have the long term funds to finance infrastructure with long gestation and also lacked credit appraisal techniques for thorough assessment of actual requirements of very large projects of different types of industry involving outlay of thousands of crores. The dependence of these banks was mainly on merchant bankers like SBI Capital Markets and some private sector banks like Axis Bank and ICICI bank who performed the task of loan syndication aggressively. This was to earn fee based remuneration in the shape of syndication fees, processing fees, monitoring fees and documentation charges. The new private sector banks kept themselves out of funding to the major infra projects due to their risk aversion and non availability of adequate capital. Rather they concentrated on Non-Fund based business. However some of the big corporate private sector banks (who primarily give big ticket loans to big companies only) also failed to appreciate the high risks associated with big corporate business and poorly managed credit risks. “They have taken unsustainable risk onto their balance sheets and derived too much comfort from being in the herd. They have failed to recognize that in their highly leveraged institutions, upside is limited to a small spread and downside is unlimited. (KVS Manian 2018) ”

Everything was going good initially after the global crisis of 2008 but the greed, inefficiency and the intense competition amongst public sector banks to show bigger balance sheets took over. The result of aggressive lending came to the fore. The borrowers started signs of sickness as the cash flows expected from the projects did not materialize as per projections and their loan accounts were moving toward classification as NPAs. Public Sector Banks which constituted seventy five percent of the advances of banking system in 2015 were growing and had gross non-performing assets (GNPAs) of 5% only at that point of time. This was big achievement as NPAs seemed to be under control even with huge credit growth. “However the 5% number was deceptive. Like an iceberg only a fraction of the real bad loans was visible as NPAs (Rajiv Kumar)”. The Asset Quality Review (AQR) by Reserve Bank of India from Dec. 2015 analyzed large loan accounts and started bringing out the true classification of standard restructured assets as restructuring was just a gimmick to extend their repayment period. All scheduled commercial banks were hiding the NPAs under the carpet by the ever greening (not reflecting true classification of loan assets) route. The NPAs for all the scheduled commercial banks peaked in 2018

causing ringing of alarm bells for the Government of India.

2.Review of Literature

The studies on NPAs have sought to examine the multiple reasons for accumulation of such bad assets. Many authors have attributed macro-economic factors including directed loans (Priority sector lending) for the growing incidence of NPAs in banks whereas others have observed the reasons internal to the behavior of the bank borrowers. Inefficient management of credit portfolio is also described as one of the reasons of burgeoning of NPAs in banks by many authors.One of the most prominent causes for NPAs, as often observed by RBI Inspectors, is the slackness on the part of the credit management staff in their follow up to detect and prevent diversion of funds in the post-disbursement stage (Muniappan 2002). Some of such studies are enumerated below:

Hippolyte Fofack (2005) investigated the leading causes of NPLs during the economic and banking crises that affected the large number of countries in Sub-Saharan Africa in the 1990. The results highlight a strong casuality between these loans and economic growth, real exchange rate appreciation, the real interest rate, net interest margins and interbank loans consistent with the casuality and econometric analysis which reveal the significance of macro and microeconomic factors. **Richard (2010)** however observed that the unfavourable economic environment specifically the national economic downturn leading to the depression of business to be perceived as a major factor causing NPLs is not established. Rather diversification of funds and weak credit analysis were the major factors contributing to NPLs in Kenya.

Chaudhuri (2005) observed that presence of NPAs indicate asset quality of the balance sheet and hence future income generating prospects. This also requires provisioning which has implications with respect to capital adequacy. Declining capital adequacy adversely affects shareholder value and restricts the ability of the bank/institution to access the capital market for additional equity to enhance capital adequacy. Low capital adequacy will also severely affect the growth prospects of banks and institutions. **Ghosh (2014**) raised many questions on rising NPAs of Indian Banks including whether macro-economic variables play a more significant role than bank specific factors in determining NPA levels and whether corporate governance factors like board composition and ownership affect NPAs. **Chavan and Gambacorta (2016**) on a study of the banks in India observed that quality of loan is a concern . It has been impacted after GFC and thereafter turned severe after 2011. It can be attributed to high growth period after the crisis period. It is found that a one-percentage point increase in loan growth is associated with an increase in NPLs over total advances (NPL ratio) of 4.3 per cent in the long run .The non performing loan ratio of banks is sensitive to the interest rate environment and the economic growth.The decline in loan quality was mainly on account of public banks, but private banks and foreign banks also contributed to it. It is observed that the decline in loan quality was sharper in the case of particularly infrastructure and core industries.

Sengupta and Vardhan (2017) emphasised that an early recognition of stressed assets and timely action on their resolution mitigates the damaging impact of a crisis. To enable banks to take such prompt action, strong governance and proactive banking regulation is critical. This will ensure that the subsequent NPA resolution has minimal effect on the banks' capital. Regulatory forbearance does not facilitate resolution and can actually worsen the banking crisis by providing incentives to the banks to defer NPA recognition and delay action. It is suggested that restructuring of a loan should be the commercial decision of a bank. **Gupta and Gautam (2017)** found that the level of NPAs both gross and net is having an increasing trend. They also found that there is a

negative relationship between Net profits and NPA of PNB. They viewed it because of mismanagement and wrong choice of client.**Tandon et al. (2017**) examined bank specific macroeconomic determinants of non-performing loans and their impact on the banking profitability. Multivariate panel data analysis for 35 Indian public and private sector banks over the period 2007-2016 concluded that NPA management in public sector banks needs attention as it affects the efficiency and profitability exponentially. **Mishra et al, (2020**) analysed macro-economic determinants of non-performing assets in the banking system, using panel data regression analysis and proved that public sector banks can be considered as less efficient in NPA management as compared to private sector banks. **Asha Singh (2013**) observed that the banking sector has been facing the serious problems of the rising NPAs. In fact public sector banks are facing more problems than the private sector banks. The NPAs in public sector banks are growing due to external as well as internal factors. One of the main causes of NPAs in the banking sector is the Directed loans system under which commercial banks are required to supply 40% percentage of their credit to priority sectors.**Swamy (2013)** offered a different view by expressing that share of priority sector credit is not significant in affecting the NPAs contrary to the general perception. **Mukhopadhyay (2018**) again asserted that in India, priority sector lending (under priority sector lending banks extend credit to agriculture and SMEs) is often stated as a significant reason for the accumulation of NPAs. However, it is established that for both public sector banks and private sector banksaccumulated NPAs in the priority sector is relatively small compared to the accumulated NPAs in the non-priority sector.

Singh, V (2016) is of the view that as profitability of Indian banks is highly dependent on income from interest on funds lent, GNPAs impact the profitability of banks. Also the NPA level of our banks is still high as compared to foreign banks. The government should make more provision for faster settlement of pending cases and it should reduce the mandatory lending to priority sector as this is a major problem creating area. **Tripathi and Syed** (2017) observed that public sector banks have major share in NPA growth because of low interest rate and government pressure of giving creditto priority sectors and also because of weak collection procedure by public banks. **Das and Dutta (2014**) studied NPA, its causes as well as its impact on the banking sector and the economy as a whole. The study was done on the State Bank of India and its associates and the other public sector banks based on the secondary data from 2008 to 2013 through ANOVA to find out whether there is any difference in the NPA occurrence between the various banks during the period of the study. It is concluded that there is no significant difference between the means of NPA of the banks. **Dhananjaya andRaj (2017)** studied the Inter Bank Disparity in Non-Performing Assets management in Indian Public Sector Banks. The accumulation of NPAs and the provision coverage ratio (PCR) of different banking groups like State Bank Group, Nationalised Banks, Private Sector Banks and the Foreign Banks was evaluated. It was observed that there is deteriorating asset quality of particularly Public Sector Banks which are in deep trouble in terms of rising NPAs and the consequent impact on their profitability. **Mishra and Pawaskar (2017)** did a ratio analysis by using Net NPA Ratio, Total Provision Ratio, Substandard Ratio and Doubtful Assets Ratio for the period 2011-16 of Bank of Maharashtra to obtain bank's trend of NPAs **.** It was observed that the bank needs to be proactive in the selection of clients and customers while improving performance in several key areas.Various analyses were used by **Nachimuthu and Veni (2019) to** find out the impact of NPAs on the profitability of the scheduled commercial banks for the period 2007-08 to 2016-17 and concluded that the profitability of the banks has reduced due to rise in the non-performing assets of scheduled commercial banks in India. **Garg (2019**) observed that due to the presence of a huge set of NPAs it has become difficult for the banks to

finance huge and fresh investments to the private sector. Lots of remedial measures need to be taken to revive lending. A critical review of non-performing assets in the Indian banking industry was done by **Agarwala V and Nidhi (2019)** who concluded that growth rate in the NPA level shows that the problem is evident not only with small-sized banks but also with big names in the banking space.. The NPAs not only impact the profitability level of these banks but also affects the shareholders' wealth. **Devika (2020**) observed that the public sector banks have defective lending process as they are not followed by cardinal principles. The recapitalization benefits public sector banks and reduces the stress level of loans. But growing Non-Performing Assets will make capital infused less effective and valuable for only a small period. **Wadhwa and Ramaswamy (2020**) in their research studied banks with highest NPA ratios for the period 2015 to 2019. Correlation analysis and multiple regression was applied to compute the impact of different financial heads on NPAs. The results revealed that NPA was negatively correlated with Net profits in the selected banks except HDFC Bank With the help of regression analysis it was also revealed that there was significant impact on Net Profits due to NPAs.

3. Growth of NPAs, Remedial Action and Analysis

The central bank of the country being the regulator of banking entities had created enough ways to correct stressed assets scenario of banks in India. This included creation of Corporate Debt Restructuring (CDR mechanism) in 2001, Refinancing 5:25 Scheme in 2014 and Strategic Debt Restructuring Scheme (SDR) in 2015. However the banks were still not making proper classification of assets and the unscrupulous promoters continued to take undue benefit of all these restructuring schemes. Banks were to blame as many large NPAs continued to be shown as standard accounts. The reasons were two fold. One was to show good balance sheets and the other was to escape the eye of investigating agencies as public money was at stake. RBI therefore decided to put an end to the forbearance before it was scheduled to end as banks were still hiding NPAs and also not following uniform procedures for classification of their loan portfolio. Many a time even in consortium lending some member banks were showing an account as NPA whereas others were projecting it as Non-NPA. Due to paucity of capital they were not making adequate provisions for their NPAs.

Banks could have taken out many accounts out of stress by giving due support but fearful of projects' even chances of revival after a second dose of financial support they did not help the promoters to put the projects back on track due to mistrust as the promoters failed to bring on steam the projects with the original project financing. Banks also apprehended chances of further diversion of funds. This slackened their credit growth affecting their financials like Operating Profit, Capital Adequacy, Return on Assets, Net interest Margin and Gross NPAs.

RBI had to initiate Asset Quality Review (AQR) in 2015 and inspected a large number of accounts to especially ascertain signs of ever-greening. Team of supervisors was assigned the job of cleaning up balance sheets of banks by inspecting the large borrowal accounts to check their classification as per prudential norms. As per economic reports about 200 accounts were identified as non-performing. It is interesting to see the growth of Non-performing assets of PSBs and Private Sector Banks before and after AQR from Figure 1 and Figure 2:

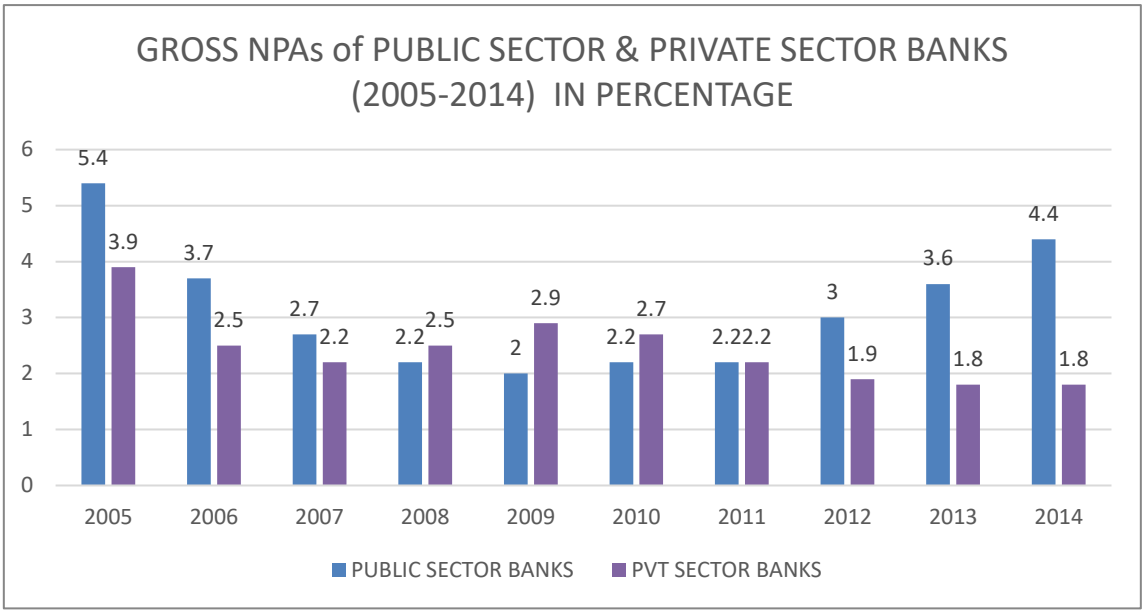


Figure 1 : Gross NPAs of PSBs & Private Sector Banks (2005-14)

(Data Source : RBI)

It can be observed from Figure 1 that gross NPAs of public sector banks were below 5 percent in all years except 2005 whereas for private sector banks it was below 4 percent. The banks were able to keep the ratio low by ever greening of very large accounts. The position took an adverse turn after the AQR (Figure 2):

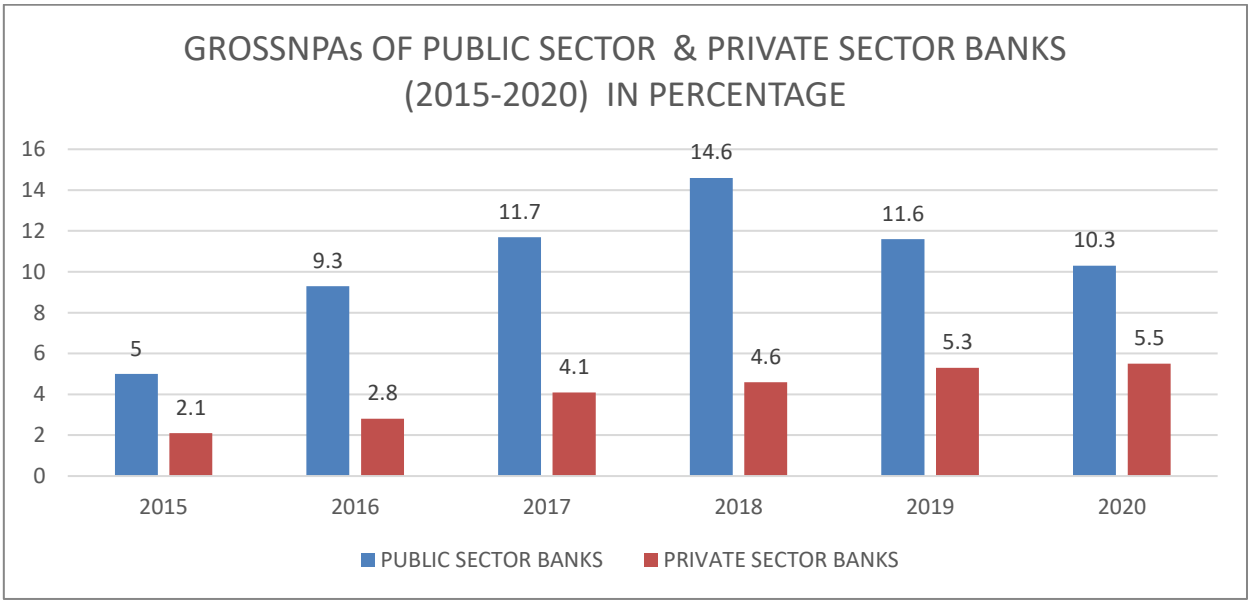


Figure 2 : Gross NPAs of PSBs and Private Sector Banks (2015-20)

(Data Source: RBI)

The above figure explains the sudden spurt in Gross NPA ratio of banks: It is quite clear that after RBI inspected the books of many banks and directed to classify many big accounts as NPA, the ratio slipped to 9.3 percent in 2016 and to 14.6 percent in 2018 for public sector banks. Similarly it slipped to 4.6 percent in 2018 and 5.5 percent in 2020 for private sector banks. The impact of AQR on individual banks can be seen from Table1:

Table 1:GNPAs of Selected Public Sector Banks

(In Percentage)

YEAR	PNB	OBC	UBI*	CORP	DENA	IOB	CBI**	UCO	BOI
2016	12.90	9.57	13.26	9.98	9.98	17.40	11.95	16.09	13.07
2017	12.53	13.73	15.53	11.70	16.27	22.39	17.81	17.12	13.22
2018	**18.38**	**17.63**	**24.10**	**17.35**	**22.04**	**25.28**	**21.48**	**24.54**	**16.58**
2019	15.50	12.66	16.48	15.35	21.07	21.97	19.29	**25.00**	15.84
2020	14.21	12.67	13.40	13.80	-----	14.78	18.92	16.77	14.78

(Data Source: RBI)

*United Bank of India **Central bank of India

It is established from Table 1 that in some of the public sector banks the incidence of NPA reached alarming proportion. In United Bank of India (UBI), Indian Overseas Bank and United Commercial Bank (UCO) it was about 25 percent which means one fourth of total advances were bad. The situation was worrisome as most of NPAs were destined to become Loss assets in next few years.

The classification of loan assets is depicted in Table 2:

Table 2: Classification of Loan Assets of PSBs

(In Percentage)

YEAR	STANDARD	SUB-STANDARD	DOUBTFUL	LOSS
2011	97.8	1.0	1.0	0.2
2012	97.0	1.6	1.2	0.2
2013	96.3	1.8	1.7	0.2
2014	95.6	1.8	2.4	0.2
2015	95.0	1.9	2.9	0.2
2016	90.7	3.4	5.6	0.3
2017	88.2	3.0	8.4	0.4
2018	85.4	3.5	**10.2**	**0.9**
2019	88.4	2.2	**8.2**	**1.2**
2020	89.7	2.1	**6.4**	**1.8**

(Data Source: RBI)

With respect to the classification of loan assets it is significant to observe that out of Non-performing Assets, Loss Assets (where there is 100 percent erosion of value) of public sector banks, continue to rise regularly over last few years (from 0.2 percent in 2011 to 1.8 percent of total advances in 2020). The doubtful assets (which are non-performing for more than 12 months) which were hardly 1 percent in 2011 went upto10.2 percent in 2018 and in 2020 have moderated to 6.4 percent of total advances of PSBs which implies that providing for these doubtful assets and loss assets continues to be a challenge for PSBs and requires massive recapitalization. The amount wise classification is depicted in Figure 3:

(Amount in Rs Lakh Crores)

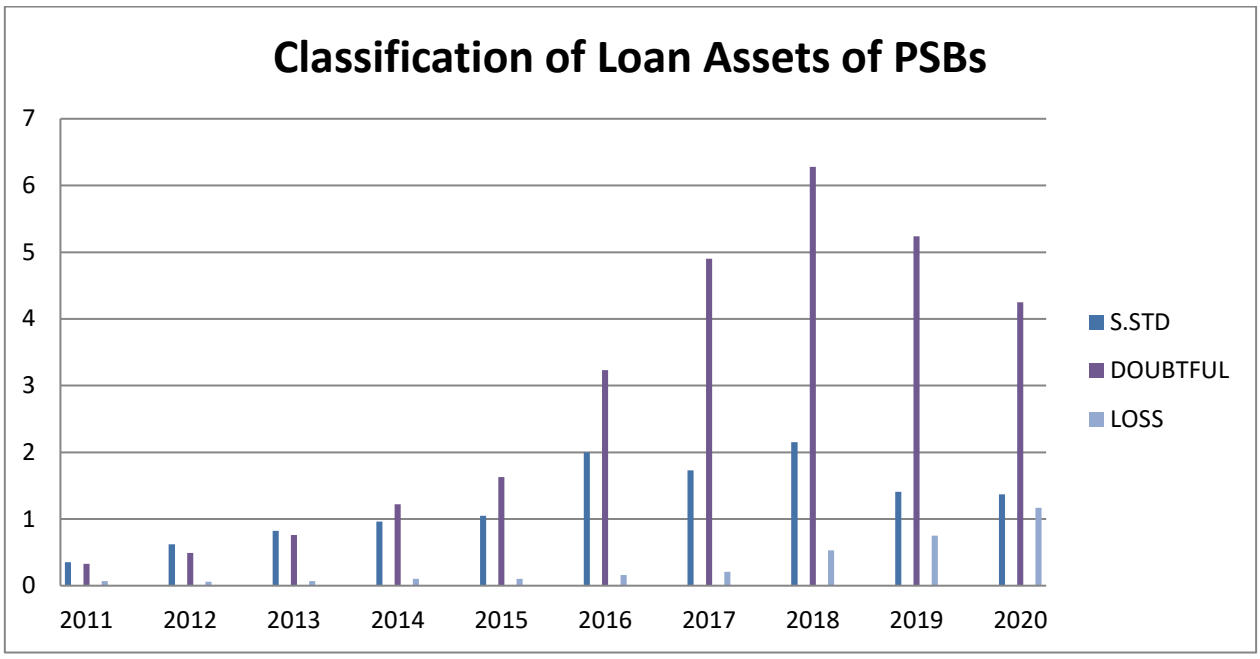


Figure 3: Classification of Loan Assets of Public Sector Banks

(Data Source: RBI)

The doubtful assets which were only Rs 33200 crore in 2011 reached an alarming proportion of Rs.627712 crore in 2018 and have since reduced to Rs 424828 crore in 2020 (as these shifted to loss assets). Similarly the loss assets which were only Rs 6500 crore in 2011 reached to a dangerous level of 116638 crore in 2020 after having risen continuously for the last ten years.

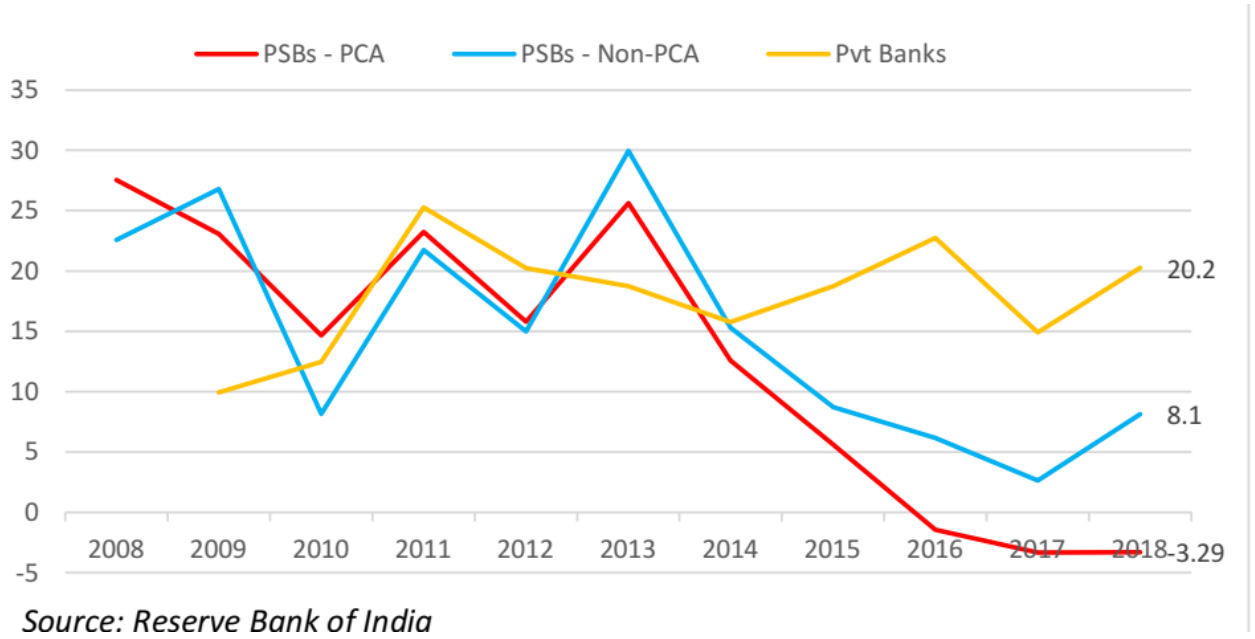
The serious fallout of rising NPAs and their continuous downgrading to loss assets in different banks is that their capital is eroded to a large extent. Equity capital is a protection against asset losses of an entity. It is the primary source of loss absorption and gives a sense of comfort to all stakeholders. The anticipated losses can be absorbed by a high level of capital. Banks in India were deeply impacted by very high level of NPAs and due to this reason their capital adequacy also took a deep cut. The inadequacy of capital leads an entity to bankruptcy and exposes the unsecured creditors (Depositors) of a bank. The depositors have only a limited insurance of Rs 5 lakhs from Deposit Insurance Guarantee Corporation of India (DICGC) and deposits beyond this limit are unsecured. As such the insolvency of a bank can pose a systemic risk to the economy (systemic is defined as a situation where problems affected banks which in aggregate hold at least 20 percent of the total deposits of the banking system -Dziobek and Pazarbasioglu 1997).

3.1 . Prompt Corrective Action

To check the high NPAs the Reserve Bank of India invoked Prompt Corrective Action (PCA) in April 2017. PCA is born out of the regulatory intervention which is enforced on banks in U.S.A. PCA works on the core principle of structured early intervention for corrective action on banks to check their financial deterioration (V.V. Acharya). It was invoked on many banks whose thresholds were breached relating to CRAR (regulatory Capital to risk-weighted assets ratio), Asset Quality, Profitability and Leverage. RBI had introduced PCA earlier also known as PCA Old-2002 but in 2017 it was named as PCA-Revised and implemented rigoursly on various banks. It has again been revised on Nov 2, 2021. The provisions of the revised PCA Framework will be effective from January 1, 2022.Eleven public sector banks which form a fifth of the total banks' credit and deposits were

placed under the PCA of 2017. Most of these banks had high GNPA ratios and had also breached thresholds as mentioned above by the regulator.

The rapid credit growth especially of the PSBs during 2010-2012 was mainly responsible for their stressed assets and consequent huge rise in NPAs. The reason was lack of strong credit appraisal and post sanction monitoring of disbursal of funds which were generally diverted to group companies and not utilized for completion of projects for which these were meant. The effect of being put under PCA was that these banks have to restrict expansion of their risk weighted assets. There are other restrictions like non-declaration of dividends and not to access/ renew costly deposits besides special audits of the bank. Due to PCA the growth of advances of these banks came to a halt.



Source: Reserve Bank of India

Figure 4: Yearly Growth of Advances (Percentage)

It can be observed from figure 4 that PSBs under PCA had a negative growth of advances in 2016-18 as there were restrictions imposed on them for further lending. Their share in banking sector advances had also gone down (Table 4):

Table 4: Bank Group wise share in Advances

(In Percentage)

Year	Public Sector Banks	Private Sector Banks	Foreign Banks
2000	79.41	12.56	8.03
2005	74.25	19.21	6.54
2010	77.24	18.08	4.68
2015	74.28	21.26	4.46
2020	59.80	36.04	4.16

(Data Source: RBI)

Table 4 indicates that share of public sector banks in credit has come down to 59.80 percent from 74.28 percent due to PCA. Many banks went slow on lending due to intervention of the regulator and paucity of capital required for credit expansion. The share of private sector banks has gone up from 21.26 percent in 2015 to 36.04 percent in 2020.

3.2. Recapitalization of Public Sector Banks

Given their significant share in the overall banking sector, the stability and solvency of Indian PSBs is of paramount importance. It is important that this group of banks being the major and dominant player in the economy of India is always well capitalized to offset any potential losses due to non-performing loans and frauds. Also adequate capital helps them to drive higher credit delivery expected from them. Basel committee on banking supervision (BCBS) also recommends to member countries to ensure that their banking system follows capital adequacy norms laid down by it .The last such recommendation for capital adequacy was made through Basel-3 in 2010 which was to be fully implemented by 31-3-2020.

Public sector banks at their own were not able to raise capital from the market due to their deteriorating financials. They had also invited the lens of the regulator due to not reflecting the true financial position of their affairs. However support was necessary to strengthen banks which were now undercapitalized due to keeping hefty provisions for bad loans some of which had to be completely written off. The government had been recapitalizing the public sector banks regularly though in small measures being the majority owner of these banks.

In order to build up the capital adequacy of the PSBs the Government of India, as the majority shareholder, infused Rs.1,18,724 crore from 2008-09 to 2016-17 in PSBs as reflected below:

Table 5 : Recapitalisation of Public Sector Banks
(Rs. In Crores)

YEAR	AMOUNT
2008-09	1900
2009-10	1200
2010-11	20117
2011-12	12000
2012-13	12517
2013-14	14000
2014-15	6990
2015-16	25000
2016-17	25000

(**Source: CAG Report No.28-2017)**

It can be noticedthat Government of India had to regularly step in and recapitalise the PSBs by using taxpayer's money. It is incumbent upon the government to safeguard the capital of such banks to enable them to fulfil the laid down objective of social upliftment by catering to credit needs of the economy.It has been observed by the Comptroller General of India that the Government of India (Department of Financial Services) did not follow the basis for capital infusion in different banks as per an understanding reached with PSBs in 2012. Rather the capital infusion was done to comply with the BASEL requirements of maintaining capital as per the accepted norms.

In view of continuous rising of NPAs and massive erosion of capital of public sector banks, Government of India therefore had to again give a booster dose of capital to PSBs by announcing a recapitalization plan for public sector banks in October 2017 for Rs 2.11 lakh crore. Again in FY 22 the government had set aside Rs.20000 crore in the budget for capitalization of Public Sector Banks

An RBI internal working group has recommended to allow large corporate houses to become bank promoters. Many recommendations of this group have been accepted and accordingly the country can

witness new private big banks in future. For last many years the banking industry in India is not having a reasonable growth (during 2010-15 the credit growth used to be between 20-25 percent). Since it is now widely known that this unbridled growth was due to large scale financing of unviable units, it can be construed that it may take years to revive credit growth in the economy. So it looks logical to enhance corporate business houses participation in banking in India as government may be on back foot for recapitalizing PSBs by tax-payers' money. There may be a requirement of 4-5 lakh crore of recapitalization needs for public sector banks in the next 3-4 years if growth targets for credit are to be revived and the target for a $ 5 trillion economy is to be achieved by 2025. Since opening up of banking sector further to big corporate houses (it contradicts strongly the theme of nationalization enunciated in 1969) has political overtones, it may take quite a few years for this to take shape. Meanwhile a major step has been taken by the Government of India is to restructure public sector banks by merger in 2018-2020.

3.3. Restructuring of Public Sector Banks

Bank restructuring denotes key changes in their operations, financial engineering and change of management to improve their financial health. This is resorted to meet the expectations of all stakeholders to make banks more profitable and as a consequence to reduce their dependence on shareholders for capitalization needs. If many banks in an economy experience challenges of survival this may also usher into a systemic risk. Banking entities worldwide have been facing the problems of liquidity and non performing loans .They also have to maintain adequate capital for growth and also as a buffer against loan losses. The second Narasimham Committee appointed by the Government in 1997 to suggest reforms in the Banking sector had made its recommendations for bank mergers. The committee submitted a report in 1998 and suggested for merger of banks. It was suggested that there be 2 to 3 banks in India of international size, 8 to 10 banks of national importance besides local banks for deeper penetration and higher financial inclusion in the country. Faced with a systemic risk the government had to implement the said recommendations even though quite late.

The various banks which were merged from **01-04-2019** are as under:

- **Bank of Baroda + Vijaya Bank+ Dena Bank** (Total Business Rs.16.13 lakh cr.)

The wide ranging benefits as claimed by the government from the above merger are growth, rationalization of operations, better technology for new products and capacity for garnering capital resources.

The second merger of nationalized banks which happened with effect from **01-04-2020** are as under:

- **PNB + OBC + United Bank of India** (Total Business Rs.17.94 lakh cr.)

The expected benefits out of the above merger are mobilisation of higher CASA, cost reduction due to consolidation of branches coupled with higher lending ability of the merged entity.

- **Canara Bank+ Syndicate Bank** (TotalBusiness Rs. 15.20 lakh cr.)

The government expects a high cost reduction due to rationalization of branches being south based banks and both having similar culture.

- **Union Bank + Andhra Bank + Corporation bank** (Total Business Rs.14.59 cr.)

The business is expected to increase two to four and a half times besides cost reduction due to merger of branches in near proximity as in case of other mergers.

- **Indian Bank + Allahabad Bank** (Total Business Rs.8.08 lakh cr.)

The rationale behind merger is increase of business to double through enhanced CASA and increase in credit operations.

Before this consolidation, associate banks and Bhartiya Mahila Bank (BMB) were merged with SBI which now has a total business of Rs. 52.05 lakh crore and is ranked at 45 among the top 50 banks of the world. It may be noted that Finance minister has laid down certain objectives for consolidation of PSBs as above but the implementation challenges will remain. Only future will unwrap whether the stated benefits of such merger / restructuring to make PSBs stronger and bigger are achieved. It shall be a worthwhile exercise if the Government does not have to recapitalize these banks and they can access capital markets directly for their requirements.

3.4. Present trend of NPAs

It was expected that Restructuring / Merger of PSBs will have a tectonic impact on reduction of NPAs due to increased profitability and higher capital to provide cushion for cleaning their books. Even though it is only 2-3 years for different set of mergers, there seems to be only a mild effect of the effort put in by the Government. The Table 6 exhibits the position of GNPAs of merged entities and other PSBs not considered for restructuring. The reduction seems to be more in the case of smaller banks not restructured whereas in some of the restructured banks like Canara and Indian bank GNPA ratio increased in 2021 after merger as reflected below:

Table 6: GNPA Ratio of Select PSBs after Amalgamation

(In Percentage)

YEAR	PNB	BOB	CANARA	UNION	INDIAN	BOI	IOB	PSB	UCO
2019	15.50	9.61	8.83	14.98	7.11	15.84	21.97	11.83	25.00
2020	14.21	9.40	8.04	14.15	6.87	14.78	14.78	14.18	16.77
2021	14.12	8.87	8.93	13.74	9.85	13.77	11.69	13.76	9.59
2022*	11.78	6.61	7.51	11.11	8.47	9.98	9.82	12.17	7.89

(Data Source:RBI)

*Figures of Year 2022 taken from respective banks investor presentations and may change after RBI audit.

The performance of unmerged banks like BOI, IOB and UCO is better than the amalgamated banks as these have been able to bring about significant reduction in their NPAs. Performance of the restructured PSBs and unmerged banks though looking better (Table 6) from gross NPA figures can however take a negative turn due to the following reasons:

- The pandemic has aggravated the crisis already being faced by all banks with the surge of NPAs. Due to COVID-19 there was a forbearance allowed to banks to declare NPAs as business activity had come to a halt due to lockdowns and thereafter restrictions on movements. With normalisation of business the moratorium granted earlier for repayment of loans has ended and therefore NPAs may surge.

- The government allowed an Emergency Credit Line Guarantee Scheme (ECLGS) for Rs.4.5 lakh crore (increased by Rs.50000 crore in budget for

FY 23) with a view to support various businesses impacted by the second wave of COVID 19 pandemic. The last date of disbursement under the scheme has now been extended to March 31, 2023. The scheme provides full guarantee coverage to banks and NBFCs to enable them to extend emergency credit facilities to Business Enterprises/ MSMEs having even high turnover to meet their additional term loan/working capital requirements upto 20 percent of their outstanding as on Feb 29, 2020. These relief measures are going to be highly misutilised by majority business units as the same is repayable with a longer tenure of 4 years. The reason is all restructuring schemes in the past have not been successful and huge diversion of funds has taken place. Borrowers are taking advantage of the legal process. Even if there are no stressed accounts, the borrowers take undue benefit of restructuring schemes due to weak checks and balances. These schemes are often used to reduce interest costs by softening the pricing term and elongation of repayment schedules without improving on the basic viability of the borrowing concern. Even Raghuram Rajan Ex- Governor Reserve Bank of India referring to the various restructuring schemes initiated conceded that these failed to bring the desired results towards reduction of NPAs. "Banks now had the power to resolve distress, so we could push them to exercise these powers by requiring recognition. The schemes were a step forward, and enabled some resolution and recovery, but far less than we thought was possible. Incentives to conclude deals were unfortunately too weak "

- Under KV Kamath committee recommendations 26 sectors have been selected which will require restructuring based on their financial parameters. All the major industrial and service sectors of economy are covered for government support. These are mostly the sectors which created maximum NPAs on the books of Scheduled Commercial Banks especially the PSBs during the economic optimism boom of 2009-2014. The financial parameters on the basis of which these sectors are to be restructured relate to leverage, liquidity and debt serviceability. Some of the financial ratios like debt to EBIDTA, Debt Service Coverage Ratio (DSCR), Current Ratio are to be met by the borrowers by fiscal 2023. It is highly unlikely that these benchmarks set by the committee will be achieved by the beneficiary units resulting into the need for second restructuring or slippage to NPAs.
- As per Report on trends and Progress of Banking in India 2019-20 by RBI the GNPA ratio of banks has mainly come down at the end-September 2020 due to resolution of a few large accounts through the Insolvency and Bankruptcy code (IBC).
- The reduction which appears in NPAs of many public sector banks is deceptive. It is due to cleaning of balance sheets of banks by technical write offs as NPAs more than four years require 100 percent capital coverage. Banks have written off Rs 2.02 lakh crore NPAs in FY 21 whereas they wrote off NPAs worth Rs 11.68 lakh crore in the last ten years. In the first six months of 2021-22 bad loans worth Rs 46382 crore were written off. This massive write off certainly reduces the NPA figures of banks. RBI's Financial Stability Report of January 2021, indicates that the GNPA ratio of all SCBs may increase from 7.5 per cent in September 2020 to 13.5 percent by Sept, 2021. If the economic environment worsens further, the NPAs are estimated to rise to14.7 per cent under a severe stress scenario. Though NPAs might reduce by Dec2021, the final classification will be done at year end March 22 after the mandatory annual statutory audit of different branches / banks.
- Bankers may refrain from selling NPAs to asset reconstruction companies (ARCs) due to the fear

of post-facto investigations in their action (Recent Income Tax Department's Search action on four ARCs revealed that they had adopted various unfair and fraudulent trade practices in acquiring these loans. Banks may therefore now depend more on IBC and /or the bank-led National Asset Reconstruction Co Ltd (NARCL). The IBC route initially helped banks for faster time bound resolution of their NPAs but with passage of time got diluted with litigation by both borrowers and banks.

- The bigger banks are finding it difficult to find offtake of their funds by corporates as they are able to raise money successfully from the market by making big Initial Public Offers (IPOs). Unless the loan book of banks grows the percentage of NPAs will not come down.
- There are still many big restructured corporate accounts with public sector banks. Their classification as NPA might have been deferred due to paucity of capital. With passage of time these will surface and add to the NPA kitty of banks.
- The unending war between Russia and Ukraine and the threat of it turning into nuclear has resulted in disruptive supplies and high oil/energy prices. It may adversely impact many of our trading partners and domestic sectors of economy. The surging inflation and soaring prices of commodities without commensurate rise in earnings may impact retail loan segment of banks. The significant depreciation of rupee despite the central bank selling its dollars to curb its free fall and its impact on the capital goods import may affect many a new industrial and service projects and generate new big NPAs in Corporate sector.

4. CONCLUSION

During the global depression of 2008 forbearance helped borrowers to tide over hardship caused due to the crisis. As per the Economic Survey 2020-21 the government should have stopped the restructuring window in 2011when the economy had bounced back after the recession of 2007-08 .The continuance of forbearance resulted in serious damage to the banks, borrowers and the economy in general. The continuation of soft handling of potential NPAs of banks ultimately harmed all the stakeholders. Borrowers benefitting from the banks' lack of proper technical and financial appraisal invested in unviable projects most of which never commenced operations thus adding to the NPA baggage of banks. Similarly the inflated profits of public sector banks due to not reflecting the true classification of their loan portfolio prompted them to pay increased dividends to shareholders (mainly the government).This ultimately led to banks' huge undercapitalization when forced by the regulator after AQR to classify their loan assets as per prudential norms. It is generally said that future is uncertain and generates fear among the mankind. With all good intentions of all stakeholders various measures have continuously been taken in the past to make banks globally competitive. The liberalization and privatization resorted to earlier to integrate the Indian economy with the world has not brought the desired results. The great financial crisis of 2008, unbridled growth during 2009-2014 of mostly unviable projects resulting in massive deadwood for the banks in the shape of NPAs, inefficacy of the legal system for bank recoveries and frauds perpetrated on the system by dubious businessmen (moral hazard) have made banks weak on financials. The present macroeconomic environment does not support growth in manufacturing, mining and infrastructure resulting in everyday declining GDP estimates. COVID-19 and Omicron have taken a heavy toll on all sectors of economy and eroded employment and the resultant consumption by the people. Banks worldwide are embarking upon new Digital Innovations, Artificial Intelligence (AI) and Crypto currencies. All this is very challenging and scary for our enormously weak Indian banking sector. One can

expect many more mergers of the weak links in the system since it impacts our citizens in a big way. In private sector the cases of YES Bank, Lakshmi Vilas Bank and Punjab Maharashtra Cooperative (PMC) Bank are recent examples where the Government of India has been proactive and put efforts to salvage the situation.

With growth in non-performing assets concurrent with likely opening and expansion of the economy, there may be further need for massive capitalization of public sector banks. The government on its part seems not to recapitalize banks by taxpayers' money as it becomes a political issue. It is this reason that in budget for FY 23 there is no budgetary allocation for capitalization of public sector banks. The fact remains that unless the performance of smaller banks improves and they are able to plough back profits or they are capitalized by government support, they cannot be sold to the new investors. This is evident from the fact that privatization of two of the public sector banks (names not disclosed) which were announced by the Finance Minister in the budget for 2022 seems to have been put on hold .As the investors will look for some value in their new acquisitions, the banks with poor financials cannot be privatized. The Government needs to put hardcore professionals at the boards of different banks and also give them a free hand to bring operating efficiencies and the confidence to tackle big NPA accounts without witch hunting. The need of the hour is to study the NPA malaise thoroughly and to rectify situation to make the banking system robust sooner than later. A strong banking system is crucial for a developing economy and its failure is bound to have a dampening effect on other segments of the economy also. Accordingly it is a bigger priority to ensure that the banking system takes early cognizance of the impending stress in the borrowal accounts. There is already a restructured standard advances portfolio of Rs.58424 crore with PSBs as at end of March 2021. Much of this restructured portfolio of public sector banks may be on a threshold of becoming sub-standard or NPA. Proper monitoring of such restructured advances is required to keep these in standard category otherwise it can prove quite damaging to the financial health of respective banks in next few years. Unless the top managements are able to tackle NPAs effectively and bring down the numbers substantially, they will not be able to perform their developmental role for growth of their organizations and the economy.

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Ultrasound-Assisted Green Synthesis of Nanoparticles and their Applications

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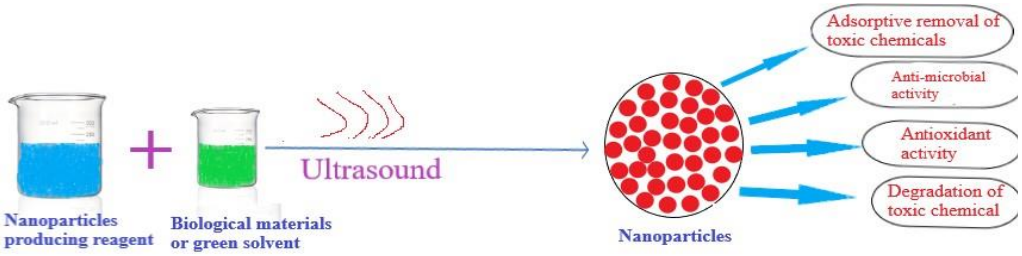
ABSTRACT

Since the 1990s, the popularity of green synthesis has been steadily increasing because the process is environment-friendly, cost-effective and requires biological materials or green solvent. In the present case, the ultrasound-assisted green synthesis of nanoparticles has been studied. Nanoparticles provide more surface area and active sites compared to their bulk materials and hence they are more effective in applied fields. The potential use of nanoparticles in adsorptive removal of toxic chemicals, catalytic use in degradation of dyes, pesticides, pharmaceutical drugs etc., antioxidant activity and antimicrobial activity has been highlighted. Antioxidant activity of nanoparticles was performed by scavenging DPPH free radicals. Antimicrobial activity of synthesized nanoparticles was tested on some bacteria such as Escherichia Coli, Enterococcus faecalis, Salmonella typhimurium, Staphylococcus aureus, Bacillus subtilis, Streptococcus faecalis, Klebsiella pneumoniae, Streptococcus pyogenes etc. The catalytic activity toward degradation of methylene blue, methyl orange, 4-nitrophenol, Rhodamine B and parasoaniline were tested by the researchers. The use of nanoparticles as adsorbents for the removal of malachite green, Rhodamine B, Cu2+ metal ion and BR18 synthetic dye has been demonstrated by the researchers.



Keywords : Ultrasound, Sonication, Green synthesis, Nanoparticles, Antimicrobial activity, antioxidant activity, Degradation of toxic chemicals, Adsorptive removal

I. INTRODUCTION

The concept of green chemistry and green synthesis was initially developed after the U.S. pollution prevention act (1990) which declared to reduce pollution by improving the design. Green synthesis involves the use of cost-effective biological materials, use of green solvents such as water, ethanol etc., use of raw materials and recycling of the process. Green chemistry and green synthesis became more popular among researchers as they could reduce environmental pollution. A large number of chemical compounds such as toothpaste, soap, detergents, medicines, toilet cleaner, vinegar, Epsom salt, hand sanitizer, shampoo, insect repellent etc. have been used by us in our daily life. In most cases, the synthesis of these chemical compounds involves several steps releasing chemical waste which comes out with the industrial effluents. With the increasing global population, the environment becomes more polluted by chemical compounds. Green synthesis may help us to reduce such types of chemical pollution as it produces less toxic or non-toxic side products.

Particles with diameters 1-100 nm are known as nanoparticles. Nanoparticles generally show different physical and chemical properties compared to their bulk materials. Nanoparticles are widely used in medicines, tissue engineering and regenerative medicine [1], diagnosis and treatment of breast cancer [2], as an electrode in electroanalysis [3], as an agent to control pests [4] and as activity against bacterial growth [5]. The use of nanoparticles is also found in sustainable agriculture. Uses of nanofertilizers, nanopesticides, nano-plant growth promoters and nanoherbicides have been developed for potential use in agriculture [6,7]. Nanoparticles are frequently used as an adsorbent for the decontamination of water and wastewater from synthetic dyes, drugs, pesticides and many other contaminants. They provide more surface area as well as more active sites which facilitate the adsorption process. Nanoparticles have great importance for their catalytic activity in the degradation of toxic chemicals. The antioxidant activity of nanoparticles by scavenging DPPH radicals was also reported by researchers [5,8].

Ultrasound is a sound wave with a frequency greater than the upper audible limit of human hearing. The frequency of ultrasound may vary from 20 kHz to several gigahertzes. Although humans can't hear this sound, its use is immense in various fields including medical science and chemical synthesis. Ultrasound-assisted synthesis is found quite effective in organic synthesis. Mostly, the reactions under influence of ultrasound have taken place via cavitation. Ultrasound has also been noticed important use for the initiation or enhancement of homogeneous and heterogeneous catalytic reactions [9]. Ultrasound is also widely used to disperse material in a suitable solvent. Ultrasound-assisted green synthesis of nanoparticles and their applications towards antimicrobial activity, antioxidant activity, catalytic activity and adsorptive removal of contaminants have been studied in this review paper.

II. DISCUSSION

Green synthesis of CuO nanoparticles was performed by Gu et al. (2017) [5] using extract of a brown alga, Cystoseira trinodis. They synthesized colloidal CuO nanoparticles from copper sulphate and extract of Cystoseira trinodis in presence of ultrasonic conditions (500 Hz, 20 kH). The antimicrobial activity of synthesized nanoparticles was examined against a few bacterial strains such as Escherichia

Coli, Enterococcus faecalis, Salmonella typhimurium, Staphylococcus aureus, Bacillus subtilis, and Streptococcus faecalis. They reported that the synthesized nanoparticles exhibited excellent activity against bacterial growth. Gu et al. (2017) [5] also reported the antioxidant property of synthesized nanoparticles by performing the DPPH free radical scavenging activity. They also studied the degradation of synthetic using synthesized nanoparticles as a

catalyst. The degradation of methylene blue was performed by varying dye concentration, pH, and amount of catalyst in presence of sunlight and UV light. Mahmoodi et al., (2019) [10] synthesized a novel bio-based metal organic framework nanocomposite, ZIF-67@Fe_3O_4@ESM, and the synthesized adsorbent was utilized to remove Cu^{2+} metal ion and BR18 synthetic dye from water. The green ultrasound method was selected for the synthesis of the eggshell membrane-zeolitic imidazolate framework. The adsorbent was employed to remove pollutants by the adsorptive method. It was found that the pseudo-second-order kinetic model and Langmuir isotherm model fitted well with the experimental data showing the maximum adsorption capacity of 344.82 and 250.81 mg g^{-1} corresponding to Cu^{2+} and BR18 concentration respectively. P´erez-Beltr´an et al. (2021) [11] studied the ultrafast green synthesis of magnetic nanoparticles from a solution of $FeCl_2{\cdot}4H_2O$ and $FeCl_3{\cdot}6H_2O$ by a sonochemical approach. They employed different methods for the functionalization of bare magnetic nanoparticles by several coating agents such as chitosan, polydopamine etc. The enzymatic inhibition study was carried out with functionalized magnetic nanoparticles. Anchoring of antibody and immunoprecipitation studies were also carried out with the functionalized magnetic nanoparticles. A green synthetic method of gold and silver nanoparticle synthesis was reported by Fatimah et al. (2019) [8]. Clitoria ternatea flower extract was used to synthesize nanoparticles of Ag and Au with particle size ranging from 18 to 50 nm. The antioxidant activity of Au and Ag nanoparticles was evaluated by scavenging DPPH radicals. The antibacterial activity of synthesized nanoparticles was investigated against Escherichia coli, Klebsiella pneumoniae, Streptococcus pyogenes, and Staphylococcus aureus. Ruíz-Baltazar et al. (2021) [12] reported the sonochemical activation-assisted biosynthesis of Au/Fe_3O_4 nanoparticles. Ruíz-Baltazar et al. used the extract of Piper auritum, an endemic plant, as a reducing agent during the biosynthesis of Au/Fe_3O_4 nanoparticles. The synthesized nanoparticles were employed to the ultrasound-assisted catalytic degradation of methyl orange in a dark room to nullify the photocatalytic effect. Dheyab et al. (2021) [13] reported the synthesis of highly stable gold nanoparticles by the sonochemical method by using an ultrasonic probe in an aqueous solution of sodium citrate and $HAuCl_4$. The synthesized nanoparticles were employed as a catalyst for the degradation of methylene blue by sodium borohydride. Akilandaeaswari and Muthu (2021) [14] reported the one-pot synthesis of bimetallic nanoparticles in an ultrasonic bath. In order to synthesize Au/Ag bimetallic nanoparticles, an aqueous solution of $HAuCl_4$ and $AgNO_3$ was taken with the extract of Lawsonia inermis seed in an ultrasonic bath operating at 40 kHz. The synthesized bimetallic nanoparticles were applied for the catalytic degradation of methyl orange and 4-nitrophenol.

Synthesis of ultrasound-assisted SnO_2 nanoparticles was reported by Fathima et al. (2022) [15] via Tinospora cordifolia stem extract and reduction methods. The synthesized nanoparticles were tested for degradation of Rhodamine B dye in an aqueous solution. Ultrasound-assisted green synthesis of silver nanoparticles was reported by Nouri et al. (2020) [16] using Mentha aquatica leaf extract. The preparation of leaf extract was also carried out by an ultrasonic probe. They prepared silver nanoparticles from silver nitrate solution and Mentha aquatica leaf extract in presence of ultrasound by varying pH, ultrasonic power, temperature, and volume of silver nitrate solution to Mentha aquatica extract. Nouri et al. studied the antibacterial and catalytic activity of synthesized nanoparticles. Catalytic reduction of methylene blue was carried out using ultrasound-assisted synthesized silver nanoparticles by varying pH, $NaBH_4$/ methylene blue molar ratio, and amount of catalyst. They also studied the antibacterial activity of synthesized nanoparticles against two gram-positive bacteria namely, P. aeruginosa and E. coli.

Vatandost et al. (2020) [17] reported the synthesis of reduced graphene oxide from grapheme oxide precursor using the extract of green tea. In this method, the green tea extract was prepared by applying a sonicator. The reduced graphene oxide nanoparticles were employed to detect the electrochemical detection of sunset yellow in the food products. Green synthesis of iron oxide and silver nanoparticles was reported by Deshmukh et al. (2019) [18] using fenugreek seed extract. The ultrasound-assisted silver nanoparticles were synthesized from silver nitrate and fenugreek seed extract where the seed extract was found to behave as a reducing and capping agent. Ultrasound-assisted synthesis of iron oxide nanoparticles was performed from a mixture of $FeCl_3$ and $FeCl_2$. The antibacterial activity of synthesized nanoparticles was investigated against two bacteria namely S. aureus and E. coli. Deshmukh et al. (2019) [19] reported the synthesis of hexagonal boron nitride nanosheet using various plant extracts as a green solvent. They reported that the plant extract was used as a reducing, capping and stabilizing agent. The adsorption of plant extract was found on the surface of h-BN and thereafter the plant extract weakened the interlayer interaction exfoliating h-BN in the form of layer nanosheets. The synthesized h-BN nanosheets were applied to study the antioxidant activity by scavenging DPPH radical. Besides the antioxidant activity, they also studied the adsorptive removal of both cationic and anionic dyes. Sonochemical synthesis of platinum nanoparticles was reported by Jameel et al. (2021) [20] using Prosopis farcta fruit extracts. An aqueous solution of K_2PtCl_4 and Prosopis farcta fruit extracts were subjected to an ultrasonic solid horn of 20 kHz. Prosopis farcta fruit extracts behave as the reducing agent in the synthesis of black-coloured platinum nanoparticles. Jameel et al. (2021) [20] also reported the mechanism and the effect of solvent properties on the ultrasound irradiation power. They did not mention any application of their synthesized platinum nanoparticles in this research paper. CDS/multiwalled carbon nanotube quantum dots was synthesized by Kandasamy et al., (2020) [21] using an ultrasound-assisted microwave method. Opuntia ficus-indica fruit sap was used in the synthesis of the quantum dots. The photocatalytic activity of CDS/multiwalled carbon nanotube quantum dot was studied for the degradation of parasoaniline dye. Mahmoodi et al. (2019) [22] reported the green ultrasound-assisted magnetic amine functionalized carbon nanotube (NH_2-CNT/Fe_2O_3)-zeolitic imidazolate framework-8 nanocomposites. The synthesized nanocomposites were applied to the removal of two cationic dyes namely malachite green and Rhodamine B.The optimum condition of dye removal obtained from RSM study was found at pH=6.0, adsorbent dose = 0.004 g, contact time = 145 min and dye concentration = 25 mg/L. Adrover et al. (2017) [23] described the synthesis of hierarchical FAU zeolite with uniform nano-sized crystals. They prepared a precursor gel containing Na_2O, Al_2O_3, SiO_2 and water with the molar composition of 9.5:1.0:14.0:288. The precursor gel was sonicated for 1 h at 47 kHz followed by hydrothermal treatment at 60^0C for 48 h under the static condition to obtain nanocrystalline zeolite. They also performed the aging pretreatment by mechanical agitation instead of sonication.

Conclusion

A large number of research papers have been published in different journals every year on the green synthesis of nanoparticles. Among these, few papers have reported the ultrasound-assisted synthesis of nanoparticles. This review paper briefly describes the ultrasound-assisted synthesis of nanoparticles along with the required materials. The applications of synthesized nanoparticles toward the degradation of toxic chemicals including synthetic dyes, adsorptive removal of toxicants, antibacterial activity and antioxidant activity by scavenging DPPH free radicals have been studied in this paper. This paper may be

helpful for those researchers, who are engaged in the synthesis of ultrasound-assisted nanoparticles.

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Assessment of Total Hardness (TH) Rising Towards Danger in Ghaghara River Water at Saran District

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ABSTRACT

Due to the presence of unwanted substances in the water of the rivers of India, its quality is getting reduced drastically. The lack of quality in the water of the river is becoming a problem for the aquatic life and human beings. Due to the increase in the total hardness of the river water, agricultural work and industries based on it are also getting affected. The increasing total hardness in the water of the Ghaghara river is affecting the current aquatic life and the work of human interest. This is the reason why we needed to study the total hardness of the Ghaghara river water.

The Ghaghara River is one of the important rivers of the country. Based on mythological texts and religious beliefs, it is considered a holy river. The Ghaghara river is known as the Sarayu river in the mythological texts of India. The Ghaghara River flows in the south direction of Chhapra town in Saran district. The water of Ghaghara river from Bhaironpur Nizamat of Doriganj to Bahuara was studied. It is between 25.7293691 North Latitude and 84.8284750 East Longitude to 25.8897213 North Latitude and 84.4919165 East Longitude. Pre-monsoon and post-monsoon water samples were studied from several major locations and their total hardness and other parameters were checked. *The total hardness of water samples found to vary in the range of 164.0 ppm to 192.0 ppm with an average of 179.11 ppm and median value of 180.0 ppm in pre-monsoon and the range of 76.0 ppm to 124.0 ppm with average value of 90.58 ppm and median of 88.0 ppm in post-monsoon.*

After examining the water sample, the data of the results obtained was studied, it was founded that the total hardness of river water was very high before monsoon but its total hardness is very less after monsoon. The average total hardness in pre-monsoon water was 179.11 ppm but its post-monsoon average total hardness only 90.5 ppm. This result proves that 86.69% increase in total hardness of water obtained by nature is due to other reasons. According to the Indian Constitution, it is the duty of all of us to protect the natural resources. It is expected from the state and central government that there is a need to manage the water of Ghaghara river through scientific methods to check the increasing total hardness.

Keywords: Total hardness, Rising, Ghaghara River, Saran District.

I. INTRODUCTION

Due to the presence of unwanted substances in the water of the rivers of India, its quality is getting reduced drastically. The lack of quality in the water of the river is becoming a problem for the aquatic life and human beings. Due to the increase in the total hardness of the river water, agricultural work and industries based on it are also getting affected. The increasing total hardness in the water of the Ghaghara River is affecting the current aquatic life and the work of human interest. This is the reason why we needed to study the total hardness of the Ghaghara river water.

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II. METHODS AND MATERIAL

Hardness in water causes scale formation in boilers. Hard water does not produce lather with soap, so it is difficult to wash clothes or do other tasks. Generally, salts of Ca (Calcium) and Mg (Magnesium) contribute hardness to natural waters.

There are two types of hardness of water:

(i) Temporary hardness (ii) Permanent hardness

Temporary hardness: The hard water in which present magnesium and calcium hydrogen carbonate is called temporary hardness. It can be removed by boiling method.

Permanent hardness: The hard water in whit present magnesium and calcium chloride or sulphate is called permanent hardness. i.e. $MgCl_2$, $MgSO_4$, $CaCl_2$, $CaSO_4$. It could not remove by boiling method.

Principle

In alkaline condition EDTA reacts with Ca (Calcium) and Mg (Magnesium) to form a soluble chelated complex. When hard water is treated with EDTA and Eriochrome Black T indicator, it changes from wine rate colour to blue, indicating the point of filtration. The pH for this titration has to be maintained at 10.0 ± 0.1. When the pH is high, calcium ions is present in it and 12 g of magnesium ions is precipitated. At this pH Murex indicator form a pink colour with Ca^{2+} When EDTA is added Ca^{2+} gets complex resulting in a change from pink to purple which indicates end point of their action.

Interference

By addition of inhibitors the lkexan can be removed in presence of metal ion.

Reagents

1. Buffer solution: Dissolve 16.9 g NH_4Cl (Ammonium chloride) in 143 NH_4OH (Ammonium hydroxide). When 1.25 g of EDTA magnesium salt is mixed and diluted to 250 ml, the indicator changes rapidly.

2. Inhibitor: Dissolve 4.5 g hydroxyl amine hydrochloride in 100 ml 95% ethyl alcohol.

3. Eriochrome Black T Indicator: Mix 0.5 dye with 100 g NaCl to prepare dry powder.

4. Standard EDTA solution 0.01 M: Dissolve 3.723 g EDTA sodium salt and dilute to 1000 ml. Standardize against standard Ca solution, 1ml = 1 mg $CaCO_3$.

5. Standard calcium solution: Weigh accurately 1.0 g AR grade $CaCO_3$ and transfer to 250 ml conical flask. Place a funnel in the neck of a flask and add 1+1 HCl till $CaCO_3$ dissolves completely. After adding 200 ml distilled water to it and heat it for about 20

to 30 minutes to expel CO_2 Cool and methyl red indicator. Ad NH_4OH 3N drop wise till intermediate orange colour develops.

Procedure

1. Keeps the sample in a 50 ml conical flask.
2. Add a pinch of Eriochrome Black T and titrate with standard EDTA (0.01 M) till wine red colour changes to blue. Record the volume of calcium and EDTA (X)
3. Run a reagent blank if buffer is not checked properly. Record the volume of calcium and EDTA (Y)
4. Calculate vol. of EDTA required by sample, C = (X-Y) from vol. of EDTA required in steps 3 & 4.
5. **Calculate as follows:**

$$\text{Total hardness mg/l as } CaCO_3 = \frac{\text{C x D3 x1000}}{ml\ in\ sample}$$

Where,

C = Vol. of EDTA required by sample.

D = mg $CaCO_3$ = per 1.0 ml EDTA 0.01 M used as titration.

III. RESULTS AND DISCUSSION

A. Statistical Data of Total Hardness Pre-Monsoon Post-Monsoon (Table 01)

Parameters.	Unit	Desirable Limit*	Mximum	Minimum	Average	Median
Pre-TH	mg/l	200	192.00	164.00	179.11	180.00
Post-TH	mg/l	200	124.00	76.00	90.58	88.00

B. Table 02: Histogram of Total Hardness (TH)

Histogram of Total Hardness (Post-monsoon)		
Range	*Frequency*	*Cumulative %*
70-80	8	18.18%
80-90	16	54.55%
90-100	16	90.91%
100-110	1	93.18%
110-120	2	97.73%
More	1	100.00%

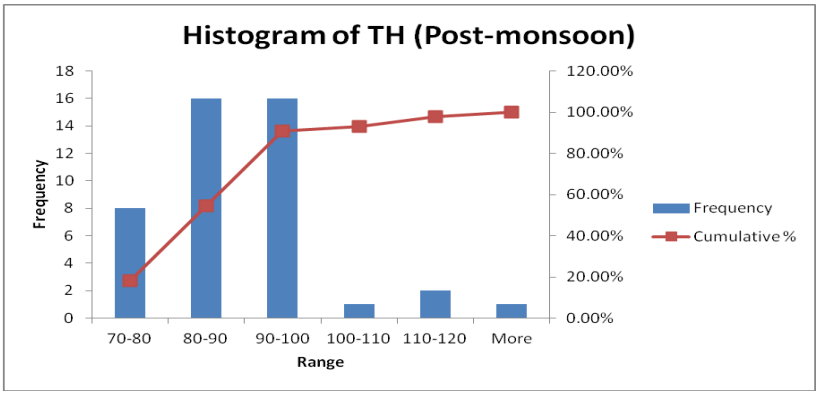

Figure 01: Bar Chart of Total Hardness (TH)

C. Data Analysis & Discussion

After examining the water sample, the data of the results obtained was studied, it was found that the total hardness of river water was very high within desirable limit before monsoon but its total hardness is very less after monsoon. The all parameters were almost within the standard limits but TDS and Iron was increased.

The total hardness of water samples found to vary in the range of 164.0 ppm to 192.0 ppm with an average of 179.11 ppm and median value of 180.0 ppm in pre-monsoon and the range of 76.0 ppm to 124.0 ppm with average value of 90.58 ppm and median of 88.0 ppm in post-monsoon. The total hardness of water in both pre-monsoon and post-monsoon is within the standard limit but its total hardness is very less after monsoon. *The average pre-monsoon total hardness in water is 179.11 ppm but its post-monsoon total hardness only 90.5 ppm. This result proves that 86.69% increase in hardness of water obtained by nature is due to other reasons.* The rising in total hardness of river water can be dangerous.

IV. CONCLUSION

After studying the data of the results obtained, it was founded that the total hardness of river water was very high before monsoon but its total hardness is very less after monsoon. The average pre-monsoon total hardness in water was 179.11 ppm but its post-monsoon total hardness only 90.5 ppm. This result proves that 86.69% increase in total hardness of water obtained by nature is due to other reasons. The rising in total hardness of Ghaghara river water can be dangerous. According to the Indian Constitution, it is the duty of all of us to protect the natural resources. It is expected from the state and central government that there is a need to manage the water of Ghaghara River through scientific methods to check the increasing total hardness.

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Digital Marketing Strategy in India

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ABSTRACT

This research aims to provide input to PT. ABC India in the digital marketing industry about a strategy that will provide competitive advantage from other competing companies in the digital marketing industry. The data processed with descriptive qualitative methods of Milles and Huberman,The data collected based on primary and secondary data through direct interviews with companies in the digital marketing industry to look at external and internal factors that include PESTLE (Political, Economic, Social, Technological, Legal, Environmental), 5 Forces Porter, RBV (Resource Based View) methods at PT. ABC India . Recommendation Strategy based on VRIO (Valuable, Rare, and Imitability Organized) to see the resources are a competitive disadvantage, competitive advantage parity, or sustainable competitive advantage and SWOT (Strength, Weakness, Opportunities, Threat) matrix to see and create alternative strategies that can be implemented firmly.

Index Terms : Strategy, VRIO, SWOT, Competitive Advantage, Competitive Disadvantage

I. INTRODUCTION

THE development of rapidly advancing information technology on a global scale is increasingly exacerbating the company's business competition when senior management needs to think about strategic steps in each plan of business activity. One of the company's efforts to win the competition is to use the Internet as a complete and accurate medium. The presence of the Internet is very helpful in providing information and knowledge. Increasingly, the Internet, as a communication and information medium, will facilitate the rapid dissemination of information for all users, especially consumers.

Table 1: The world's largest Internet user in 2018

No	Country	Total
1	China	855.0
2	India	469.5
3	India	121.6
4	Japan	104.8
5	Russia	97.9
6	Brazil	138.2
7	USA	285.4

The above picture shows that the population of India is 262 million people that of Internet users in India is 121 million, 46% are active users. The following data

relates to the effectiveness of digital marketing based on its platforms.

A strategy is a way to achieve long-term goals. Business strategies can be in the form of geographic expansion, diversification, acquisition, product development, market penetration, employee rationalization, divestment, liquidation and joint ventures (Kartajaya in Yuliana, 2013). The strategy is a unified, comprehensive and integrated plan that addresses the company's strategic superiority to environmental challenges and ensures that its business objectives can be achieved through its proper implementation (Nitisemito in Yuliana, 2013). According to David (2015: 39), management strategy can be defined as the art and science of formulating, implementing, and evaluating cross-functional decisions that enable an organization to achieve its goals. Barney and Clark in Butarbutar et al. (2017) prsssssssssssssssssssssssssoffers a sustainable competitive advantage. First, resources must be valuable (V) or provide added value to the end product and consumers. Second, these resources are hard to obtain or rare (R). Unless it is difficult to source resources, there is equality of the competition. Third, resources must be difficult to replicate or have low imitability (I) because they are historical, have a causal link with a performance that is difficult to understand, socially complex, or in fact cannot be replaced. Finally, these resources must be well utilized by the organization (O). Therefore, strategic planning must analyze the factors of corporate strategy (strengths, weaknesses, opportunities, and risks) under the current conditions. The SWOT analysis compares external opportunities and threats with internal strengths and weaknesses. Barney in Setiawan (2017) defines strategy as a business theory for successful competition. The implementation of business theory on competitive behavior has three effects on a company's competitive position:1. Very successfully compete for competitive advantages, 2. Successful competition for equality of competition, 3. Competition is unsuccessful to gain competitive disadvantages, that is when the company's actions in an industry. Offer no economic added value.

II. RESEARCH METHOD

The research approach is incorporated into descriptive research with a qualitative approach. Understanding Qualitative Research is research that seeks to understand the phenomena that are experienced by research topics holistically and by a description in the form of words and language in a special complex that is natural, and using various natural methods (Moleong in Bayu Aji) Pernama Journal, 2012). A qualitative descriptive approach is used, with the aim that this research can be carried out in-depth to provide answers to the problems formulated. This type of research is descriptive research with the aim of systematically, factually and accurately describing the facts and characteristics of populations and certain objects. Qualitative research does not prioritize population size or the sample is very limited, even among the population or sample. If the data collected is profound and can explain the studied phenomenon, there is no need to look for other samples. Here the problem of the depth (quality) of the data and not the quantity) of the data is emphasized more. The Unit Analysis in this study is the digital marketing industry of PT ABC India. The technique of data acquisition takes place over the cross- sectional time horizon. According to Sekaran and Bougie (2013: 106), cross-sectional research is a study that can be conducted if the data is collected only once. The data collection techniques used in this study include the interview method, observation method, and documentation method.

III. RESULTS AND DISCUSSION

a. V R I O Results

Based on the data that has been obtained and analyzed, VRIO FRAME described in the following table:

No	Capabilities & Resources	Type of Resource					Categories
1	Human Resource	Human Capital			o		Competitive Disadvantage
2	Employee loyalty	Human Capital			o		Competitive Disadvantage
3	Distribution of employee work	Structural Capital			o		Competitive Disadvantage
4	Relationships between employees	Structural Capital			o		Competitive Disadvantage
5	Relationships with suppliers	Relational Capital			o		Competitive Disadvantage
6	Relationships between employees	Relational capital			x		Sustainable competitive Disadvantage
7	Relationships with customer loyalty	Relational Capital			x		Competitive Disadvantage
8	Employee ideas	Human Capital			x		Competitive Disadvantage

Based on the results marketing industry at PT. ABC India can develop alternative strategies to maximize PT's resources and capabilities. Above all, PT. ABC India relies on resources and capabilities that remain competitive advantage and competitive advantage equality to gain sustainable competitive advantage. For those who have tasted in the category of lasting competitive advantage, resources and capabilities do not require specific strategies or new strategies, but only to continue to maintain and sustain the existing strategy. Based on the results of the analysis of the importance of resources and capabilities in PT. ABC India in the digital marketing industry has found that there are sources and capabilities that fall into the category that is urgently needed for a new business development strategy that has two competitive disadvantages, namely human resources and employee retention, three competitive parties, namely, division of labor, employee relations, and supplier relationships, then there are three of the lasting competitive advantages, namely customer loyalty, customer relationships, and employee ideas.

b. SWOT analysis results

Following are the results of the analysis of the SWOT analysis results

No	SWOT	Results
1	Strength	a. The offered price is cheap and still has quality b. The price depends on the budget of the customer c. Give the customer a free trial d. Give customer priority e. Stay in touch with customers who have employment contracts
2	Weakness	a. Not many customers due to labor shortage b. New in the digital marketing industry c. Most marketing uses WOM d. The workforce is less committed and disciplined
3	Opportunities	a. Master most of the forex industry b. Offer opportunities through digital seminars c. The era of digital transformation d. The capital is no bigger than online
4	Threat	a. New trends and competitors b. Work results can not be known by the public c. A company that already has its own digital marketing division

d. Five Forces Porter analysis

Based on data obtained from primary data through direct interviews with PT. ABC INDIA and secondary data from the Internet provide researchers with information related to theFive Forces Porter theory. The details of the information obtained can be explained as follows; 1) Threat of replacement products or services, the risk of replacingproducts or services is inherently low.2) The threat of new entrants in the digital marketing industry is quite strong. 3) Thethreat from suppliers' bargaining power is relatively weak. The digital marketing industry is categorized as an attractive industry because Facebook

and Google alone are estimated to benefit up to 220 US dollars from digital advertising in 2019.

e. PESTLE analysis

Based on the indicators contained in PESTLE namely Politics, Economy, Social, Technology, Legal and Environment. It was found that PT. ABC India has several things related to these 6 indicators, as explained in previous research about the meaning of the PESTLE analysis which is a very useful tool in understanding an external environment that is based on opportunities and opportunities from the surroundings, namely external parties.

Table : Pestle Analysis

Politics	There are obstacles in blocking Facebook in several countries
Economy	A weakening exchange rate economic growth grew by 5% which affected purchasing power
Social	changes in people's lifestyles
Technology	the internet creates a paradigm in the industry in society
Legal	the legality of the ITE Law in Indonesia
Environment	The application of digitalization to paper reduction

IV. CONCLUSION

Based on the data analysis results obtained by PT. ABC India concluded that:

a. SWOT analysis

In this case, the results of the SWOT analysis obtained by researchers were obtained from the results of interviews conducted with the top management, namely the director of PT. Saint Technologies India. From the conclusions of the researcher, an alternative strategy formulation was obtained, which was implemented by PT. ABC India is called: Market penetration, Market development, Product development,

Forward integration

b. VRIO analysis

The VRIO analysis carried out was obtained with the results of interviews with the top management, namely the director of PT. ABC India and subordinate management, namely PT's Chief Marketing Officer and Copywriter. Saint Technologies India, therefore the data will be summarized and alternative strategies will be applied that can be applied to PT. ABC India, namely: Market penetration, Product development, backward integration

c. Strategy recommendations

From the results of the analysis with SWOT and VRIO alternative strategies can be derived, which are recommended by PT.ABC India is two suitable strategies that can be implemented based on the company's external and internal environment. Defining the strategy of the researchers based on the results of the company analysis. The strategies that can be implemented are market penetration strategy and product development strategy

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Advanced Machine Learning Techniques for Predicting a Student's Performance in A University

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ABSTRACT

The Internet of Things has a big influence on the transportation industry (IoT). Autonomous vehicles (AVs) are designed to improve a variety of daily activities, such as package delivery, traffic flow, and freight transportation. Aside from being on the ground, AVs may also be in the air or underwater, and they have a wide range of applications. To address this problem, we are employing data transfer to autonomous cars based on cyber security (CS). In this instance, a cloud serves as an intermediary to transmit files to an autonomous vehicle. We use the CS-based Advanced Encryption Standard algorithm to further secure the communication by converting the supplied data into cipher text. The encrypted content may be decrypted using the sender's private key created for that particular AV.

Keywords : Cyber Security, Cipher text, AES, Private Key, AV.

I. INTRODUCTION

The number of AVs has increased dramatically in recent years. Businesses are spending a lot of money on AVs.

Despite the promise of AVs and the advantages they might bring to the transportation sector, security and privacy issues present additional difficulties that must be resolved. The sensors are vulnerable to intentional manipulation (e.g., IMUs are susceptible to sound waves and GPS receptors are susceptible to spoofing signals). Before acting on sensor signals, vehicles should make sure they're accurate.

Attacks are possible on the Internet of Transportation Systems (like any cyber-physical system). Such technologies, such as autonomous and in the future, driverless automobiles, are collecting streaming data. Energy conservation is necessary when transportation systems transition to electricity. Due to assaults on energy management, threats to the security of such systems might result in accidents, loss of life, and being trapped on isolated roadways, among other grave consequences.

The objective is to apply stream analytics/learning approaches to transportation data while using data science/ML to examine AV data. How, for instance, might the ML approaches be used to process the vast volumes of sensor data coming from the AVs? For a variety of applications, such as providing the best

instructions, driving without a person in the loop, and many more, the Internet of Transportation Systems will also largely rely on Data Science/AI/ML (Machine Learning) approaches. The adversary will become familiar with our machine learning models and attempt to undermine them. The privacy of the person must be maintained even if the Internet of Transportation Systems captures enormous quantities of data. We anticipate that the cloud-based services coupled with the Internet of Transportation System will be used for a large portion of data exchange and analytics.

This study investigates the integration of artificial intelligence, security, and the cloud to create intelligent internet transportation systems. The integration of cyber security is the first topic we cover. Next, we go into how data analytics for transportation systems may be done via a secure cloud. We talk about privacy and security for data transportation systems. We go over how the various elements (such as AI and cloud security) may be combined to create intelligent and secure transportation systems.

II. RELATED WORKS

Securing Autonomous Vehicles with a Robust Physics-Based Anomaly Detector: Autonomous vehicles (AVs), which include air, sea, and land vehicles, use a range of sensors and actuators to analyze their surroundings in order to carry out particular tasks like navigating a route, hovering, or avoiding collisions. As long as AVs continue to rely on sensor data without data validation or verification, attackers can take advantage of these weaknesses by providing false sensor data to the system with the goal of causing disruption or taking over control. Using solid physical invariants, SAVIOR is an architecture for securing autonomous cars that we describe in this work. On two well-known open-source controllers for aerial and ground vehicles, we put our suggestion into practice, confirm it, and show how well it works.

Cyber Security Based on Artificial Intelligence for Cyber-Physical Systems: Ten pieces are included in this special issue, all of which discuss cyber security for cyber-physical systems (CPSs). Systems nowadays are far more sophisticated, intricate, autonomous, and intelligent. They include very intricate interactions between various cyber and physical components; in addition to this complexity, they are subject to significant disruptions as a result of purposeful and inadvertent occurrences, making it exceedingly challenging to forecast their behavior. As a result of the rise in cyber-attacks and the sophistication of their activities, sometimes known as zero-day threats, research scientists in business and university are becoming more interested in cyber security for CPS. The articles in this issue seek to bring together academic and industrial researchers to discuss their vision of AI application in the context of cyber security, and showcase problems and current efforts and advancements related to AI-based cyber security applied to CPSs.

Data Mining Applications in Malware Detection: The practice of asking questions about vast amounts of data and extracting information—often previously undiscovered—using mathematical, statistical, and machine learning approaches is known as data mining. Numerous industries, including marketing and sales, online and e-commerce, medical, law, manufacturing, and, more lately, national and cyber security, can benefit from data mining. Data mining, for instance, may be used to identify unrecognized connections between terrorist organizations and even forecast terrorist activities based on prior incidents. To enhance e-commerce, one may also use data mining techniques for specific markets. Multimedia applications such as video analysis and picture classification can benefit from data mining. Data mining may also be employed in security applications including the identification of dangerous software and suspicious events. In our last book, we concentrated on data mining technologies for applications in online

browsing, picture categorization, and intrusion detection. We only highlight the data mining technologies we have created for cyber security applications in this book.

Bayesian network-based analysis of cyber security impact on safety: With the consideration of life cycle risk analysis of technical systems, such as Systems of Systems (SoS) or Cyber-Physical Systems (CPS) are terms used to describe the growing reliance on networked systems and processes in fields like industry 4.0 or smart homes. The problem of examining an increasing number of possible linkages between safety and security elements arises when networked systems are used in contexts where safety is crucial. The assessment of functional safety is a regular technique in industrial settings, e.g. using IEC 61508 and domain-specific derivatives, but cyber security in safety-relevant domains has just recently been introduced. Although cyber security assessment is a fast-evolving field, there have only been a few attempts to combine standardized security and safety standards. In this study, a method based on Bayesian Networks (BN) is presented for taking into account how functional safety concerns are impacted by cyber security risks. Integrated safety and security BN is created using a reduced x-by-wire approach to infer safety and security relations as well as structures. The ability to modify selected target parameters to a necessary integrated safety and security level using BN's parameter learning has been shown. As a result, the system configuration may be improved while taking new cyber security risks into account.

SecAI: Integrating Cyber Security and Artificial Intelligence with Applications in the Internet of Transportation and Infrastructures: The topic of intelligent transportation systems (ITS), which is still in its infancy, is distinguished by sophisticated data models, dynamics, and stringent time constraints. The efficiency and safety of transportation depend on the complicated challenge of ensuring cyber security in ITS. One of the crucial phases in the development of ITS is the imposition of standards for a complete architecture as well as specialized security requirements. The paper looks at ITS architecture's broad contours and security concerns. The setup and initialization of the devices during manufacture at the perception layer, as well as anonymous authentication of nodes in VANET at the network layer, are the key objectives of security techniques; Fog-based structural defense at the support layer, definition and standardization of the intricate data and metadata model, and AI-based system defense at the application layer. The article discusses certain traditional techniques that should be modified and used in ITS cyber security, such as network segmentation and cryptography. The emphasis is on cutting-edge solutions that have recently been attempting to find a place in ITS security plans. Blockchain, bloom filters, fog computing, artificial intelligence, game theory, and ontologies are a few of these methods. In conclusion, a connection is drawn between the approaches that are discussed, the issues they address, and the architectural levels where they are used.

III. Methodology

Proposed system:

We are implementing CS-based data transfer to autonomous cars in the suggested solution to overcome the problems. In this instance, a cloud serves as an intermediary to transmit files to an autonomous vehicle. We use the CS-based Advanced Encryption Standard algorithm to further secure the communication by converting the supplied data into cipher text. The encrypted content may be decrypted using the sender's private key created for that particular AV.

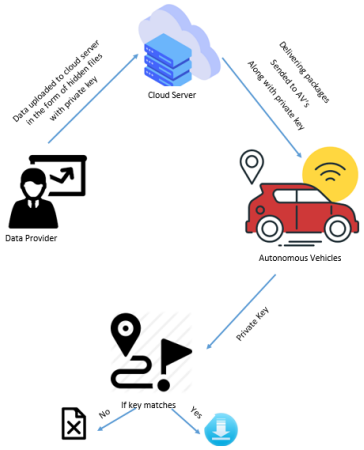


Figure 1: Block diagram

IV. IMPLEMENTATION

The project has been implemented by using the below-listed algorithm.

1. AES Algorithm

Round keys are a specific collection of specially generated keys used in the encryption process. These are used on a data array that contains exactly one data block, along with additional operations. The encrypted data. We refer to this array as the state array.

You do the AES encryption methods below for a 128-bit block:

- From the cipher key, get the set of round keys.
- Use the block data to initialize the state array (plaintext).
- Include the starting state array with the initial round key.
- Manage the state for nine iterations.
- Complete the eleventh and last state manipulation.
- Export the encrypted data as a copy of the final state array (ciphertext).

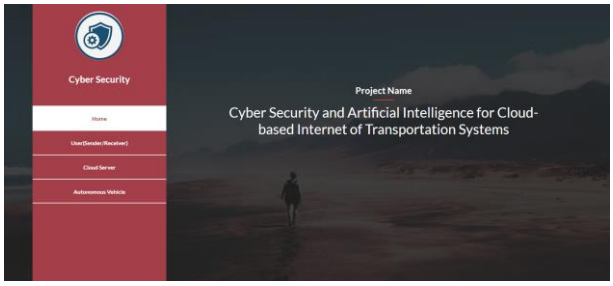
The tenth round includes a slightly different manipulation from the other nine rounds, which is why the rounds are labeled as "nine followed by a final tenth round."

There are only 128 bits in the block that has to be encrypted. We first divide the 128 bits into 16 bytes because AES only works with byte amounts. Although we say "convert," data is probably definitely already saved in this manner. A two-dimensional, four-row, four-column byte array is used for operations in RSN/AES. The 16 bytes of data were encrypted at the beginning.

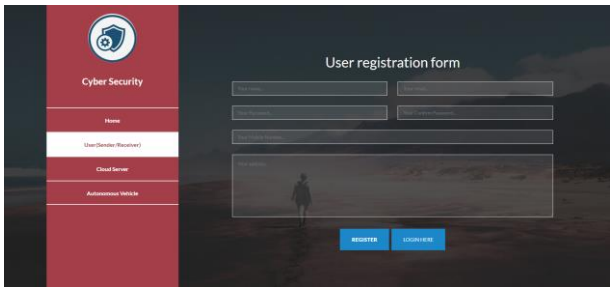
V. Results and Discussion

The following screenshots have depicted the flow and working process of the project.

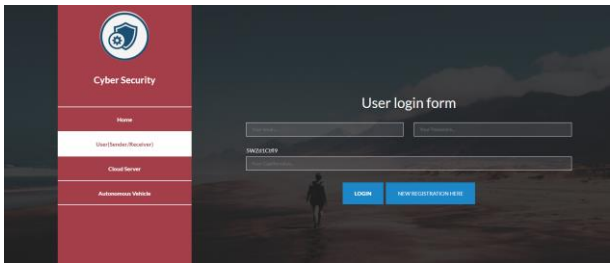
Home Page: This is the home page of cyber security and artificial intelligence for cloud-based internet of transportation systems.



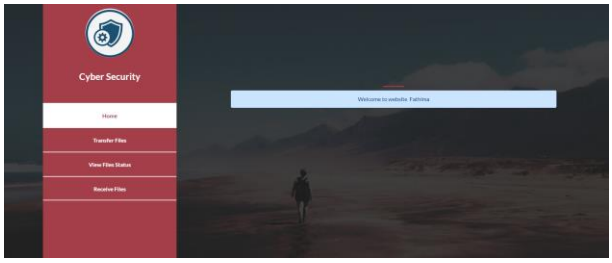
User registration page: The user can get registered into the application.



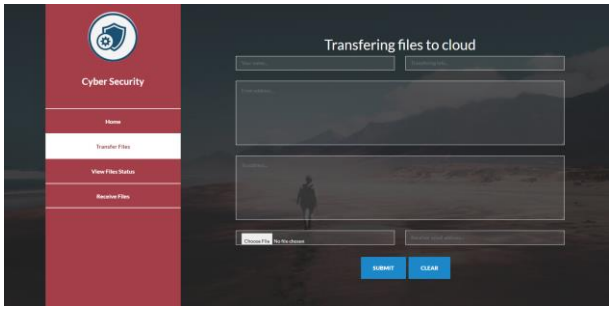
User registration form: The user needs to fill up this registration form for registration.



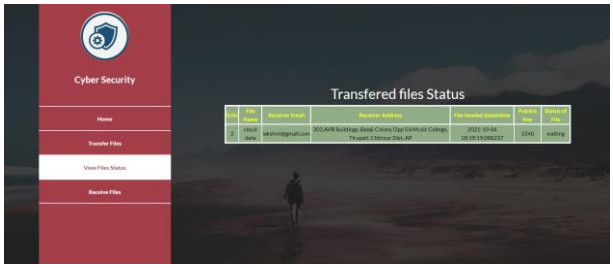
User home page: After successful login user can view this home page.



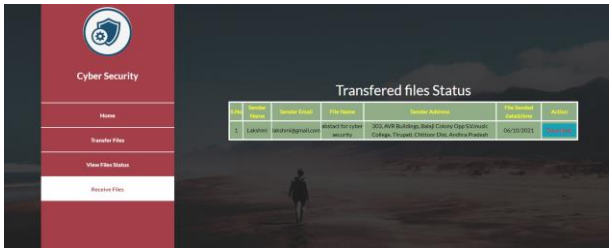
Upload transferring files: Files get uploaded from this page.



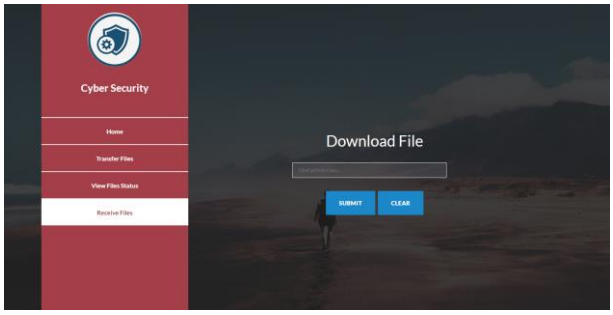
Transferring files status tracking: This page shows the status of transferring files.

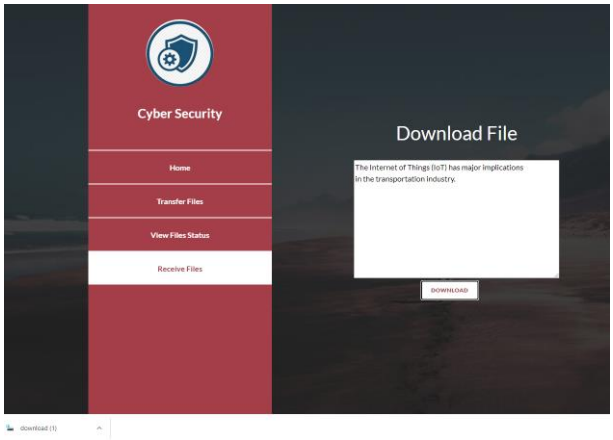


Received files information: Here we can see the received files information.

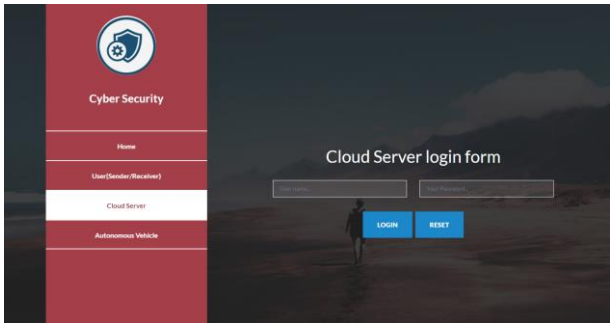


Downloading file: Files can download from this page.

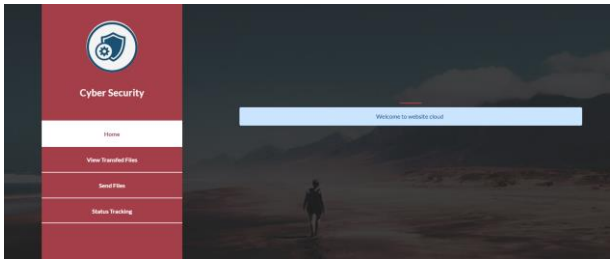




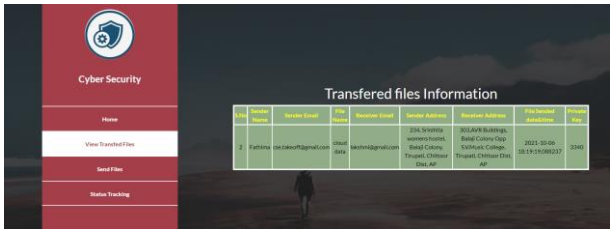
Cloud server login page: Here cloud server can log in with valid credentials.



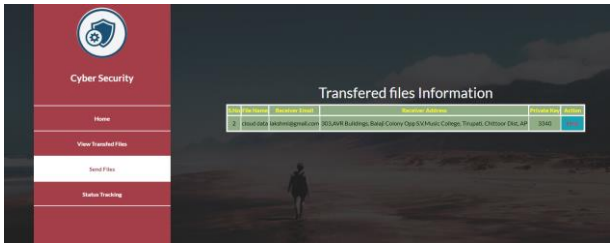
Cloud server home page: After login cloud server can view this home page.



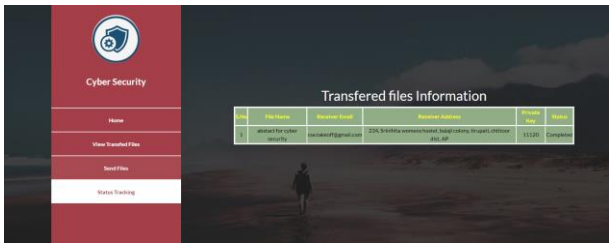
View transferring files: The cloud server can view the transferring files.



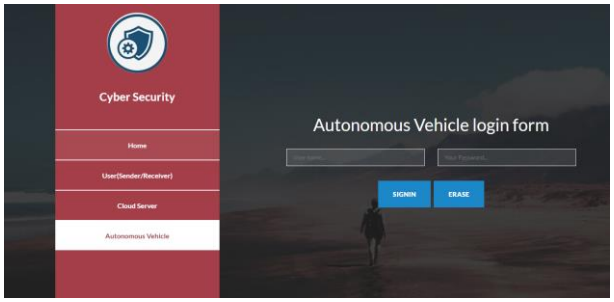
Send files: Files will be sent from this page.



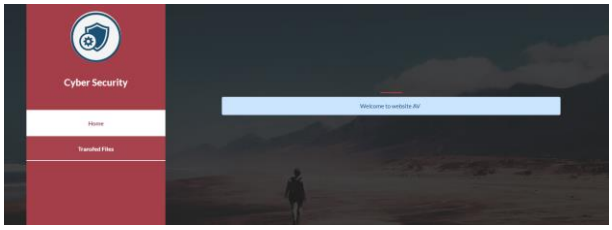
Status tracking: This page displays the status tracking of sending files.



Autonomous vehicle login page: Autonomous vehicle can log in with valid credentials.



Av home page: After login Autonomous vehicle can view the home page.



Sent transferring the file to the user: Here AV can transfer files to the user.

VI. CONCLUSION

Here, we implemented Cyber Security (CS) based data transfer to an Autonomous vehicle system. AES-based CS-based algorithm (Advanced Encryption Standard) is employed as a mediator in the cloud to more securely transfer files from the sender to the autonomous car. The private key created by the sender and given to the specific AV is used to decrypt the encrypted text.

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Design of Bio Potential Amplifier for Biomedical Applications

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ABSTRACT

The design of bio-medical signal acquisition system has become possible because of advancements in CMOS technology at rapid rate with tradeoffs in area, speed and power. These advancements have made it easy to continuously monitor and process the various bio-physiological signals whose amplitude and frequency characteristics are in the voltage range of few μV to mV and a frequency range of dc-10 kHz respectively. In bio-medical signal acquisition system, the first and the foremost important block is front-end amplifier (FEA), also sometimes referred as low noise amplifier (LNA) or preamplifier, or in some applications also called as instrumentation amplifier (IA). The important characteristics of such an analog front end are, it should exhibit low-power, low-noise, high gain, high CMRR, high PSRR, high input impedance, high dynamic range and smaller area. Tradeoffs among these characteristics can be optimized in a FEA design by suitable selection of its topology. Design of such analog front end amplifier has a vital role in defining the performance characteristics of the overall biomedical system. In this research work a novel amplifier designs are proposed to improve the noise efficiency especially for biomedical applications.

Keywords : Amplifiers, Operational transconductance amplifier, Bio-potential amplifier, Low noise amplifier, Source degeneration, Transconductance, Unity gain bandwidth.

I. INTRODUCTION

There has been an incredible ascent in enthusiasm for advancements in neuroscience and neuroprosthetic applications over the most recent couple of decades. The principle point of neuroscience is a superior comprehension of the brain, human neurophysiology, and source of disorders like Alzheimer, Parkinsons, deep coma etc. Recent, bio signal recording systems are massive and are not versatile that makes it difficult for ongoing diagnostics and causes discomfort to the patient. The role of implantable medical devices is becoming more important to save and improves the quality of human's lives [1]. The requirement for these systems to make flexible, compact and portability to extend their applications in various fields.

Advancements in CMOS technology paves the way for realizing integrated circuits with dense packing of transistors. This led to the procreation of bio-medical systems in the form of wearable and implantable systems which can help in diagnosis of physiological signals like neuroprosthesis, brain stimulation therapies, fetal ECG monitoring and many more. However, the need for bio-potential signal acquisition systems which are accurate made the researchers to focus on the development of integrated circuits with high packing density, lower cost, and power-efficient. So these advancements in microelectronic circuits have made possible to design portable and implantable electronic devices for biomedical applications by continuous integration of analog and digital building blocks on a single chip. These bio-medical systems need to be designed for low power consumption. More in particular implanted devices should exhibit low power dissipation to avoid heat flux tissue damages. Hence minimizing the total power consumption for such recording systems is a vital task.

Bio-medical signals and their characteristics The continuous growth in microelectronics, communication, and low power circuit design techniques have considerably brought changes in the instrumentation required for monitoring the physiological state of the human body, brain, and heart. The main challenge in the design of such analog front-end instrumentation is to deal with the nature of physiological signals. The bio-potential signals are the responses of physiological activities of organisms ranging from protein sequences to neural and cardiac rhythms to tissue and organ images. Several bio-medical signals includes Electroencephalogram (EEG), Electrocardiogram (ECG), Electromyogram (EMG), Electrocorticogram (ECoG), Local field potentials (LFPs), Action potentials (APs) and many more. Electrocardiogram (ECG) signals are the electrical potentials generated during the alternating contractions of atria and ventricles of the heart with an amplitude range of 0.5 mV to 4 mV at a frequency range of 0.01 Hz-250 Hz. Neural signals represent the electrical activity of the brain.

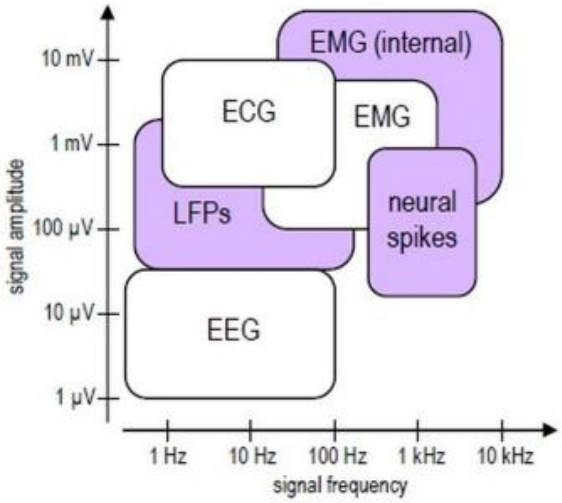

Figure.1. Frequency and amplitude of bio-Potential signals.

This electrical activity can be recorded from within the brain in the form of local field potentials (LFPs) or spikes with an amplitude range of 10 µV to 1 mV at a frequency bandwidth of 1 Hz-10 kHz or over the surface of the brain in the form of Electrocorticogram (ECoG) signals with an amplitude of 5 µV to 10 mV at a frequency band of 1 Hz-250 Hz or over the scalp in the form of Electroencephalogram (EEG) signals with an amplitude of 5 µV to 500 µV at a frequency range of 0 Hz-150 Hz. While Electromyogram (EMG) signals are the electrical activity of the muscles with an amplitude of 0.1 mV to 5 mV with a frequency band of 0 Hz-10 kHz. Hence the amplitude of bio-potential signals irrespective of the source is in the order of a few µV to tens of mV with a frequency range spanning from 0 Hz to a maximum of 10 kHz. Different bio-potential signals with their amplitude and frequency characteristics are illustrated in Figure.1.Figure.2 shows the conventional architecture of a bio-potential signal acquisition system. To record the various bio-potential signals having smaller amplitudes and smaller frequencies with high quality under the presence of various noise sources like

electronics, electrodes, power line interface, etc, the architecture consists of a front end amplifier (FEA) with low input-referred noise, reconfigurable bandwidth and higher gain followed by a programmable gain amplifier to accommodate weak signals and high dynamic range that limits the signal bandwidth and can supply current to external loads such as the input of an oscilloscope or a digital signal processor unit, etc used to visualize or process the waveforms respectively. Recent advances in technologies made neurobiology researchers make a connection between the electrical activity of the human body and the real world through integrated electronics. However, this type of system requires simultaneous recording of electrical signals from various nodes or points of the body for accurate signal processing resulting in the design of a multichannel recording system with optimized power dissipation and high accuracy of recording.

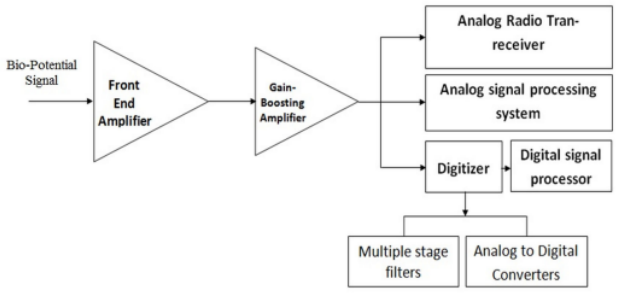

Figure.2. Conventional architecture of a bio-potential signal acquisition system.

Over the past four decades, Scaling in CMOS technology has been the primary concern of electronics industry and is responsible for producing highly denser and faster integrated circuits. The demand of miniaturization of integrated circuits (IC) in terms of number of devices on chip has been resulted in the reduction of channel length of MOS devices. The reduction in channel length has reported the performance improvement in terms of decrease in power and increase in device density on chip. But this trend has increased the power density i.e, total circuits per chip, and the total power consumption of chip. However, the need of improvement in performance has escalate the scaling process in every device parameter that includes effective channel length, power supply voltage, gate dielectric thickness, threshold voltage, transit frequency (fT), device leakage, etc. Table.1. shows the scaling trends in various MOS device parameters. The Table.1. is reprinted from[2]. Since most of these device parameters have reached the fundamental limits, substitutes to the present existing material and structures are need to be replaced in order to utilize the advantages of scaling.

Table.1. Scaling trends in various MOS device parameters

Node	nm	250	180	130	90	65	⇊
LGate	nm	180	130	92	63	43	⇊
t_{ox}	nm	6.2	4.45	3.12	2.2	1.8	⇊
Peak g_m	μS/μm	335	500	720	1060	1400	↑
g_{ds} @ Peak g_m	μS/μm	22	40	65	100	230	↑
g_m/g_{ds}	-	15.2	12.5	11.1	10.6	6.1	⇊
V_{DD}	V	2.5	1.8	1.5	1.2	1	⇊
V_{TH}	V	0.44	0.43	0.34	0.36	0.24	⇊
f_T	GHz	35	53	94	140	210	↑

Regularly, the monitoring or recording of bio potentials which are collected by electrodes from various parts of the human body and these signals are used to diagnose the diseases. The recording system setups are like EEG, ECG, EMG and ECoG. Figure.3. depicts the amplitude (1μV-10mV) . The acquisition of original signals is difficult in the practical recording system due to EEG signals are dominated by background noise as shown in Figure.4. The performance of bio-signals are restricted due to background noise is around 10μV i.e. offset voltages at electrode-tissue interface, noise interference from supply line and noise from MOSFETS [3]. EEG signal defines the function of neuron activity in the brain which is records in the form of electrical signals. The faithful extraction of EEG signal relates to the performance of EEG recording system. By recording the EEG signal from the brain diagnose the diseases like Epilepsy, Seizure detection, Alzheimer, confusion,

memory loss, head injuries, tumors, sleep disorders, deep coma and monitor the brain activity during brain surgery.

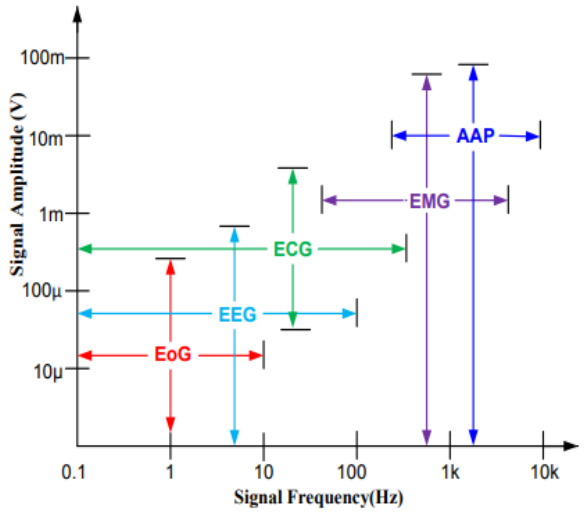

Figure.3. Various Physiological Signals from the Human Body and with Corresponding Amplitude and Frequency Ranges

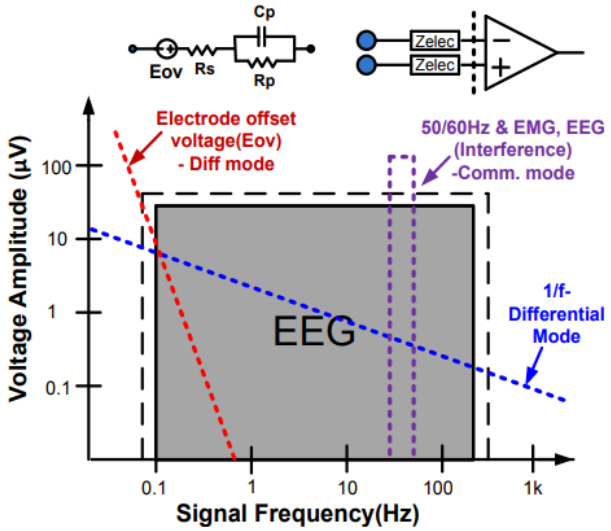

Figure.4. Effect of Various Noise Sources in Bandwidth of Biosignals Range

Other noise sources are the common mode interference noise from the 50Hz/60Hz AC supply and differential mode interference due to mismatch in input devices. Therefore, the designing of EEG recording system with low noise and low power is crucial for these applications. For the proper diagnosis, the faithful signal extraction should require an analog front end with low noise, low power, high Common Mode Rejection Ratio (CMRR) and configurable gain. From the past, the study about BMI (Fig.5.) has been developed rapidly. BMI systems are capable of creating a communication line to the human brain. These interfaces monitor brain-derived neurophysiological signals. When using an EEG-BMI system, the user wants to perform things on purpose so that their brain will produce signals that can be translated into orders. These instructions are sent to the machine so that it may do tasks or move objects that are external, such prosthetic limbs. The new experiences that enable connection between people and digital technologies like home appliances and prosthetic devices have been quite successful because to BMI technology. Researchers and developers have launched health care monitoring in biomedical sectors along with a number of applications using the brain-machine interface idea. The following criteria are the main focus of the researchers: • Cutting-edge, non-invasive electrodes that accurately detect EEG signals • Compact and wearable BMI systems; Low power and Low noise EEG recording devices.

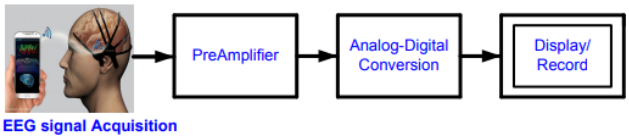

Figure.5. Block Diagram of EEG Signal Recording System

II. PRINCIPLES OF EEG ELECTRODES

Apart from above discussion, the challenging issue is measurement of the brain signals accurately with low noise by the development of advanced electrodes. To provide original EEG signal acquisition at the electrode-tissue interface, development of highperformance electrode is crucial. Many researchers have been interested recently in the development of simple, durable and low noise electrodes. The voltage-current characteristics of bio signal electrode are usually nonlinear. It is the

consequence of charge potential at an electrode surface. Electrodes are to be entitled by linear models need to be operated at low currents and voltages. Considering these ideal conditions, electrodes can be an embodiment of equivalent circuit shown in Fig.6. [4] published an explicit model give a detailed about electrode-skin interface as second order filter. This electrical equivalent circuit is the mixture of six linear components (resistors and capacitors). Wet and dry electrode terminals are relied upon to have the same electrical model however the parameter esteems will be fundamentally differs.

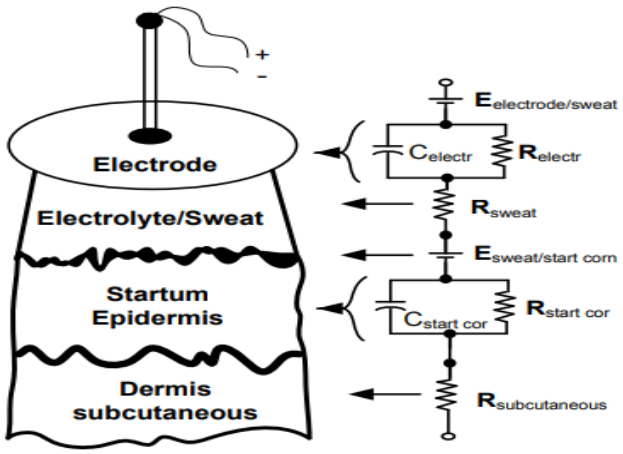

Figure.6. Electrode-Skin Interface and Electrical Equivalent Circuit

Passive electrodes are popularly used in basic wired BMI systems to measure the EEG signals. Passive electrodes are in the ring or disc shape and simple structure. The record of determined EEG signals some extra care must be needed because the potentials from the scalp are only in micro volts range and these are very sensitive to noise. Preparations are needed like hair removal, usage of conductive gels or for the better stick and good conductivity may discomfort or requires more time for an arrangement. These issues for contact impedance at the electrode-tissue interface are not reliable and comes out with a reduction in SNR. Sometimes the quality of the signals to be recorded has an ill effect with the wire vibrations [5]. Previously, to overcome the issues of passive electrodes new research diversion is carried and they come up with advanced electrodes called dry electrodes. For these dry electrodes, the conductive installation process is not required. Dry electrode design looks like a finger and easy to operate into the scalp through the human hair without any extra arrangement. Dry electrode can reduce the installation time between scalp and electrode. Recording signal quality for both passive electrode and the dry electrode is same. To improve the signal quality the researchers are introduced. The active electrodes consist amplifier or unity gain circuits embed to the electrode itself [6,7]. The target of the active electrode is for impedance conversion. This electrode provides high input impedance at inputs of amplifier along with reduced distortion in recorded signals. Therefore, the record of brain signals quality will be remaining same by using active electrodes. Fig.7. depicts the variation of electrode impedance with respect to frequency with which it can be inferred that as the frequency increase the electrode potential degrades gradually.

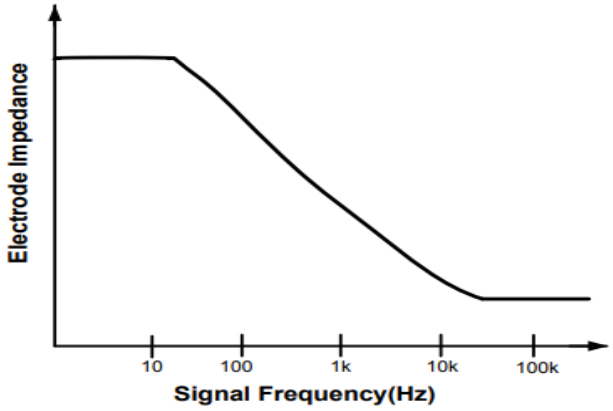

Figure.7. Variation in Electrode Impedance with Frequency

For the design of signal recording system, it is more important to know about electrically equivalent circuit which occurs between electrodes. This equivalent circuit shown in Fig.6. is used to specify the input impedance of bio signal amplifiers [8]. A modeled parallel RC circuit with the series resistor is

equivalent to one electrode. These modeled resistors in the electrode are contributed of thermal noise, so it is desired to have electrode impedance as small as possible. Bio signal amplifiers should have higher input impedance than electrode impedance, otherwise lose in the bio signal amplitudes, produces signal distortion and distorted bio potentials results misguide the clinicians in the diagnosis process.

III. EEG SIGNALS

General classification of bio signals are made as endogenous (EEG, ECG, EMG) and exogenous (X-rays, Monochromatic light, Optical Coherence Tomography (OCT)) types. Endogenous signals originate and collected from natural biology within or on living organisms, membrane cells, nerve cells and muscle cells through electrodes. Exogenous signals are externally applied to scan the body for observe the internal structure. Endogenous bio potentials have the bandwidth of 0.1Hz-10kHz. These signals are collected bio signals along with noise, which exists due to various noise sources in the system and displays the faithful signals from the brain by eliminating the noise. The typical EEG signals are recorded from the scalp in the range of hundreds of micro volts. These signals are used to diagnose epilepsy, sleep disorders, coma, brain death and brain tumor etc. Conventionally, EEGs are classified into 4 frequency bands [9]. • Delta Waves(δ): arises in adults deep sleep with large amplitudes and low frequency (lessthan 4kHz). Theta Waves (θ): mostly occur in young children and adults, teenage people with drowsiness. The frequency band of 4-7 Hz. Alpha waves (α): Origin for these waves at the rear side of the head, two sides and larger amplitude in more influence side. The bandwidth of alpha waves is 8-15 Hz. Beta Waves (β): These waves are appearing on both sides of the scalp with uniform distribution and with low amplitudes (13-50 Hz). Gamma Waves (γ): Gamma waves having the frequency greater than 32 Hz. The signals originated from somatosensory cortex and shown in short term memory. The above all signals are close to DC potential range. it is hard to differentiate the biosignals from the noise at DC level. For the better diagnosis need to have larger number of signals collection from the unit site meanwhile it also consumes more power and area. The recording system should have properties like low noise and low power to collect the original signals. Advanced devices such as nano scale devices are having less noise contribution, low voltage operation suites to meet the requirement of recording systems. IC technologies prove high noise immunity and ultra power dissipation suitable for the bio-chip designs.

IV. NANO INTEGRATION TECHNOLOGY

Moores law defines the advancements in continuous CMOS scaling or minimum feature size of transistors growing in exponential manner. It is most important that in spite of many challenges and difficulties, the theme of decreasing dimensions of the transistor and the resultant magnification of the VLSI IC industry have decided for standing for more than ten years. As the minimum feature of transistor size is going below 10nm, the sevier problem of switching activity will arise. Technology scaling in CMOS transistors, the many changes has been undergone to realize the architectures from past years. The basic operation of MOSFET will remain the same even though the numerous changes are happen. The phenomena of current carrying in a MOS device with some limitations will restrict the scale down of supply voltage at certain limit. As keeping the supply voltage constant with reducing the size of the transistors is the present trend. This results no improvement in power efficiency, which may possible with decreasing the supply voltage. Recent improvements in architectures, principle of operation and new material structure combinations will overcome the challenges of the conventional MOSFETs. In this regard, Tunnel Field Effect Transistor (TFET) is the nano structured device operating on the basis of quantum mechanical tunneling. TFET have been proven superior switching characteristics than conventional transistor. The

TFET device will become the solution for power efficient circuits with low operating supply voltages. Early in 1990s, limitations on integration circuits and reliability problems are forcibly driven towards low power supply voltages.

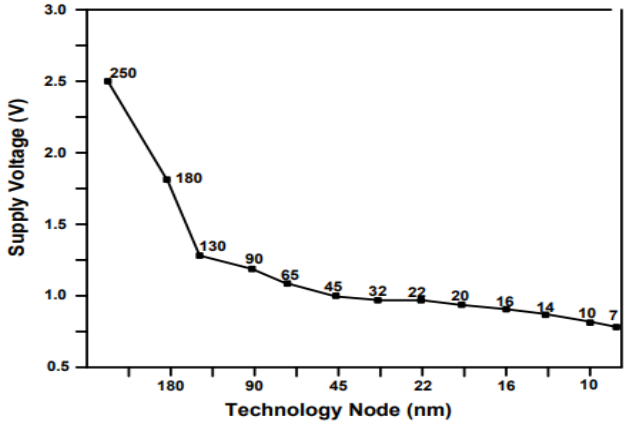

Figure.8. The ITRS Roadmap shows the Technological Requirement of Supply Voltages Related to Technology Nodes

Technically, there are issues about continuous CMOS scaling: Reducing VDD and Vth of the transistors without changing the electrical characteristics of the device. Control of leakage current and short channel effects in the devices. Minimizing the interconnect delays and compactness. Should care about thermal problems by increased transistor density and also reliability of the chip. Withstanding capability of large variations in the process corners at smaller dimension devices. Making the device with smaller technology node for maintain sufficient outcome. The International Technology Roadmap for Semiconductors (ITRS) helps in guiding the technological requirement of supply voltages for a corresponding technology node in nano level circuit designs is shown in Fig.8.

V. EXISTING MODULE

Figure.5. shows the block diagram of a measurement system. There is a demand for medicines and clinicians of multi-channel integrated implantable recording system. These systems help to record bio signals from multiple sites of the brain and human body for genuine diagnosis [10]. Non-invasive electrodes are placed on the scalp or the top of the cortical surface which will pick the EEG signals and fed to signal conditioning stage. The signal which is collected at electrode-tissue interface is the mixture of offset voltages along with EEG signal. The offset voltage is appeared due to variations in electrode interface, impedance mismatch, large electrode impedance, noisy components like MOS, resistance at the amplifier input. The signal conditioning block is responsible for the separation of EEG signal from the mixture. The main function of signal conditioning stage is that elimination of noise and amplifies the biosignals up to acceptable level by considering the high gain. The filtered and amplified signal is given to the A/D converter to process in digital form for further stages. This can be extended up to the application like remote, mobile and IoT health monitoring systems.

The performance of recording system for faithful signal display or recording depends on the signal conditioning block i.e.amplification and filtering of noise with low power consumption. The constraint on design parameters of signal conditioning circuitry is low power, low noise and with sufficient gain. Large no. of amplifiers (order of 100 -1000) is integrated into the on-chip multi-recording system, which reports the constraint about power and noise. First, the amplifier is the important block in signal conditioning stage which replicates the performance of recording system as a function of power consumption and noise. The power consumption of each and every amplifier should be reduced to overcome the problem of excessive heat dissipation which in turn may cause tissue damage or death in the surrounding tissues [11,12]. It is not easy to establish the precise limit on power dissipation. Conventionally, the maximum temperature at recording sites due to the power consumption of tissue should keep less than 1 ◦C (IEEE Standards Coordinating Committee 28 1992). Power limitation

determined by size and shape of the implantable system. Recent multielectrode arrays having roughly 100 electrodes with power consumption of 10mW and this calculation shows each channel consumable power less than 100μW in the uninjured state [13,14]. Taking into consideration, the power budget for all on-chip devices such as signal condition circuit, analog to digital converter and digital processing units along with supply regulation units, the power limit of each amplifier should be less. The battery operated implantable neural recording systems with low power consumption could be helpful for reducing the no. of charging cycles and more durability for avoiding the battery replacements. If the recording systems are allowable for ultra low power, it may be possible for replace the battery fully or partially by wireless power system [17] or by other alternatives like energy harvesting, self power generation techniques [15,16] such as piezo, thermoelectric, electromagnetic, infrared radiant principles. The energy harvesting devices are to generate energy from surrounding places through direct energy transformation. The idea of gathering energy from natural sources, human body movement and body heat for implantable gadgets has picked up another importance. By further research and improvements are going to help to make battery-less implantable recording systems. Since the physiological signals are weak in amplitude, the input referred noise of the amplifiers should be minimized to improve the dynamic range. The recording site of the electrode-tissue interface, impedance mismatch at the interface of the electrode input terminal of amplifier and circuit components like MOS devices, resistors forms the noise voltage is called total input referred noise. Typically, the background noise exists in the range of 5-10 μVrms which is dominates the bio-signals range. For the acquisition of faithful signal, the input referred noise level should be maintained below the signal amplitude levels [18,9]. In this case, always there exists a tradeoff between power consumption and input referred noise of the amplifier. Consider the recorded bio electrical signals with micro volts range (5 μV-500 μV) are not sufficient for analog to digital converter. The amplifiers should have a capacity of rejecting the large DC potentials to avoid the transistors enter into saturation. The ADCs minimum resolution range in milli volts, therefore to strengthen the bio signals range from micro volts to mill volts range an amplifier should have a gain of above 40 dB. Besides, another key prerequisite for the amplifiers configuration is to maintain a strategic distance from consumption of the electrode that may bring about cytotoxicity, which causes a leakage of current at the input of the amplifier. Other two important design parameters of amplifiers are CMRR and PSRR. The signals collected at high impedance node, often it will pick up a significant amount of 50/60 Hz AC supply interference which exists in the bio signal frequency range. The minimization of signal path distance between electrode and amplifier helps to reduce a supply, capacitive and inductively coupled interferences. Other on-chip interferences like digital circuitry interference and interference from on-chip regulated power supply. Fully differential topologies are more preferable for canceling the common mode interferences by providing the high CMRR, PSRR over the single end topologies. However, an additional Common Mode Feedback circuitry (CMFB) is required for fully differential configuration which increase power, area consumption and also leads to circuit complexity.

Typically, the input impedance of amplifier should be in the order of Mega ohms. The impedance of sensing electrode is interfaced with the input terminal of amplifier forms a potential divider circuit or parasitic frequency corners, which may restrict or suppress the interest of signals. Furthermore, the impedance imbalance at an interface of electrode and amplifier input may cause degradation of CMRR and PSRR.

Having an amplifier with high input impedance is the solution for above-mentioned issues. The other constraint along with power and noise about amplifier design is area consumption. Larger size designs are not

suitable for implantable recording systems. Designers and researchers are working actively towards minimizing the area, optimization techniques and nano scale devices i.e. multi-gate technology. High-density integration saves the fabrication cost and can also avoid tissue damage while placing in the brain.

VI. MULTI CHANNEL NEURAL RECORDING SYSTEM

With the advent of tiny in chip design for multi electrode array recording or activating the activity of brain neurons, brain-machine interfaces (BMI) are rapidly advancing in popularity. As demonstrated in Fig. 5, the neuronal activity are captured as biosignals with a range of amplitude and frequency [20]. These bio-signals are captured using a neural signal recording device, which is also used to monitor brain activity during brain surgery and diagnose conditions including epilepsy, seizure detection, Alzheimer's disease, disorientation, memory loss, head traumas, tumours, and profound coma. In order to cover a high number of stimulation and recording locations, the number of implants is increased [21]. In order to accomplish both high efficiency power transmission and high quality brain signal detection, the implant might be constructed to incorporate many Integrated Circuits (ICs). The maximum temperature should not exceed 1C, as per safety requirements [22]. The new difficulty is that power dissipation cannot be prevented since an extremely low power design would be required to operate an implantable microprocessor and reduce body heat. Future biological recording systems will be more useful and complicated. IoT (Internet of Things) recording systems with external devices and cutting-edge features like these excite the human body via hundreds of channels. The maximum temperature increase is estimated to be 0.1763 C for each chip's 1mW power dissipation. Alternately, a bigger implant chip area may be purchased to reduce temperature [23]. To offer enough gain, phase margin, and stability with a minimal amount of current, the telescopic cascode amplifier is a single stage amplifier that is preferred over multi stage amplifiers. To decrease noise and power consumption, [24] suggested an inversion coefficient approach to optimise the size of each transistor for various operating zones.

Recent methods for high density recording systems (Fig. 9.) of epileptic activity include embedding hybrid systems arrays of micro electrodes alongside micro wire exhibits with groups of wires connected to the main electrodes [25] or spreading over the cortical layers using linear arrays of multiple electrodes inserted into the brain tissue. [27] claimed that at the tradeoff of increased power consumption, an extremely low noise amplifier utilising an auto-zeroing approach obtained 90 nVrms. A low power, low noise telescopic OTA for EEG applications was disclosed in [28]. These methods cannot be used for long-term monitoring before surgery. Similar work was published as the Utah Integrated Circuit, which has 320 on-chip channels, 64 of which are for neurological stimulation and 256 of which are for neural recording. A practical distributed recording system uses thin, very flexible chip wafers to create a cortex's active region, which is then covered with many electrodes and integrated circuits (IC). The cortex of the human brain's potential epileptic regions may be covered by this recording technique. Next-generation brain recording systems are shown in Fig. 9 together with multi-neural amplifiers (numbering in the hundreds, with one neural amplifier (shown in Fig. 5) per electrode) and many electrodes to aid in patient care. To lessen the impact of heat on the brain, prolong battery life, and shorten recharging periods, such multi-channel recording devices need very low power and quiet operation. The input referred noise of the amplifier should be smaller than the background noise (5–10 Vrms) for improved signal identification. Low noise and low power amplifier designs do, however, come at a cost.

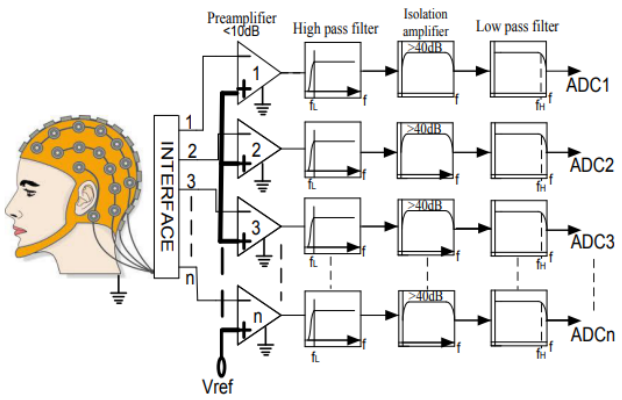

Figure.9. Shared Structure Multi Channel Neural Recording System

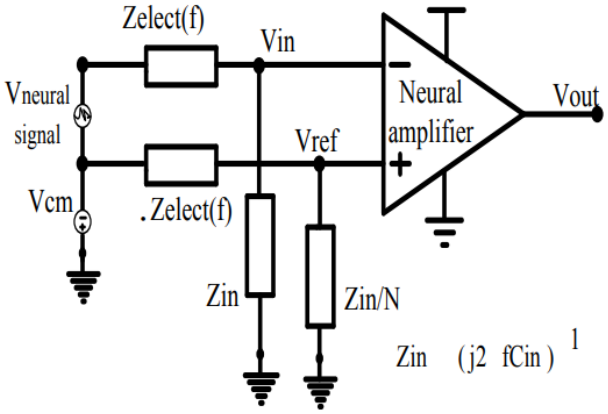

Figure.10. In a multichannel recording system, a single channel neural amplifier's electrical equivalent

Fig. 9 demonstrates that a significant amount of signals from several electrodes positioned all over the scalp must be captured. Through the appropriate channel, each electrode signal may be interfaced to the ADC [29]. One neural "amplifier" comprises of channels of a low pass filter, a gain stage (isolation amplifier), a differential stage, and a high pass filter. There are 'n' channels in a multi channel design, each containing duplicated circuitry. These complicated systems need a lot of power, a lot of consumable space, and a lot of noise. A partial sharing mechanism in the OTA structure was suggested as a solution to this issue [30], which reduces space and power consumption. For this construction, an improvement is necessary to reduce noise brought on by the many channels and more intricate circuitry. We suggest a self-cascode composite current mirror with source degeneration as an active load in OTA to combat this noise issue on multichannel recording systems. The entire recording system's power hungry block, OTA, exposes increased power usage. The degree of comprehension of illnesses like intractable epilepsy is raised by the use of parallel and massively full-duplex integrated interfaces. Real-time research may be done on implantable on-chip systems that can monitor and stimulate neurons [31]. Similar studies on the multi-channel recording system have been described.

Impedance mismatch between the reference and 'n' number of signal inputs is the main difficulty in integrating the many channels on a single neural recording device. In the multi-channel array shown in Figure 10's shared structure Vref (positive terminal), "n" inputs linked to each neural amplifier's negative terminal have the same structure. The effective capacitance at the Vref input terminal is n times greater than the rest of the inputs. The substantial common mode rejection is the cause of this huge impedance mismatch. Improved CMRR was reported, and impedance mismatch is predicted [32]. The typical intrinsic CMRR, which is dependent on the on-chip device mismatch, should be >70dB. The typical approach, in which MOS transistors operate in the saturation region, has limitations for the design of low power and low noise circuits based on contemporary VLSI circuit methods. This study adapts a recent proposal for a low power and low voltage analogue front end system architecture where all transistors are operated in the subthreshold region [33]. Recently, a charge pump level converter with an extreme low power energy harvesting architecture based on subthreshold operation with compromised performance was developed [34]. In this work, we offer a method for designing an analogue front end preamplifier with low power consumption and low noise that involves operating transistors in the

subthreshold range. Inversion Coefficient(IC) [35], a technique we offer that analyses MOS transistor behaviour depending on level of inversion, is shown in Fig. 11. The degree of inversion and operating area of MOS transistors may be determined by the inversion coefficient. Once the inversion level is known, a distinctive indicator of MOS transistor behaviour may be created. Gain, bandwidth, and aspect ratio trade-offs are optimal for designs with proper modelling and understanding of the inversion level. The designer of a circuit should be aware of how to choose the drain current, channel width (W), and channel length for each MOS transistor (L).

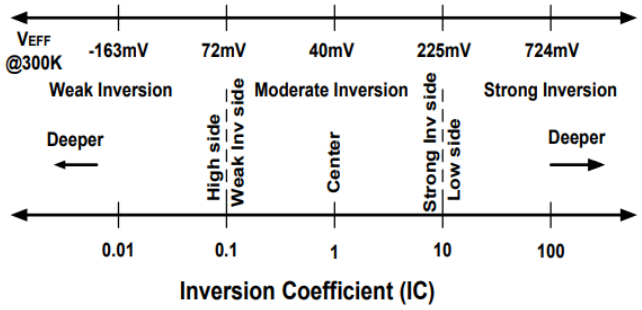

Figure.11. IC value-based operating region and bias voltages

A transistor is considered to be operating in mild inversion if the inversion coefficient (IC) value is less than 0.1, moderate inversion if the IC value is between 0.1 and 10, and severe inversion if the IC value is more than 10. With significant channel inversion, the drain drift current predominates. The ratio of the drain current to the square of the effective gate-source voltage is one in strong inversion (VEF F). The input transistors are tuned to wider widths and shorter lengths in order to produce transistors in sub-threshold region to get greater gm. Channel creation is poor and current and diffusion take precedence in weak inversion. The drain current and transconductance of a MOS transistor are inversely correlated with the gate-source voltage when the transistor is operated in weak inversion.

The proposed low noise opamp design has a source degraded current mirror and a topology similar to that of a traditional telescopic opamp [36]. Telescopic cascode is a single stage architecture that is often used because it has the advantages of two current pathways and fewer devices. By biassing the transistors at sub-threshold and mild inversion regions instead of the strong inversion region, this design helps to optimise factors including area, power, noise, and relaxation in headroom that gives high swing. In the architecture that is being suggested, M0 is a tail transistor that copies the current Ib from the bias circuitry and sources it (n+1) times. The n+1 stage shares this copied current (Ms, M1-Mn).

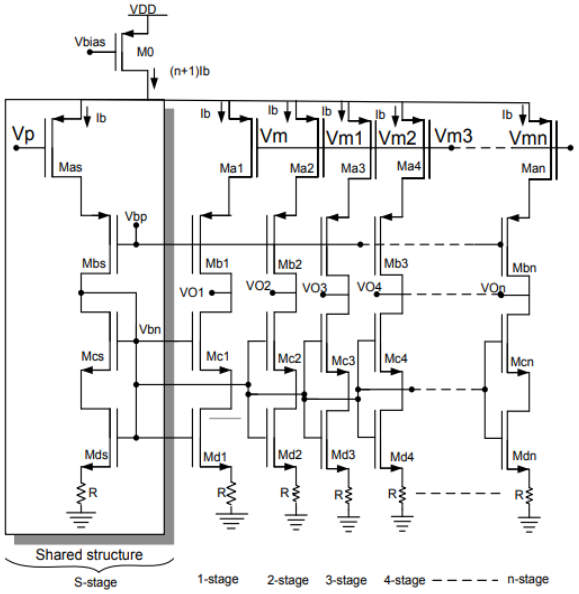

Figure. 12. Multi Channel Shared Structure with Active Load for Source Degeneration in OTA

These transistors Mas, Mbs, Mcs, Mds, and R create a shared structure that may serve as 'n' number of amplifier stages. This common method decreases the complexity of the circuitry while increasing on-chip space efficiency. The suggested method, which is shown in Figure 12, has been demonstrated to be low power and to use less current (n+1)Ib than the (2n)Ibin typical multi electrode construction. At the first stage, node V serves as the common source point for all half circuits of the n stage. The four elements of the n-stage half circuit are Man, Mbn, Mcn, Mdn, and R. Standard biassing circuitry is taken into

consideration for generating the bias voltage for the PMOS cascode devices and tail current source [37]. This study discussed low noise and low power recording channels with high density. In this study, a brand-new active load current mirror arrangement is suggested, as shown in Fig. 12. The self-cascode composite structure with source degeneration replaces the fundamental current mirror.

VII. RESULTS AND DISCUSSION

Figures 13 and 14 demonstrate how a change in R causes Rout sd and gm sd to increase. Gain enhancement and noise reduction are seen by the slope of the gm vs. R graph for the Mdn transistor. Figure 15 illustrates how R affects input referred noise, with greater R resulting in less noise. Gain enhancement and input referred noise reduction are both provided by gm dn reduction. In a self-cascode composite structure, the change in gm of local transistors caused by R is minimal, and transconductance is inversely correlated with output impedance of an active load. The value of R is inversely proportional to the input referred noise as shown in Fig. 15, and this has a restriction on the manufacture of vast values of resistance. By adding a source degenerative resistor (R) in an active load, a significant quantity of input referred noise is decreased. The trade-off between input referred noise and area is taken into account while choosing the ideal value for R. Amplifiers still produce a finite output voltage even when the input voltage is zero, which causes systematic or arbitrary deformities known as "offset." Systematic offset occurs as a consequence of erroneous quiescent operating point selection for active devices or poor amplifier design selection. The random offset is a consequence of different processing methods or mismatched machines. The offset voltage is the bare minimum input voltage required to create the output zero.

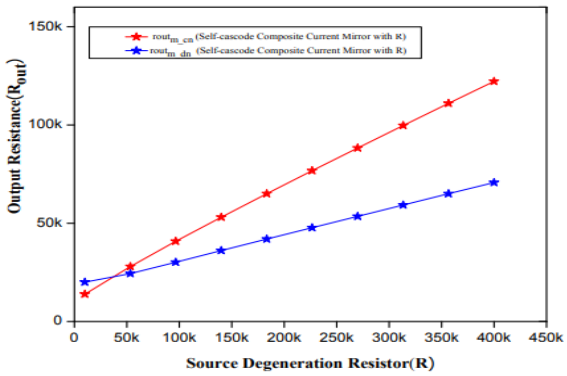

Figure.13. Impact of R Value in rout of Local Transistors (Mcn, Mdn) of Proposed Current Mirror and Cascode Current Mirror

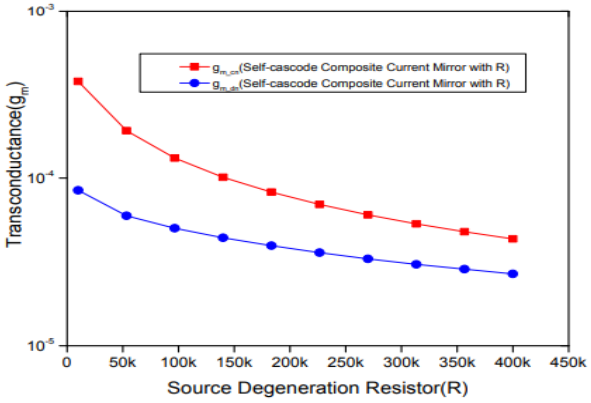

Figure. 14. Effect of R Value on gm of Cascode and Proposed Current Mirror

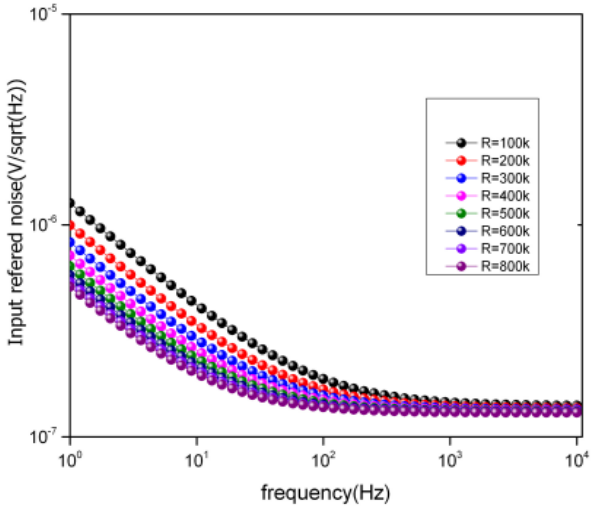

Figure. 15. Effect of R Value on Input Referred Noise Voltage.

By driving the gate terminal of the M7 and M8 output transistors from the folded node, positive feedback inside the amplifier design is achieved to raise the output impedance of RFC OTA [39]. An comparable method is used in this report for IRFC

OTA [16]. Fig. 16 depicts the half-circuit analysis used to get the formula for the MRFC OTA output impedance. A parallel combination of RN and RP, where RN and RP are the corresponding impedances of the M5 and M7 drains, respectively, is used to indicate the impedance at the output.

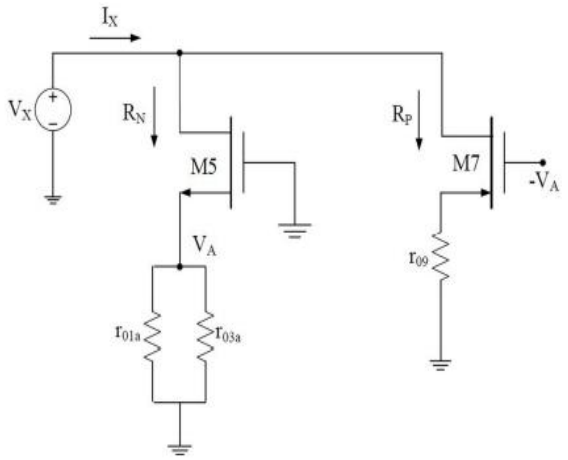

Figure.16. The small-signal counterpart of the positive feedback component for calculating output impedance.

The open-loop AC responses for each of the three designs are shown in Fig. 17. For FC, RFC, and MRFC, the simulated unity-gain bandwidth is discovered to be 24.6 MHz, 34.4 MHz, and 74.71 MHz, respectively. When compared to FC, the UGB of MRFC is raised three times; when compared to RFC, the increase is just around 2.2 times. The phase margins for the FC, RFC, and MRFC are 88.418°, 79.78°, and 74.40°, respectively.

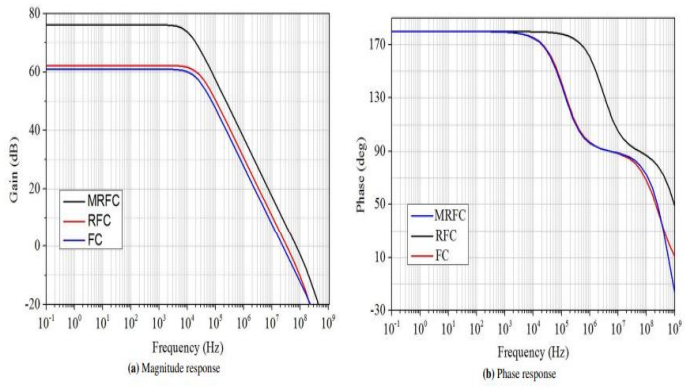

Figure.17. Response of the FC, RFC, and MRFC amplifiers to AC Frequency

VIII. CONCLUSION

In comparison to FC, RFC, and IRFC OTAs, the designed circuit performs better in terms of transconductance, DC gain, slew rate, noise, and UGB, resulting in improved FoMs at a given level of power consumption. It is possible to increase DC gain by using positive feedback at the cascode node. The suggested amplifier may be utilised to create a sample and hold amplifier for biomedical applications since it has lower input-referred noise than FC and RFC OTAs. The enhancement is made possible by including a source degeneration resistor into the self-cascode composite current mirror in this work's effort to propose a multi-channel neural amplifier that is energy efficient, low noise, and NEF enhanced. The suggested system focuses on the >40dB gain and 7.2kHz bandwidth need of bio-signals, which are used to diagnose conditions like epilepsy seizures, Alzheimer's disease, head traumas, profound coma, etc. employing neural recording systems. By regulating the trade-off between power and noise, the optimal value of R is created, and transistor design parameters like gm/ID, W/L, and ID are optimised for low power and high gain. The suggested circuit has a 66 dB gain, a phase margin of 94 o, a power consumption of 2.15 W, and input referred noise of 0.6 V/sqrt when developed and simulated in the UMC 180nm Cadence environment (Hz). It is investigated how the number of channels affects the average current of each channel, and the NEF of the suggested approach is determined for each channel. The suggested OTA is appropriate for portable and intelligent health monitoring applications because to its low power and low noise levels.

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Effect of Ink Transfer on Color Values in Lithographic Printing

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ABSTRACT

The effect of ink transfer on color parameters of primary and secondary solid inks was investigated for a commercial lithographic printing system. The ink transfer is evaluated through color density values and ink trapping factors. The results indicate that the targeted color values can be obtained by density control. The standard color values according to the ISO 12647-2:2013 are set up in relation to the ink densities.

Keywords : Lithographic Printing, Ink Trapping, Ink Density, ISO 12647-2

I. INTRODUCTION

In the process of multi-color offset printing, a paste ink of a given color – yellow, magenta, cyan, and black (CMYK) is transferred from the ink fountain through the series of inking rollers, the image areas of the plate (image carrier), the blanket, and to the paper. This ink transfer determines the dot size, ink trap, and ink film thickness, primarily in tonal and color variations. Density measurements of solid ink CMYK patches are used to monitor the ink film thickness applied during a press run. The ink density values influence dot gain, print contrast, and apparent trap [1, 2].

Ink trapping is defined as the amount of the second ink transferred on top of the first ink during the multi-color printing process [3]. In the printing process of pasty inks, such as lithography, the upper ink layers are never trapped with the whole layer thickness compared to printed directly on paper. Hence, the ink trapping is evaluated or measured in terms of percentage. A high percentage is "good" because it gives the desired color. A low percentage, which gives uneven or off-color, is "poor". A poor percentage narrows the printable color gamut and may cause image problems [4].

In multi-color lithographic printing with CMYK inks, the CMYK ink densities must be in balance. If ink densities are not in harmony, the color (hue) of the Red, Green and Blue (two color overprints) will shift. This balance depends on both ink film thickness and ink trapping. Therefore, monitoring solid ink density during a press run is essential when comparing any printed material in terms of quality [1]. However, in almost standards, the colors of solids are standardized by CIELab values, for example, ISO 12647 [5]. A matching ISO 12647 solid color can be archived with very different densities that induce different dot gain curves. Therefore, the standard color values should be connected to color densities in

every printing process.

In our study, the effect of ink transfer on the color values of printed images was investigated. A relationship between ink densities and CIE Lab values of solid colors according to ISO 124647-2 was established for a commercial offset printer.

II. METHODS AND MATERIAL

A. Experiment

The experiment was carried out in CTP workflow. The test form (Fig. 1) was output by using AM technology with a resolution of 175lpi. Heidelberg SM 74-2 colors printing machine, as shown in Fig. 2

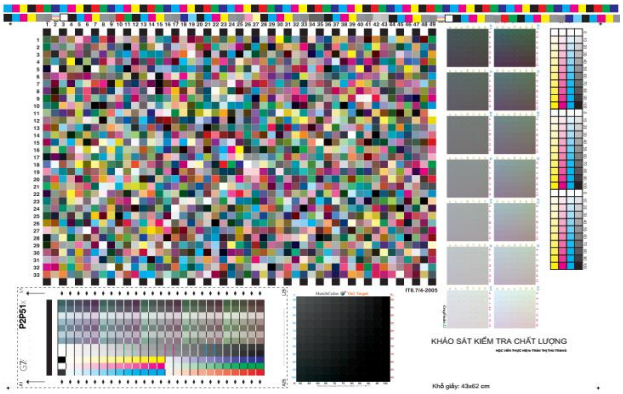


Figure 1: The CMYK test target

Figure 2: Offset printing machine SM74 – 2012

Offset printing Nippon speed (Cyan - C, Magenta - M, Yellow – Y) inks and Coated paper 100 g/m² were used. The printing process was carried out with the ink sequence Black - Cyan – Magenta – Yellow and a speed of 10.000 sph. The variation in the average and range solid ink density values (CMYK) of the printed sheets during the printing process was less than 0.1.

B. Density and ink trapping measurement

The ink trapping was calculated between the density of the first and second color sequence and the trapping of overlap two colors in wet-on-wet ink transfer as the formulas of Preucil [6]

$$FA(\%) = \frac{D_{12}-D_1}{D_2} \qquad (1)$$

Here, D_1 is the solid tone density of the first-down ink, D_2 is the solid tone density of the second-down ink, and D_{12} is the density of the overprint solid.

The dry densities are measured by an X_Rite SpectroDensitometer 504, Inc.Grandville, MI

C. CIE Lab value and color difference measurement

The color values were quantified numerically by the CIE LAB color model. The CIE Lab values were calculated by an X_Rite SpectroDensitometer 504, Inc.Grandville, MI. In the CIELAB color model, two colors can be compared and differentiated. These color differences are expressed as ΔE_{00} (Delta E or Difference in Color Sensation). The following equation is used to calculate the ΔE_{00}[7]

III.RESULTS AND DISCUSSION

A. Effect of ink layer thickness

The values of optical density of the full-tone area are listed in Table I. The optical density is proportional to the ink layer thickness. Thicker ink layers have higher values of optical density. The effect of ink densities (C, M, Y, K) on its color values is reported in Table I and Fig. 3.

TABLE I

COLOR VALUES (CMYK) OF THE PRINTS COMPARED TO THE STANDARD

Sample	Dc	L	a	b	ΔE_{00}
1	1.52	44.58	-35.75	-29.60	3.65
2	1.50	46.08	-36.09	-29.74	2.37

3	1.49	46.20	-36.07	-29.97	2.23
4	1.46	47.30	-35.59	-29.23	1.46
5	1.42	47.34	-36.26	-28.87	1.77
6	1.40	47.68	-36.29	-27.74	2.07
Sample	Dm	L	a	b	ΔE_{00}
1	1.49	40.12	60.65	0.40	2.32
2	1.46	40.88	62.82	-0.62	2.85
3	1.40	41.32	61.46	-0.08	2.64
4	1.38	42.28	59.71	-0.09	2.91
5	1.35	42.55	61.11	-0.35	3.02
6	1.32	43.13	59.95	-2.82	4.45
Sample	Dy	L	a	b	ΔE_{00}
1	1.18	75.94	-7.40	77.56	2.51
2	1.13	77.71	-7.31	80.23	1.75
3	1.10	78.25	-5.83	76.21	2.55
4	1.09	78.13	-6.23	75.33	2.73
5	1.04	78.56	-6.12	74.39	3.02
6	1.01	79.20	-6.51	73.05	3.50
Sample	Dk	L	a	b	ΔE_{00}
1	1.76	13.81	-0.37	8.67	4.76
2	1.75	13.92	2.39	1.41	2.86
3	1.74	13.96	1.28	5.89	3.01
4	1.73	14.36	0.59	7.47	3.96
5	1.72	14.68	-0.35	9.71	5.50
6	1.70	17.06	-0.40	9.79	5.90

The obtained results show that the investigated ink densities seem to have a limitation where the saturation is almost unchanged. However, there is a slight shift in the hue. With Cyan ink, the hue angle shifts about 3° toward Blue as density increases. The same shift is observed with M ink towards Red. However, for yellow and black, the hue changes caused by density increase are significantly more, about 10°.

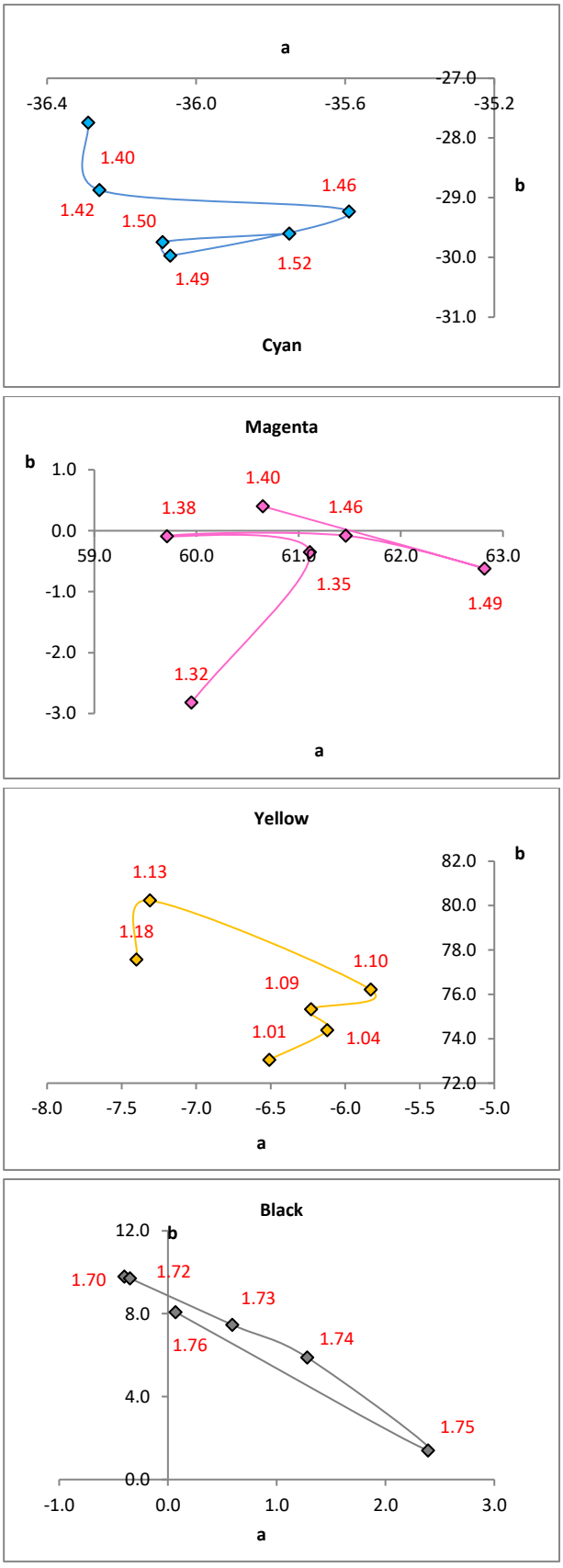


Figure 3: CIE Lab values of CMYK inks with various densities (red number)

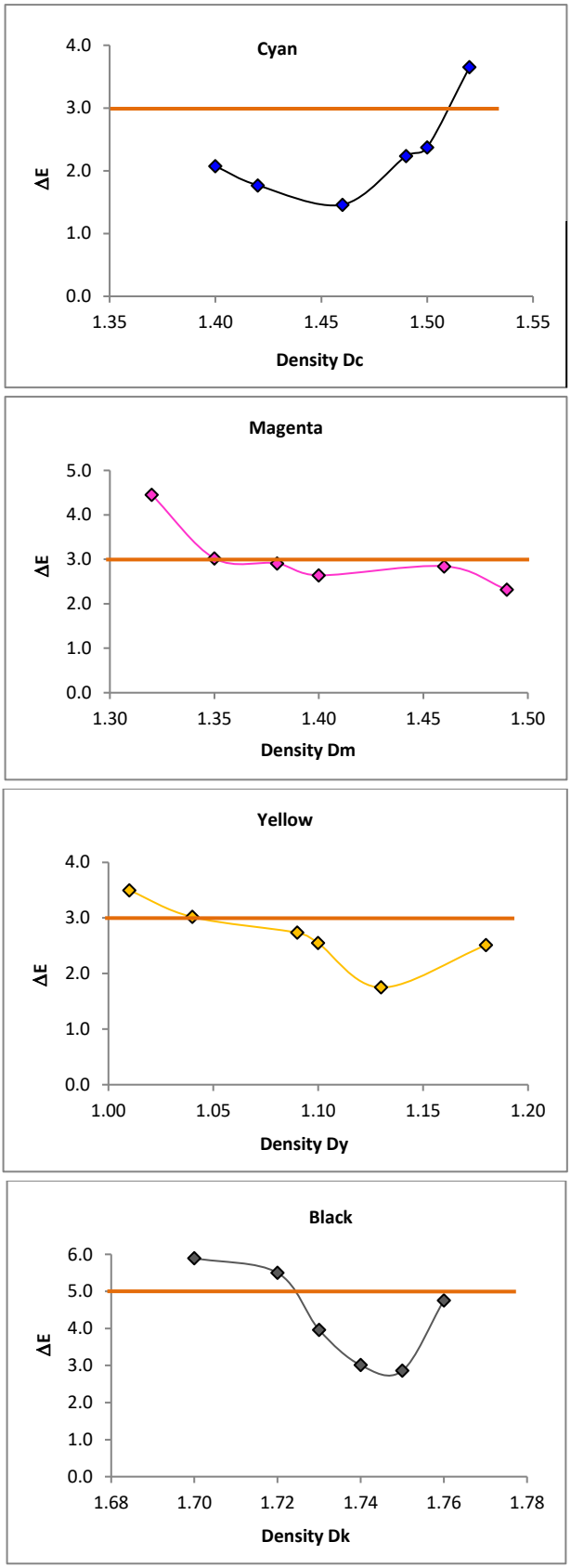


Figure 4: Color difference in solid colors of the print and ISO standard 12647-2 as a function of ink density

Color (CMYK) differences of the printed CIELab values vs. ISO 12647-2 standard CIELab values [5] are reported at various CMYK densities in Table I and Fig.4.

The density ranges corresponding to the standard color values ($\Delta E_{00} \leq 3.0$) are 1.40 – 1.51, 1.37 - 1.49, 1.07 – 1.13, 1.73 – 1.76 for C, M, Y, K ink, respectively.

B. Effect of ink trapping

In this series of experiments, the ink trapping coefficients of C-M, M-Y, and C-Y overprints were investigated at the wet-on-dry trapping processes. The calculated ink trapping coefficents are reported in Table II.

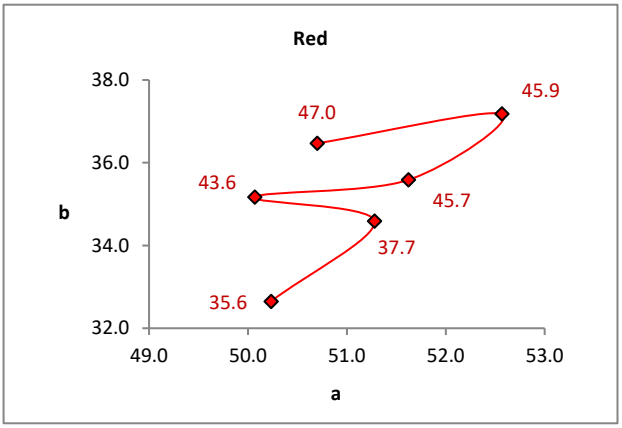
TABLE III

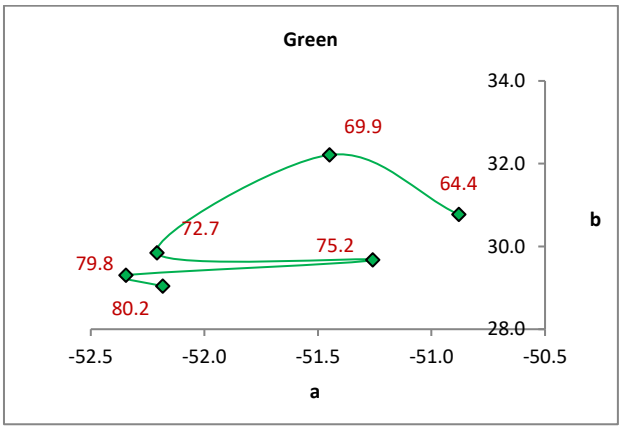
INK TRAPPING FA(%) OF TWO INK OVERPRINTS

Sample	D_1	D_2	D_{12}	FA(%)
C-M overprint				
1	0.64	1.49	1.38	49.66
2	0.61	1.46	1.40	54.11
3	0.61	1.40	1.41	57.14
4	0.59	1.38	1.47	63.77
5	0.59	1.35	1.52	68.89
6	0.59	1.32	1.51	69.70
C-Y overprint				
1	0.51	1.18	1.27	64.41
2	0.48	1.13	1.27	69.91
3	0.48	1.10	1.28	72.73
4	0.47	1.09	1.29	75.23
5	0.47	1.04	1.30	79.81
6	0.48	1.01	1.29	80.20
M-Y overprint				
1	0.97	1.50	1.20	35.57
2	0.95	1.5	1.21	37.67
3	0.92	1.53	1.21	43.57
4	0.91	1.54	1.21	45.65
5	0.91	1.53	1.21	45.93
6e	0.87	1.50	1.21	47.73

The results show that the ink trapping coefficient depends significantly on the thickness of the first-down ink layer. In all investigated inks, the ink trapping coefficient increases gradually from sample 1 to sample 6 with decreasing color density of the fist-down ink solids. The result is attributed to the fact that the thicker the previous ink layer, the longer it takes to dry, and the harder it is to transfer the overprinting ink.

With the high ink trapping coefficient, the high amount of ink transfer causes the hue of overprint colors to shift towards the tint of the second color (Fig. 5). However, a suitable range of values allows the overlapping color to be achieved according to the standard specified in Table III with $\Delta E_{00} \leq 4.2$.





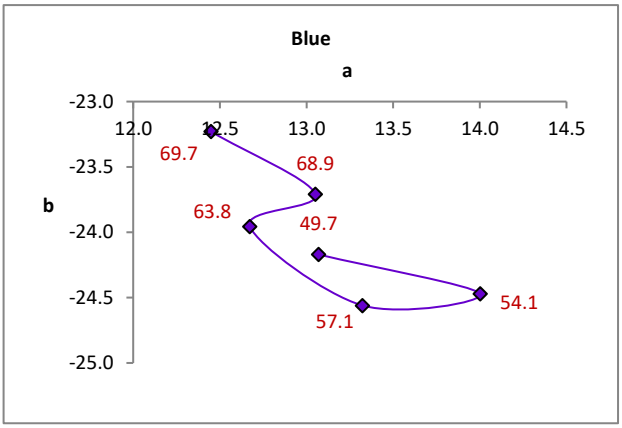


Figure 5: CIE Lab values of RGB overprints with various ink trapping coefficients (red number)

TABLE IIIII
COLOR VALUES (RGB) OF THE PRINTS COMPARED TO THE STANDARD

Sample	FA (B)	L	a	b	ΔE_{00}
1	49.66	20.19	13.07	-24.17	3.48
2	54.11	21.26	14.00	-24.47	3.44
3	57.14	21.55	13.32	-24.56	3.20
4	63.77	22.58	12.67	-23.96	3.54
5	68.89	22.74	13.05	-23.71	3.79
6	69.70	23.21	12.45	-23.23	4.05
Sample	FA (G)	L	a	b	ΔE_{00}
1	64.41	41.42	-50.88	30.77	3.16
2	69.91	43.81	-51.45	32.21	3.19
3	72.73	44.23	-52.21	29.85	2.51
4	75.23	45.21	-51.26	29.68	3.26
5	79.81	45.50	-52.35	29.30	3.16
6	80.20	46.20	-52.18	29.04	3.69
Sample	FA (R)	L	a	b	ΔE_{00}
1	35.57	39.04	50.70	36.47	2.94
2	37.67	40.71	52.57	37.17	2.64

3	43.57	41.43	51.62	35.58	3.42
4	45.65	42.33	50.07	35.17	3.90
5	45.93	42.83	51.28	34.59	4.39
6	47.73	43.77	50.23	32.65	5.55

IV. CONCLUSION

The effects of ink film thickness and ink trapping on the color values of solid color were investigated for a commercial lithographic printing system. The results indicate that these factors significantly influence the hue of printed image color. The CIE Lab values of the ISO 12647-2 standard can be controlled by ink density in the printing room.

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Analysis and Monitoring of Coma Patient Using Wearable and Monitoring Sensor System

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ABSTRACT

In India regular numerous people are impacted with trance state on the grounds that the patient are not observed opportune and appropriately and furthermore for constant customary boundaries are not proficiently work on various circumstances, continuous examination for patient condition likewise unrealistic. To defeat these sorts of circumstances, our framework is valuable. Our framework is intended to be utilized in Home or clinic for estimating and checking different boundary like Body temperature and heartbeat. By utilizing Internet of Things (IOT) innovation makes all articles interconnected and it has been perceived as the following specialized insurgency. The outcomes can be recorded utilizing Arduino showed on interacted show. Likewise the outcomes can be shipped off server utilizing IOT and Relatives or Doctors can login to a site and view those outcomes.

Keywords : Arduino, Heartbeat Sensor, Temperature Sensor, Health Parameters, IOT

I. INTRODUCTION

An implanted framework is a specific reason PC framework intended to perform one or a couple of devoted capabilities. An embedded system is a combination of hardware and software. This task presents a constant checking and recording of patient information without human mediation. In the event that there is any abrupt changes happen in the typical scope of body parameters such as heartbeat, over temperature recognition, then, at that point, Buzzer will ring and message will shipped off comparing portable number.

II. EXISTING SYSTEM

In existing framework, doctors need to monitor the patients in a screen implies both ought to be in clinic as it were. A few parts are associated with the patient to know the patient conditions by connecting temperature sensor, heartbeat sensor. If any emergency then buzzer will on and the doctors should alert. And every time their conditions are shown on LCD screen.

Drawbacks :

- It leads more time
- Sometimes it is difficult to adjust in hospitals for more time.

III. PROPOSED SYSTEM

A health observing system comprises of various sensors connected to the patient and they convey that information by means of the handling unit to the server. The patient and doctor cell phone or PCs are utilized as monitoring device. In this proposed system we are utilizing Arduino, Eye blink Sensor, temperature and Heartbeat Sensor. Temperature Sensor is utilized to screen the temperature of the patient. Heartbeat Sensor is utilized to screen the pulse of the trance state patient. Eye blink sensor is utilized to screen the flickering of eyes of trance like state patient. MEMS sensor is utilized to recognize the body developments of the patient. If any of the sensors exceeds the limit the message will sent to the corresponding mobile number and the values are uploaded to the thingspeak server.

Block diagram:

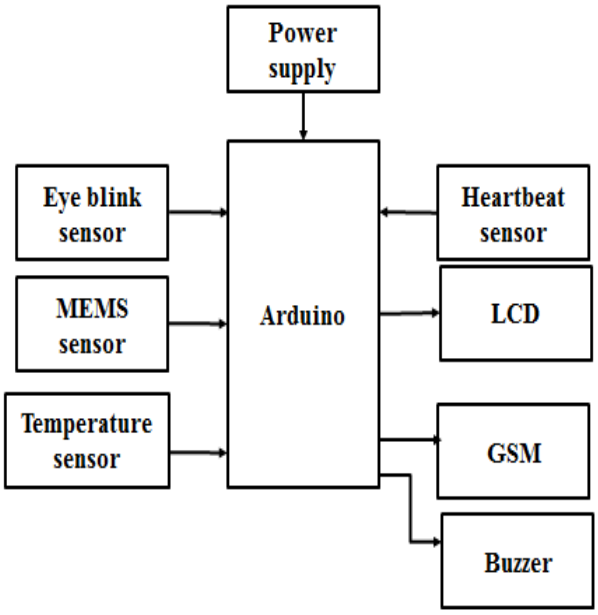

Fig 1: Block diagram of proposed Method

HARDWARE REQUIREMENTS

Arduino:

Arduino UNO is a much precious add-on to the electronics, which contains USB interface, six analog pins and fourteen digital Input/Output pins along with a Atmega328-powered microcontroller. Furthermore, the Arduino UNO also aids serial interaction with the help of Rx and Tx pins.

These Arduino is available in several variants, which exist in the market such as Arduino Due, Arduino UNO, Arduino Mega, and Arduino Leonardo. But, among the four variants, Arduino Mega and Arduino Uno are readily available than the other two. Those who you are aiming to execute a project in line with the digital electronics could choose Arduino UNO as it imparts more convenient and also be cost effective when dealing with IoT, robotics, embedded system, etc.

Fig2: Arduino

These Arduino UNO are generally open-sourced (i.e.) the related software and boards are much easily accessible that any person could alter and improvise those boards for obtaining desirable functionalities in diverse applications.

MEMS Sensor:

MEMS are low-cost, and high accuracy inertial sensors and these are used to serve an extensive range of industrial applications. This sensor uses a chip-based technology namely micro-electro-mechanical-system. These sensors are used to detect as well as measure the external stimulus like pressure, after that

it responds to the pressure which is measured pressure with the help of some mechanical actions.

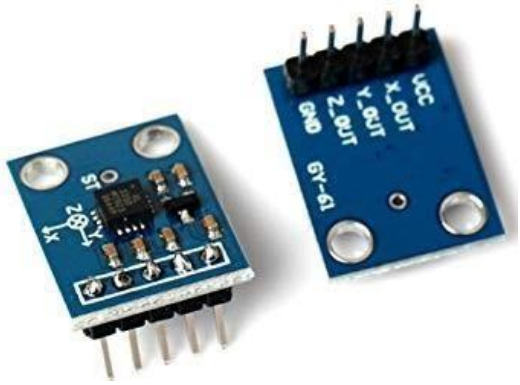

Fig 3: MEMS Sensor

Heartbeat Sensor:

Heartbeat Sensor is an electronic device that is utilized to scale the pulse for example speed of the heartbeat. Observing internal heat level, pulse and blood pressure are the fundamental things that we really do to keep us solid.

Fig 4: Heartbeat Sensor

Power Supply:

Transformer:

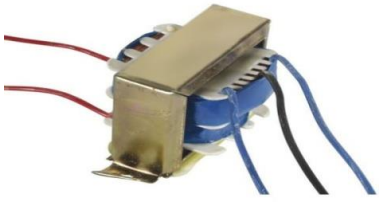

Fig 5: Transformer

Transformer is a device which reduces A.C current into required D.C current.

Bridge Rectifier:

Fig 6: Bridge rectifier

A diode bridge is a technique of four diodes in a bridge circuit arrangement that provides equal polarity of output for mutually polarity of input. While used in its maximum shared application, for transformation of an alternating-current input into a direct-current output, it is called as a bridge rectifier.

Capacitor:

Fig 7: Capacitor

A capacitor could be a passive two terminal eletrical component that stores current in a electric field. The result of this can be termed as capacitance.

Regulator:

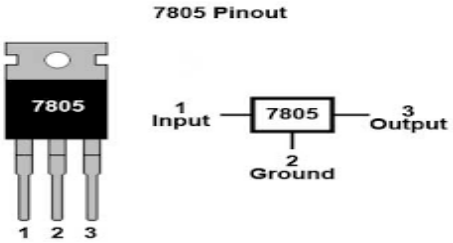

Fig 8: Regulator

A voltage regulator IC keeps the output voltage at a continuous value. 7805 IC is one of the IC of 78xx family. It maintains fixed linear regulators which is used to maintain fluctuations.

GSM Module:

GSM speaks to Global System for Mobile Communications. It is a standard set made by the

European Telecommunications Standards Institute (ETSI) to depict traditions for second time (2G) automated cell frameworks used by PDAs.

A Modem is a gadget which modulates and demodulates signals as per communication requirements. It converts an analogue carrier signal to digital signal and also converts such a carrier signal to required information.

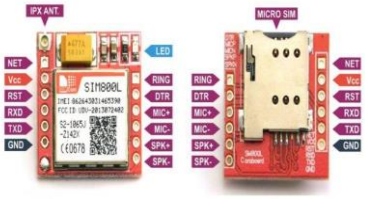

Fig 9: GSM

LCD:

LCD (Liquid Crystal Display) is the innovation utilized in scratch pad shows and other littler PCs. Like innovation for light-producing diode (LED) and gas-plasma, LCDs permit presentations to be a lot slenderer than innovation for cathode beam tube (CRT). LCDs expend considerably less power than LED shows and gas shows since they work as opposed to emanating it on the guideline of blocking light.

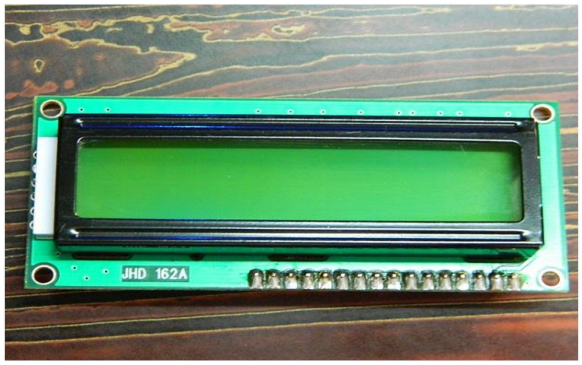

Fig 10: LCD

TEMPERATURE SENSOR

The DS18B20 is one kind of temperature sensor and it supplies 9-bit to 12-bit readings of temperature. These values show the temperature of a specific device. The correspondence of this sensor should be possible through a one-wire bus protocol which utilizes one data line to communicate with an inner microprocessor. Moreover, this sensor gets the power supply directly from the data line so the requirement for an external power supply can be eliminated. The applications of the DS18B20 temperature sensor include industrial systems, consumer products, systems which are sensitive thermally, thermostatic controls and thermometers.

Fig 11: Dallas Temperature Sensor

EYE BLINK SENSOR

The Eye Blink Sensor is based on IR. It consists of an IR Transmitter and IR Receiver. The Eye Blink Sensor enlightens the eye with infrared light and monitors the changes in the reflected light. The infrared light reflected from the eye is utilized to determine the results. The sensor output is active high for eye close and can be given directly to microcontroller for interfacing application.

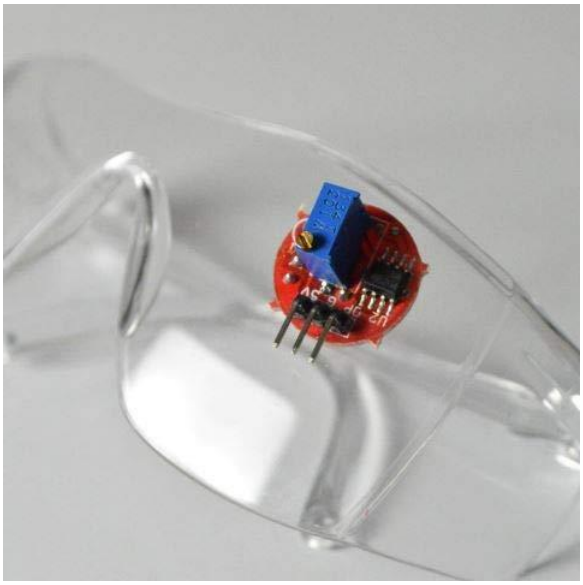

Fig 12: Eye Blink Sensor

BUZZER

A buzzer or beeper is a sound signaling gadget, which might be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, clocks and affirmation of client information, for example, a mouse snap or keystroke. Ringer is a coordinated design of electronic transducers, DC power supply, broadly utilized in PCs, printers, copiers, cautions, electronic toys, car electronic gear, phones, clocks and other electronic items for sound gadgets.

Fig 13 : Buzzer

SOFTWARE REQUIREMENTS

Arduino IDE:

The Arduino IDE software is open-source software, where we can have the example codes for the beginners. In the Present world there are lot of versions in the Arduino IDE in which present usage is Version1.0.5. It is very easy to connect the PC with Arduino Board.

Fig14: Arduino IDE Window

ADVANTAGES

- Easy to interface with server
- Monitoring the patient continuously
- Easy to build

APPLICATIONS

- Used in hospitals
- Used in remote areas

IV. CONCLUSION

The proposed system uses sensor innovation as an arising component for medical care administrations. PC and mobile monitoring system is presented which is able to continuously monitor the patient's heartbeat, temperature, eye blink sensor, MEMS sensor. The system is able to carry out a long term monitoring of patients condition and furnished with a crisis component. A real time monitoring system is developed to provide clearer and more point to point to point perspective of the underground mine. This system is displaying the parameters on the monitoring unit. To Alarm triggers when sensor values passes the boundary level.

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A Blockchain-Based Covid Vaccine Booking and Vaccine Management System

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ABSTRACT

Immunization is all about using Blockchain for managing and tracing the vaccine stocks, logistics, and transparent distribution. Immunization gives you continuous visibility and enables actionable insights to track vaccine distribution and ensure a fair and equitable distribution. Immunization allows you to book your vaccination appointments and will also allow you to keep track of the vaccine being distributed. Blockchain helps in maintaining the integrity and transparency of the whole process right from the inception of the vaccine.

Keywords : Machine Learning Algorithms, Classifiers, Cervical Cancer, Ensemble Classification.

I. INTRODUCTION

The prevalence of coronavirus leads to respiratory infections with symptoms ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). Since then, the eyes of the world have been on the pharmaceutical sector as industry leaders race to test, produce and distribute a vaccine to combat COVID-19. On March 11, WHO concluded that COVID-19 could be a pandemic. Worldwide the partners are working together to reduce the spread of disease by developing multiple vaccines. Once a vaccine is approved by WHO for common people's disposal, attention will turn to the orchestration and the planning done by the respective Governments for the vaccine distribution and the methods to be used by them such as shipping, storage, and distribution, especially if special storage condition is required. The most challenging factor is the demand for the vaccine. The immunization campaign is critical due to vaccine roll out and its success depends upon the transparent supply chain. The vaccine registration can be done us a blockchain consensus algorithm. The algorithm creates a new block to the chain and confirms the transaction. The blockchain algorithm is necessary for security while registering for the vaccine, which prevents fraud and enables trust. It requires more computational power and time. Real-time visibility can be obtained by providing detailed information about the cost and security analysis incurred by the stakeholders within the chain. In terms of latency and efficiency, the proposed blockchain system shows promising results.
The healthcare industry is loaded with immense data and those data are stored independently, hence there

would be no collision among the information stored. The test detail collection helps reduce pressure on healthcare and hospitals. In this project, we are implementing a website for a transparent and tamperproof vaccine distribution system. Patients can register, then log in, and may share their knowledge on our website. We also keep tracking the transactions and the vaccine being used. Blockchain technology could be a distributed ledger that ensures a transparent, safe, and secure exchange of data among supply chain stakeholders. Smart contracts are used for observing and tracking the right vaccine distribution. This enables people to believe that vaccines are effective and do their daily chores without any fear.

II. RELATED WORKS

A planning model for the WHO-EPI vaccine distribution network in developing countries: In many developing countries, inefficiencies in the supply chain for the World Health Organization's Expanded Program on Immunization (EPI) vaccines are of grave concern; these inefficiencies result in thousands of people not being fully immunized and creates a significant risk of disease epidemics. Thus, there is a great deal of interest in these countries in building tools to analyze and optimize how vaccines flow down several levels of the supply chain from manufacturers to vaccine recipients. This article develops a mathematical model for typical vaccine distribution networks in developing countries. This model has been successfully adapted for supply chains in three different countries (Niger, Thailand, and Vietnam), and its application to several issues of interest to public health administrators in developing countries are discussed.

Optimal influenza vaccine distribution with equity: This paper is concerned with the optimal influenza vaccine distribution in a heterogeneous population consisting of multiple subgroups. We employ a compartmental model for influenza transmission and formulate a mathematical program to minimize the number of vaccine doses distributed to effectively extinguish an emerging outbreak in its early stages. We propose an equity constraint to help public health authorities consider fairness when making vaccine distribution decisions. We develop an exact solution approach that generates a vaccine distribution policy with a solution quality guarantee. We perform sensitivity analyses on key epidemic parameters in order to illustrate the application of the proposed model. We then analyze the scalability of the solution approach for a population consisting of subgroups based on geographic location and age. We finally demonstrate the proposed model's ability to consider vaccine coverage inequity and discuss a derivative-free optimization approach, as an alternative solution method that can consider various different objective functions and constraints. Our results indicate that consideration of group-specific transmission dynamics is paramount to the optimal distribution of influenza vaccines.

Optimizing vaccine distribution networks in low and middle-income countries: Vaccination has been proven to be the most effective method to prevent infectious diseases. However, there are still millions of children in low and middle-income countries who are not covered by routine vaccines and remain at risk. The World Health Organization – Expanded Programme on Immunization (WHO-EPI) was designed to provide universal childhood vaccine access for children across the world and in this work, we address the design of the distribution network for WHO-EPI vaccines. In particular, we formulate the network design problem as a mixed integer program (MIP) and present a new algorithm for typical problems that are too large to be solved using commercial MIP software. We test the algorithm using data derived from four different countries in sub-Saharan Africa and show that the algorithm is able to obtain high-quality solutions for even the largest problems within a few minutes.

Optimizing national immunization program supply chain management in Thailand: an economic analysis,

Public Health: Objectives: This study aimed to conduct an economic analysis of the transition of the conventional vaccine supply and logistics systems to the vendor-managed inventory (VMI) system in Thailand.
Study design: Cost analysis of health care program.
Methods: An ingredients-based approach was used to design the survey and collect data for an economic analysis of the immunization supply and logistics systems covering procurement, storage, and distribution of vaccines from the central level to the lowest level of vaccine administration facility. Costs were presented in 2010 US dollars.
Results: The total cost of the vaccination program including the cost of vaccine procured and logistics under the conventional system was US$0.60 per packed volume procured (cm3) and US$1.35 per dose procured compared to US$0.66 per packed volume procured (cm3) and US$1.43 per dose procured under the VMI system. However, the findings revealed that the transition to the VMI system and outsourcing of the supply chain system reduced the cost of the immunization program to US$6.6 million per year because of the reduction of unopened vaccine wastage.
Optimal but inequitable prophylactic distribution of vaccine, Epidemics: The final epidemic size (R_∞) remains one of the fundamental outcomes of an epidemic, and measures the total number of individuals infected during a "free-fall" epidemic when no additional control action is taken. As such, it provides an idealized measure for optimizing control policies before an epidemic arises. Although the generality of formulae for calculating the final epidemic size has been discussed previously, we offer an alternative probabilistic argument and then use this formula to consider the optimal deployment of the vaccine in spatially segregated populations that minimizes the total number of cases. We show that for a limited stockpile of vaccines, the optimal policy is often to immunize one population to the exclusion of others. However, as greater realism is included, this extreme and arguably unethical policy is replaced by an optimal strategy where vaccine supply is more evenly spatially distributed.
Continuous Genetic Algorithms in the Optimization of Logistic Networks: Applicability Assessment and Tuning: Globalization opens up new perspectives for handling goods distribution in logistic networks. However, establishing an efficient inventory policy is challenging by virtue of the analytical and computational complexity. In this study, the goods distribution process that was governed by the order-up-to policy, implemented in either a distributed or centralized way, was investigated in the logistic systems with complex interconnection topologies. Uncertain demand may be imposed at any node, not just at conveniently chosen contact points, with a lost-sales assumption that introduces a non-linearity into the node dynamics. In order to adjust the policy parameters, the continuous genetic algorithm (CGA) was applied, with the fitness function incorporating both the operational costs and customer satisfaction level. This study investigated how to select the parameters of the popular inventory management policy when operating in non-trivial networked structures. Moreover, precise guidelines for the CGA tuning in the considered class of problems were provided and evaluated in extensive numerical experiments.

III. METHODOLOGY

Proposed System

In the prop the used system we are using a Blockchain which helps in maintaining the integrity and transparency of the whole process right from inception of the vaccine. block chain helps in managing and tracking the vaccine stocks, logistics and, transparent distribution.

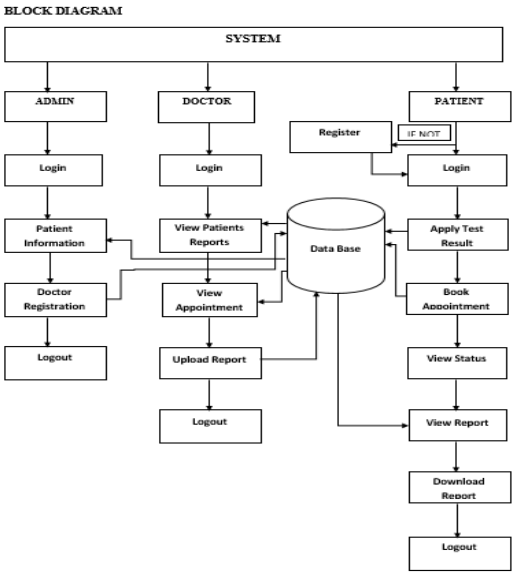


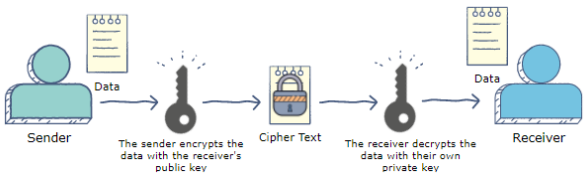
Figure 1 : Block diagram

IV. IMPLEMENTATION

The project has been implemented by the sing below listed algorithm.

DATA ENCRYPTION:

Data encryption translates data into another form, or code so that only people with access to a secret key (formally called a decryption key) or password can read it. Encrypted data is commonly referred to as cipher text, while unencrypted data is called plaintext. Currently, encryption is one of the most popular and effective data security methods used by organizations. Two main types of data encryption exist - asymmetric encryption, also known as public-key encryption, and symmetric encryption.



PURPOSE:

The purpose of data encryption is to protect digital data confidentiality as it is stored on computer systems and transmitted using the internet or other computer networks. The outdated data encryption standard (DES) has been replaced by modern encryption algorithms that play a critical role in the security of IT systems and communications.

These algorithms provide confidentiality and drive key security initiatives including authentication, integrity, and non-repudiation. Authentication allows for the verification of a message's origin, and integrity provides proof that a message's contents have not changed since it was sent. Additionally, non-repudiation ensures that a message sender cannot deny sending the message.

DATA DECRYPTION

Decryption is the process of transforming data that has been rendered unreadable through encryption back to its unencrypted form. In decryption, the system extracts and converts the garbled data and transforms it to texts and images that are easily understandable not only by the reader but also by the system. Decryption may be accomplished manually or automatically. It may also be performed with a set of keys or passwords. One of the foremost reasons for implementing an encryption-decryption system is privacy. As information travels over the World Wide Web, it becomes subject to scrutiny and access from unauthorized individuals or organizations. As a result, data is encrypted to reduce data loss and theft. Some of the common items that are encrypted include email messages, text files, images, user data and directories. The person in charge of decryption receives a prompt or window in which a password may be entered to access encrypted information.

Implementation:

This module includes home page, user registration, user login, doctor login pages

The user registers himself and takes the preliminary tests and can check the details of the disease and can book the appointment for taking vaccines and in the token confirm page can check whether his booking has been confirmed or not by the hospital management. A Doctor logs into his account and can check about his information in the home page, the home page also shows the number of visitors he has had and the appointment verify page shows the

appointments booked by patients and the doctor can either confirm. Patient can register, can login, fill the information related to the medications taken for other sickness and the doctor can decide when the person needs to take the vaccine. Meanwhile the patient can book appointment for the preferred hospital. Patient can see the appointment status in their login.

The user registers himself and takes the preliminary tests and can check the details of the disease and can book the appointment for taking vaccines and in the token confirm page can check whether his booking has been confirmed or not by the hospital management.

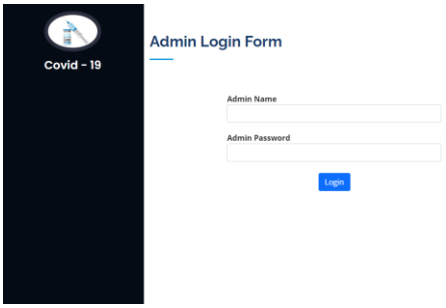
In the Admin module, admin can add the doctor's information along with doctor's information and view the patient health reports. In the Doctor module a doctor can add text information. View user test information and confirm user information.

V. Results and Discussion

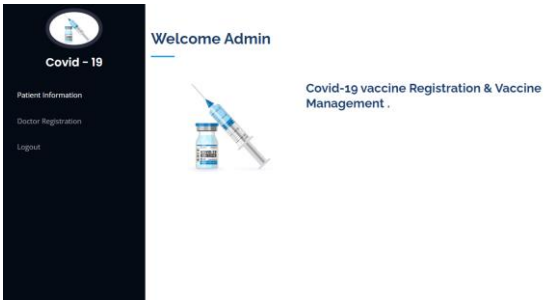
The following screenshots are depicted the flow and working process of project.

Home Page: This is the home page the project where can get all the facilities by using this application.

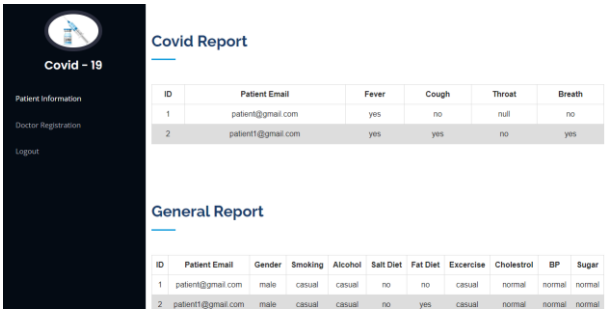
Admin Login Page: Admin should login by providing valid credentials.



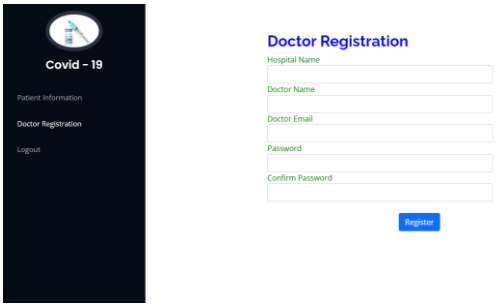
Admin Home Page: Admin can view the home page of the project with all facilities can accessed by the admin.



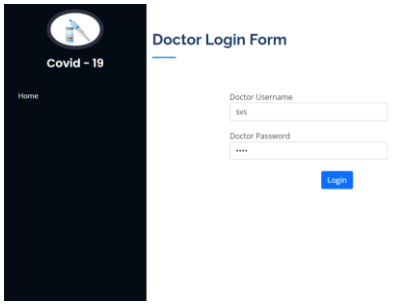
Patient Information: This page displays the patient information.



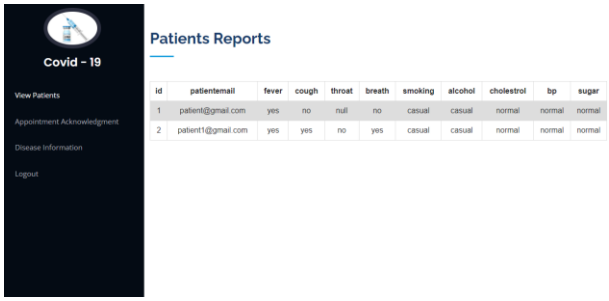
Doctor Registration Page: Doctor can register by providing required details.



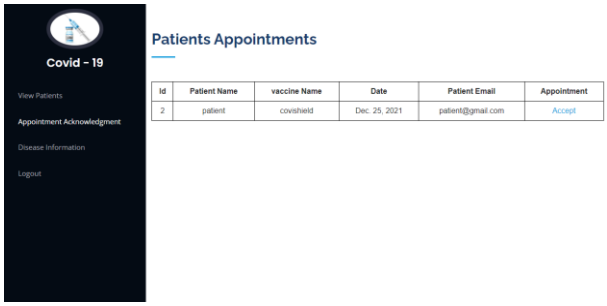
Doc Login Form: Doctor can login with valid credentials.



View patients: Doctor can view the patients.

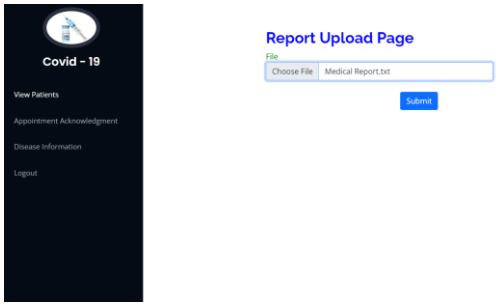


Appointment Request: This page contains appointment requested by the patient.

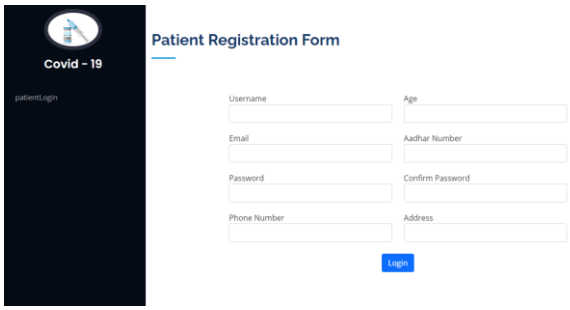


Disease Information: This page contains the information about the particular disease.

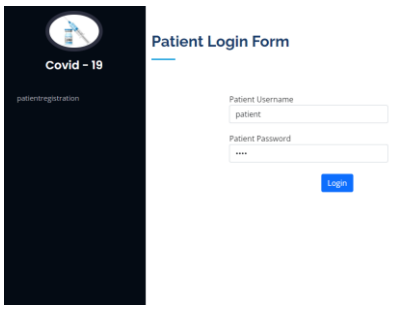
Report Upload Page: Doctor can upload reports related to particular patient.



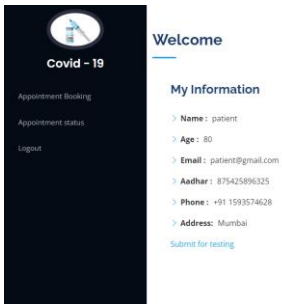
Patient Registration: Patient can register with the help of this patient registration page.



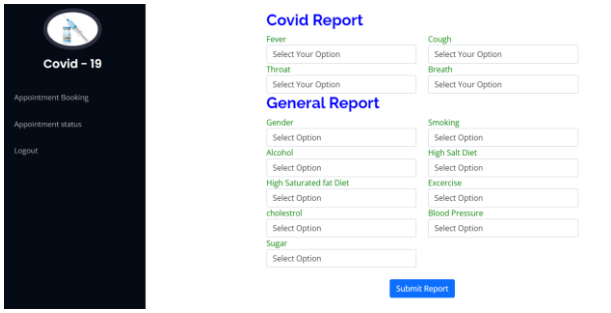
Patient Login Form: Patient can login with valid credentials.



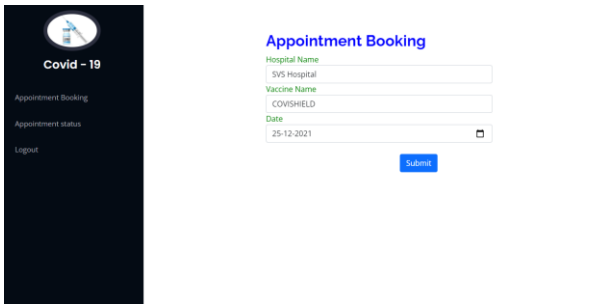
Patient information: This page contains all the information of patients.



Report page: Here patient can view the report.

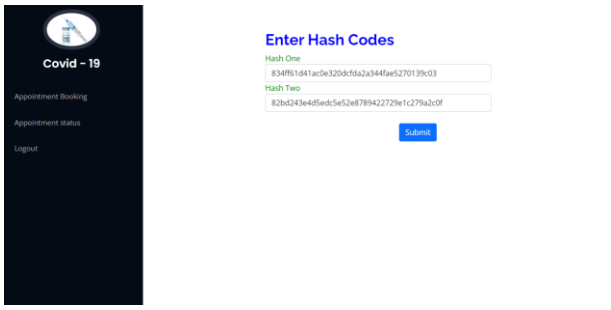


Appointment booking: Patient can book appointment.

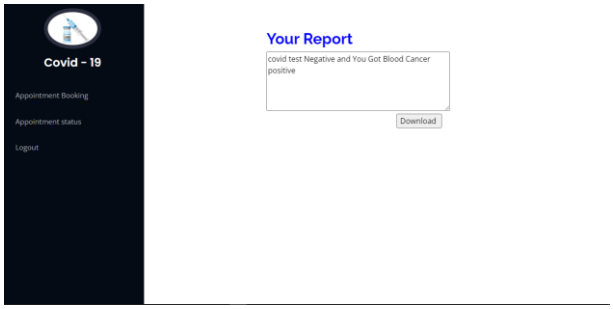


Appointment Status: Patient can view the status of his/her requested appointment.

Hash Codes: This page contains hash codes.



Patient Report: Patient can their report.



VI. CONCLUSION

In the research, the blockchain based system was implemented to trace the registration, transparency, storage and delivery of Covid-19 vaccine. Based on the findings, a blockchain solution is proposed for transparent vaccine distribution which manages the following:

1. Tracing the storage and delivery of Covid-19 vaccine with increased efficiency and transparency.
2. Assuring valid registration and monitoring the waiting test for immunization.
3. Providing a clear public reporting system.

Thus, Immunization is all about managing and tracing the vaccine stockss, logistics and transparent distribution. Immunization gives you continuous visibility and enables actionable insights to track vaccine distribution and ensure a fair and equitable. Immunization allows you to book your vaccination appointments and will also allow you to keep track of the vaccine being distributed.

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Haar Dwt of Delay Optimized High Performance Ladner Fischer Adder

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ABSTRACT

A parallel prefix-structured optimized Ladner Fischer adder was used to implement the Haar discrete wavelet transform. Since it is the most recent idea and a crucial option for balancing accuracy and parameter efficiency, we are thinking about the approximation topic in this instance. Prior to image processing and analysis, the image transformation is a crucial step. A low-complexity pre-processing filter appropriate for extremely energy-constrained image processing systems is the Haar discrete wavelet transform (HDWT). This paper provides an ideal HDWT hardware design based on the Ladner-Fisher algorithm for image processing at extremely high-performance efficiency.

Keywords - Image/Video Processing, Optimized Controller, Optimized Haar Wavelet Transform, Optimized Kogge–Stone Adder/Subtractor

I. INTRODUCTION

Digital Image Processing (DIP) is used in almost every fields known by today's modern human society such as medical, astronomy, entertainment and computer vision etc. Video Processing is the extension of the digital image processing where a sequence of still images are changing at very fast rate with proper sequences. This makes illusion to the viewer that the objects present in the frame are moving. In the case of the video, each still image is known as frame and the rate at which the frame changes are calculated in frames per second (fps) unit. As a result, image processing techniques can also be used in video processing. For good quality image, the number of the pixels present in the corresponding image must be high and similarly for video both number of pixels in the frame and frame rate must be high.

Multimedia files are large and consume lots of hard disk space. The files size makes it time-consuming to move them from place to place over school networks or to distribute over the Internet. Compression shrinks files, making them smaller and more practical to store and share. Compression works by removing repetitious or redundant information, effectively summarizing the contents of a file in a way that preserves as much of the original meaning as possible. In order to reduce the volume of multimedia data over wireless channel compression techniques are widely used. Efficacy of a transformation scheme can be directly gauged by its ability to pack input data

into as few coefficients as possible. This allows the quantize to discard coefficients with relatively small amplitudes without introducing visual distortion in the reconstructed image.

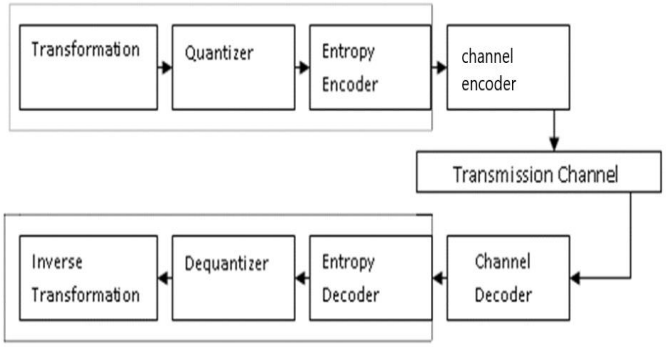


Fig 1. Image/Video Transmission System

Multimedia data processing, which encompasses almost every aspect of our daily life such as communication broad casting, data search, advertisement, video games, etc. has become an integral part of our life style. The most significant part of multimedia systems is application involving image or video, which require computationally intensive data processing. Moreover, as the use of mobile device increases exponentially, there is a growing demand for multimedia application to run on these portable devices. A typical image/video transmission system is shown in the Fig 1.

Wavelet Transform

A major disadvantage of the Fourier Transform is it captures global frequency information, meaning frequencies that persist over an entire signal. This kind of signal decomposition may not serve all applications well, for example Electrocardiography (ECG) where signals have short intervals of characteristic oscillation. An alternative approach is the Wavelet Transform, which decomposes a function into a set of wavelets.

Wavelet

A Wavelet is a wave-like oscillation that is localized in time, an example is given below. Wavelets have two basic properties: scale and location. Scale (or dilation) defines how “stretched” or “squished” a wavelet is. This property is related to frequency as defined for waves. Location defines where the wavelet is positioned in time (or space).

Haar wavelet transform

Image compression based on wavelet transform which is used to check the quality of the compressed image with respect to different thresholding techniques. The basic Haar wavelet transform is used to perform this compression and the entire algorithm is implemented using software-based simulation technique. The result shows that the soft thresholding technique is able to generate better quality image in terms of PSNR than hard thresholding technique. Hardware based discrete wavelet transform architecture. To reduce the memory requirements in the architecture, novel diagonal scan method is used to read the input image and also to design efficient filter banks, recursive pyramid hierarchical approach is considered.

Multilevel decomposition of image through discrete wavelet transform for image compression is an important parameter. The decomposition is performed through hardware architectures which is derived from fast Haar wavelet transform. This technique reduces the hardware utilizations required to decompose the input image. image fusion using wavelet decomposition method for satellite image. The fusion technique is implemented. This architecture is inefficient in terms of hardware utilizations due to the use of built-in blocks without proper optimizations.

A hardware-based architecture to implement watermarking technique in which the Haar wavelet is used as main component and to reduce the design complexity, modified lifting scheme is proposed. De-noising of ECG signal based on Haar wavelet transform and universal thresholding techniques. The entire architecture is designed through the built-in functions. Image compression based on Haar transform, DCT and Run Length Encoding techniques separately for JPEG image. The Haar wavelet

transform showed good compression ratio in terms of image size and the PSNR than existing techniques.

The watermarking architecture was designed using Haar DWT and DCT algorithm where the conventional algorithms were modified to process videos frame by frame. a tunable VLSI architecture of DWT and to achieve area and memory efficient architecture, Distributed Arithmetic technique was used along with some degree of parallelism. efficient integer wavelet transform architecture which is used for QRS detection of ECG signal effectively where the wavelet transform is mainly used to de-noise the ECG signal. The haar wavelet, zero-crossing detector, threshold and decision blocks are used to implement the entire architecture.

Working of Wavelet

The basic idea is to compute how much of a wavelet is in a signal for a particular scale and location. For those familiar with convolutions, that is exactly what this is. A signal is convolved with a set wavelet at a variety of scales.

In other words, we pick a wavelet of a particular scale (like the blue wavelet in the gif above). Then, we slide this wavelet across the entire signal i.e., vary its location, where at each time step we multiply the wavelet and signal. The product of this multiplication gives us a coefficient for that wavelet scale at that time step. We then increase the wavelet scale (e.g., the red and green wavelets) and repeat the process.

In this work, we present the first approximate HDWT VLSI hardware architectures which combine coefficient approximation and truncation. We investigate at design-time the approximate HDWT demonstrating the reduction in circuit area and power dissipation with a consequent trade-off in peak signal-to-noise-ratio (SNR). Despite the lower PSNR, this proposal fulfills the ultimate quality performance at the application-level with a slight improvement in the accuracy while providing a reduction in energy required to process image signals. Our contributions presented in this paper are as follows:

1. An HDWT matrix approximation capable of fulfilling the service quality in the application and of producing a multiplier less hardware architecture.
2. A pruning in the approximate HDWT matrix, reducing the HDWT hardware architecture to just fewer parallel additions.
3. We demonstrate that our approximate HDWT proposal can sustain a higher level of truncation than the original HDWT (i.e., efficiently processing an input signal with a lower quantization level).
4. A discussion about the hardware performance of our approximate HDWT proposal and its benefits in circuit area and power dissipation are presented, ensuring the processing of the image signal with high quality.

II. EXISTING METHOD

Kogge–Stone adder

The Kogge–Stone Adder is the modified version of Carry Look Ahead Adder is shown in fig 2. The modification is done to reduce the delay problem in generating carry signal for large size adder architecture. This adder is able to produce the output faster than other existing adders with small area overheads. The operation of this adder is divided into three parts as Pre-processing, Carry Lookahead Network and Post-Processing respectively.

1. Pre-processing: In this stage, the propagate (p) and generate (g) signals are computed separately for each ‘A’ and ‘B’ signals respectively. The logical equations of this block can be written as

$$pi = Ai \oplus Bi \quad \ldots (1)$$

$$gi = Ai \,\&\, Bi \quad (2)$$

where i ← Length of the adder.

2. Carry Lookahead Network: The carry of the corresponding bits is computed separately in this stage which increases the maximum operating speed of this adder. This stage uses the propagate

(p) and generate (g) signals to determine the corresponding carry signal. The logical equation of this stage is given as

$$p\ i{:}\ j\ = pi{:}k+1\&pk{:}\ j \quad (3)$$

$$gi{:}\ j = gi{:}k\ |(pi{:}k+1\&gk{:}\ j) \quad (4)$$

where {j, k} ← Intermediate integer values used to mix signals.

3. Post-processing: The computation of the final sum of the corresponding bits are calculated in this stage. The logical equation for this stage is

$$Si = pi \oplus ci{-}1 \quad (5)$$

where ci–1 ← Generated carry from previous adder block.

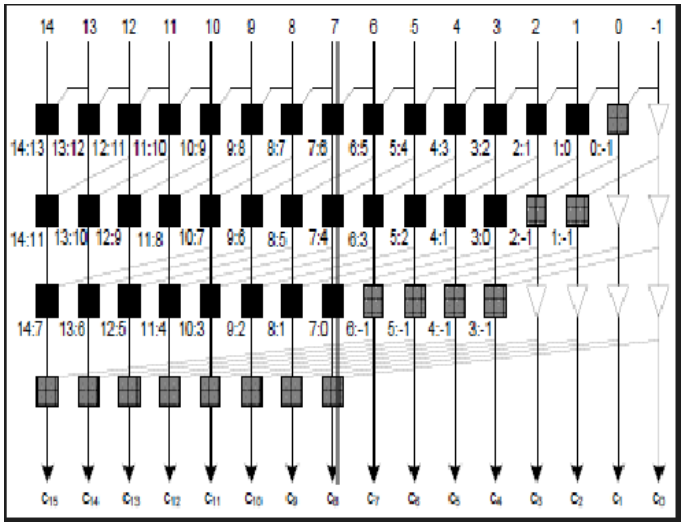


Fig 2: Structure of kogge stone adder

For many cases of image analysis, it is necessary to convert the input image into frequency domain to overcome various issues that occurs in time domain analysis. Normally various types of Fourier Transforms such as DFT, FFT and STFT etc., are used where complex sinusoidal input data is considered. In most of the real time scenarios, the input data is infinite where the information is spread over the whole-time axis of the signal making it difficult to model through regular Fourier Transforms.

To overcome from this type of problems, windowing methods are used. The windowed version of Fourier Transforms is known as windowed Fourier Transforms which is given in Eq. (6) as

$$X(\tau,\omega) = \int_{-\infty}^{\infty} \omega(t-\tau)\cdot x(t)\cdot e^{-j\omega t}dt \quad (6)$$

where ω(·) ← Appropriate window Size. The X (τ, ω) is the Fourier Transforms of x(t) where the window ω(·) is shifted by an amount 'τ ' which is modulated version of the window and named as Short-Time Fourier Transform (STFT).

Due to the use of single window, the resolution of the analysis is always same for all locations in the time-frequency plane. By varying the window size, the resolution in both time and frequency domain can be changed which is achieved by wavelet transform.

In the case of wavelets, it is possible to design the wavelet function h(t) such that the set of translated and scaled versions of h(t) forms an Orthogonal basics function with the input signal.

$$h(t) = \begin{cases} 1, & 0 < t \le \frac{1}{2} \\ -1, & \frac{1}{2} \le t < 1 \\ 0, & \text{Otherwise} \end{cases}$$

Any Wavelet Transform uses two different filter banks namely high-pass and low-pass filter which generates low and high frequency coefficients present of the respective input image. For such partitioning, let us consider

$$\omega_4 = \begin{bmatrix} H \\ G \end{bmatrix}$$

where H ← Low-pass filter coefficient matrix for Haar Wavelet, G ← High-pass filter coefficient matrix for Haar Wavelet.

III. PROPOSED METHOD

Wavelet transforms assume a scale on any real line, making it feasible for most practical and computationally expensive problems. The discrete WT function translates successive sums and multiplications. Fig.1d shows the top-level hardware block diagram of the Haar transform with four decomposition levels. It consists of M = 4 blocks called processing module (PM). This module determines the coefficients of the WT. Also, there is a control block responsible for synchronizing the operations between the PM. It ensures that the load of the registers in

block M = 4 occurs at the correct time. The other schemes in Fig.1 describe the architectural exploration of HDWT M = 4.

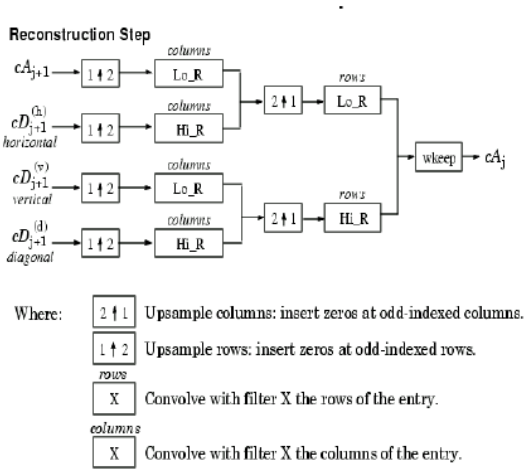


Fig 3. Block diagram of DWT

The architectures are composed of registers, adders, subtractors, multipliers, and shifts. Fig.3.1 depicts the hardware of the original HDWT (O-HDWT) without modifications to the matrix. In total, the original architecture has four subtractors, two multipliers, and six adders. A subtractor and a multiplier make up its critical path. One of the inputs of the multipliers is the H coefficient which is constant equal to √ 1 2. Therefore, to maximize the optimization of the HDWT baseline version, we implemented these multipliers employing efficient multiple constant multiplication (MCM). We generated the optimized MCM for the H coefficient using the Hcub algorithm automatically by the Spiral tool.

$$\begin{bmatrix} h_0 & h_1 & 0 & 0 & \cdots \\ g_0 & g_1 & 0 & 0 & \cdots \\ 0 & 0 & h_0 & h_1 & \cdots \\ 0 & 0 & g_0 & g_1 & \cdots \\ \vdots & \vdots & \vdots & \vdots & \ddots \end{bmatrix}$$

Fig 4: Transform matrix of vector coefficients

Optimized Haar Wavelet Transform

The proposed hardware architecture of Optimized Haar Wavelet Transform is shown in Fig. 5 which consists of Pre-processing, Reset Controller, Data Format Conversion, Optimized Controller, Moving Window Architecture, Optimized Kogge–Stone Adder/Subtractor, Buffer, Shifter and D_FF blocks respectively. First the input video is converted into a number of finite frames of standard size (256 × 256) by the Pre-processing block The pixel values of those frames are then converted into corresponding user-defined format by the Data Format Conversion block to increase data accuracy which is then used to generate 2 × 2 overlapped sub-matrix through Moving Window Architecture block. These sub-matrix pixel values are then processed by Optimized Kogge–Stone Adder/Subtractor blocks to generate all four sub-bands (i.e., LL, LH, HL and HH) respectively. Among these bands, HL, LH and HH Bands produce some negative coefficients which are removed by Buffer block. Now the intermediate signals are shifted using separate Shifter blocks to perform the corresponding division factors.

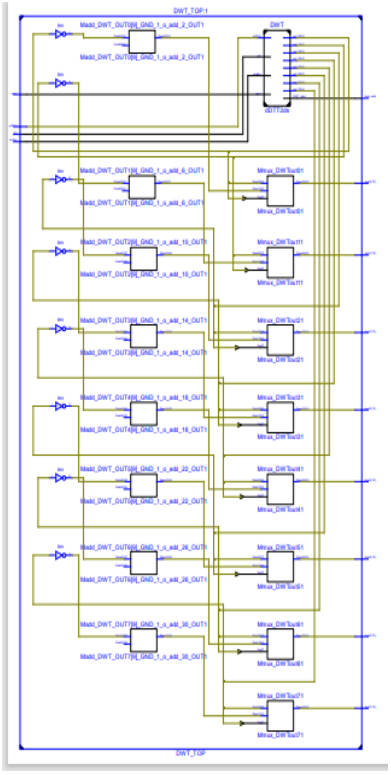


Fig. 5 Proposed architecture of optimized Haar wavelet transform

But in the case of non-separable Haar Wavelet Transform, it must be in non-overlapped format. As a result, Optimized Controller and D_FF blocks are used in interdependent manner for discarding the intermediate values generated by these overlapped matrix pixels which are also used to implement Downsample by 2 of the intermediate values by the D_FF (D-Flipflop) block. The extra output signal clk_out and rst_out are used for proper synchronization purpose. To generate nearly accurate result, enough bit sizes are considered at intermediate level with Q-notations. In future, high-resolution camera is interfaced with FPGA from which real-time high-speed video is captured and processed directly using this architecture with some modifications.

INVERSE DWT (FDWT)

In the IDWT process, to get the reconstructed image, the wavelet details and averages can be used in the matrix multiply method and linear equations. For the matrix multiply method, the Scaling function coefficients are h0 = 1, h1 = 1 and Wavelet function coefficients are g0 = 1, g1 = -1.

The IDWT process can be performed using the following linear equations (7) and (8).

$$si = ai + di \quad (7)$$

$$si+1 = ai - di \quad (8)$$

A single wavelet transform step using a matrix algorithm involves the multiplication of the signal vector by a transform matrix, which is an N X N operation(where N is the data size for each transform step). In contrast, linear equations need only N operations. In practice matrices are not used to calculate the wavelet transform. The matrix form of the wavelet transform is both computationally inefficient and impractical in its memory consumption.

The first step of the forward transform (FDWT) for an eight element signal. Here signal is multiplied by the forward transform matrix with haar filter coefficients

$$\begin{bmatrix} s_0 \\ s_1 \\ s_2 \\ s_3 \\ s_4 \\ s_5 \\ s_6 \\ s_7 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & -1 \end{bmatrix} \bullet \begin{bmatrix} a_0 \\ c_0 \\ a_1 \\ c_1 \\ a_2 \\ c_2 \\ a_3 \\ c_3 \end{bmatrix} \Leftarrow \begin{bmatrix} a_0 \\ a_1 \\ a_2 \\ a_3 \\ c_0 \\ c_1 \\ c_2 \\ c_3 \end{bmatrix}$$

Fig 6. Inverse transform matrix of vector coefficients

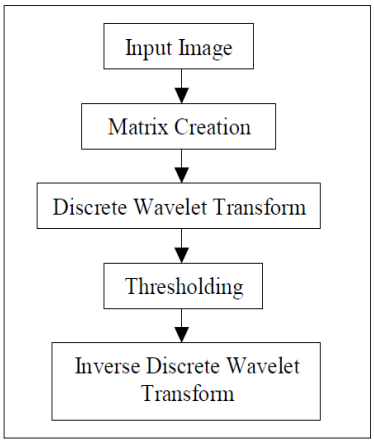


Fig 7: Steps involved in hardware implementation.

Ladner Fischer adder

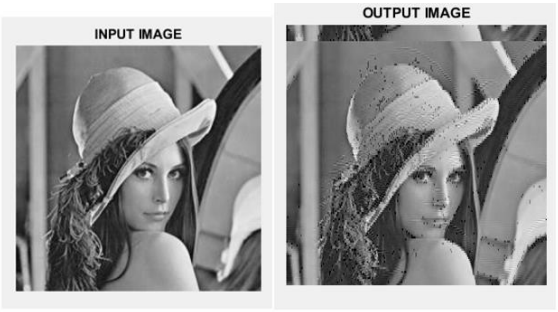
The Ladner-Fischer is the parallel prefix adder used to perform the addition operation. It is looking like tree structure to perform the arithmetic operation. Ladner-Fischer adder is used for high performance addition operation. The Ladner Fischer adder consists of black cells and gray cells. Each black cell consists of two AND gates and one OR gate. Multiplexer is combinational circuit which consists of multiple inputs and a single output. Each gray cell consists of only one AND gate.

The proposed Ladner-Fischer adder is flexible to speed up the binary addition and the structure looks like tree structure for the high performance of arithmetic operations. In ripple carry adders each bit wait for the last bit operation. In parallel prefix adders instead of waiting for the carry propagation of the first addition, the idea here is to overlap the carry propagation of the first addition with the computation in the second addition, and so forth, since repetitive additions will be performed by a multi-operand adder. Research on binary operation elements and

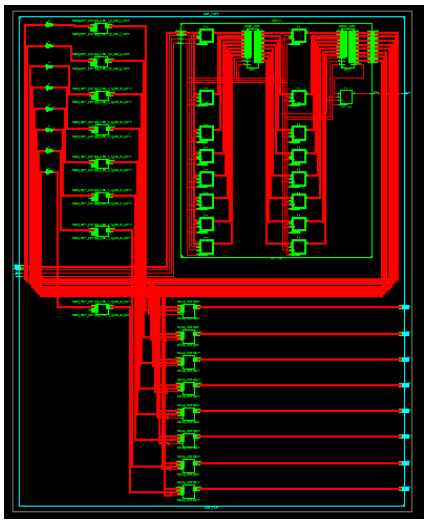
motivation gives development of devices. Field programmable gate arrays [FPGA's] are most popular in recent years because they improve the speed of microprocessor-based applications like mobile DSP and telecommunication.

IV. RESULTS AND DISCUSSION

The algorithm in MATLAB the matrix multiplication method has been used. We have tested the] as the image input file and also 8 randomly chosen image co-efficient for MATLAB simulation. After we have achieved satisfactory result in MATLAB we proceed to the next stage where we translate the code into VHDL. The development of algorithm in Verilog HDL is different in some aspects. The main difference is unlike MATLAB, Verilog HDL does not support many built-in functions such as convolution, max, mod, flip and many more.

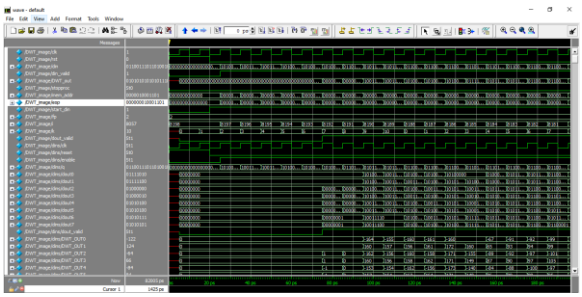


So, while implementing the algorithm in Verilog HDL, linear equations of FDWT and IDWT is used



RTL Schematic

Simulation Results:



Evaluation of Area, Delay report:

	Area	**Delay**
Existing	476/217	2.590ns
Proposed	476/213	2.556ns

V. CONCLUSION

Initially we analyze the DWT and its functionality using MODELSIM. The proposed algorithm is based on simplified linear operations such as shifter, adder and sub tractor to finely save external memory bandwidth and computational complexity. We also illustrated the performance of DWT algorithm in numerical simulations, and our model shows a significant performance improvement with speed, while the complexity is much lower compared to direct matrix multiplier-based approach.

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Prevalence of Falls among Older Adults in Africa: A Meta-Analysis

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ABSTRACT

The purpose of this study was to conduct a meta-analysis of studies that have examined the prevalence of falls among older adults living in Africa. Three investigators independently searched the databases of PubMed, EMBASE, Google Scholar, and Web of Science from their inception date until September 2019. Participants were 5,815 older adults aged 60 years and above. The prevalence of falls was determined using the random effects meta-analysis, whereas meta-regression was conducted to investigate the moderating factors. Eleven of the 921 potentially relevant studies met the inclusion criteria and were included in the meta-analysis. The meta-analysis revealed a pooled prevalence of fall rate of 24.2% (95% CI: 23.1%-25.3%, I2 = 95.2%). Multivariate meta-regression analysis found no moderating effects of study sub-region, study year, and sample size on fall prevalence (p values > 0.05). Falls among older adults living in Africa are common and therefore need continuous research to examine the possible risk factors associated with falls among older adults and to establish effective policies and prevention approaches to reduce risk.

Keywords: Fall, Prevalence, Older adults, Meta-analysis

I. INTRODUCTION

The growing number of older adult persons in developed and developing countries is a challenge [1]. This occurrence is known as "population aging"[2]. It is predicted that by 2050, the population of older adults aged 60 years and over will rise by 2 billion, which for the first time will be higher than the children's population[3]. Africa is among the world's fastest growing elderly populations, with a massive increase

in life expectancy arising from medical interventions[4]. Consequently, the growing number of older adults poses health issues, such as increasing fall rates[4]. In addition, aging causes several adverse changes, which cause different body systems to become ineffective. Also, many chronic illnesses may occur during aging, which contribute to the prevalence of falls among older people[5, 6] .

While the chances of fall increase with age, falls have become a serious public health issue for older people [1] because they are a significant cause of morbidity and death[7, 8]. One in five people who fall and experience a hip fracture will never walk and die within six months[9]. Although the definition of a fall is not universal, it can be defined as an accidental occurrence leading to an individual falling due to unexpected paralysis, epileptic seizure, or excessive external forces[10].

Studies on falls suggest an annual occurrence of between 6.5 and 42% [11, 12]. There is a fall of around 30 to 60% per year for individuals aged 65 and over and a 50 % increase for older people over the age of 80 years[13]. In a Spanish study, the prevalence of falls among older adults aged 70 years and above was 31.78%; 12.9% experienced more than one fall a year before[14]. Another Italian study found a 28.6 % prevalence of falls in older adults in the last 12 months[15]. The Center for Disease Control (CDC) has confirmed that falling, among all causes, is the 9th leading cause of death in older adults 65 years of age and above[16, 17]. The prevalence was 23% in older adults 60 years or older during two separate falls studies in Africa[18, 19]. Falls among older adults result in an immense economic burden, leading to 27% of hospital costs[20]. This problem is expected to worsen with multiple fractures and high healthcare costs[20]. Falls have been reported mainly in high-income countries [21-23], but there has not been a comprehensive analysis of their magnitude and effect on older adults living in Africa.

Throughout Africa, data on the prevalence of falls for older adults is sparse, with some contradictory reports. Understanding the overall prevalence of falls among older African adults is critical for developing successful risk management strategies and prevention approaches. This study aims to perform a meta-analysis for studies examining the prevalence of falls among older African adults. To the best of our knowledge, the overall prevalence of falls in Africa has not been meta-analyzed.

II. METHODOLOGY

A. Search strategy.

We performed a broad systematic literature search. PubMed, EMBASE, Google Scholar, and Web of Science were independently searched from their inception until September 2019 using the preferred reporting items for systematic reviews and meta-analysis (PRISMA) statements. Four investigators conducted the search (SAD, JAN, EL, JOK). The search items included: falls, prevalence, cross-sectional, older adults, and Africa. In addition, we manually searched the reference lists to find other related studies that may have been missed. Also, we established an email alert feature in related electronic databases to notify about any new publication that might meet our study criteria.

B. Inclusion and exclusion criteria.

Independent screening and review of titles, abstracts, and texts were conducted by four investigators (SAD, JAN, EL, JOK). There was no access to the full text of one paper[24], and this analysis was not included. Three investigators (SAD, JAN, JOK) examined the eligibility of the studies. Differences were deliberated and resolved between them, or a third investigator (EL) was involved, if necessary.

The inclusion criteria were: a cross-sectional survey conducted in any African country; older adults aged 60 years and above; a study reported time-frame (for example, one week or one month); the rate (percentage) of falls. The definition of fall was not included in this meta-analysis because there are

various definitions of falls with no universally accepted definition.

Reviews and meta-analyses were excluded. This study also excludes studies that did not have any information on the time frame.

C. Data extraction and quality assessment.

Three investigators separately collected relevant information using a double coding technique (JAN, FA, PYB). In case of any disagreements, a fourth investigator (EL) was involved until consensus was reached. Finally, four investigators identified and entered the study data in a spreadsheet (SAD, JAN, FA, JOK). The data in the spreadsheet included; the first author, study year, country, sub-region, study duration, sample size, gender, and the number of falls among the study population.

Two authors evaluated the quality of the included studies separately (SAD, PYB) using the Newcastle-Ottawa Quality Assessment Scale[25]. The Newcastle-Ottawa Quality Assessment Scale assessed the study group selection, comparability of the group, and the outcome of interest. The score of 9 stars for non-randomized studies was considered to be 'high quality.' Any inconsistencies were resolved with the help of a third investigator (EL).

D. Statistical analysis

STATA SE version 14.2 (Stata Corp, College Station, Tx) was used to conduct all the analysis. Using Higgins' I^2 statistic, this study assessed the homogeneity of fall prevalence. An I^2 score above 50% suggests a high heterogeneity[26]. The 95% Confidence Intervals (CI) of fall prevalence was synthesized using the Dersimonian and Laird random effect model. A meta-regression was conducted to assess the possible score of heterogeneity. A funnel plot was conducted to test publication bias. Multivariate logistic regression was conducted to examine the independent association of high fall rate with study sub-region, study year, and sample size. The dependent variable was high fall rate with study sub-region, study year, and sample size as the independent variables. Results from the analysis were considered significant when $p < 0.05$.

III.RESULTS

The literature search resulted in a total of 921 studies, and 11 out of these papers met the inclusion criteria and were included in the meta-analysis. Figure 1 shows the study selection.

Table 1 Summary characteristics of 11 studies included in the meta-analysis

No.	First Author	Study year	Country	Sub-region	Sample Size	Age range	Female	No. of Fallers
1	Kalula	2015	South Africa	Southern Africa	837	≥ 65	640 (76.5)	221
2	Bekibele	2009	Nigeria	West Africa	2096	≥ 65	NR[a]	482
3	Akosile	2014	Nigeria	West Africa	180	≥ 65	91 (50.6)	50
4	Allain	2014	Malawi	Eastern Africa	98	>60	69 (70.4)	40
5	Kamel	2013	Egypt	North Africa	340	>60	215 (63.2)	205
6	Adebiyi	2009	Nigeria	West Africa	210	>65	105 (50)	45
7	Maruf	2016	Nigeria	West Africa	131	>65	84 (64)	38
8	Ntagungira	2005	Rwanda	Eastern Africa	200	>60	73 (36.5)	46
9	Hamed	2016	Egypt	North Africa	1034	>60	207 (32.2)	350
10	Allain	1997	Zimbabwe	Southern Africa	278	>60	154 (55.4)	39
11	Altehewy	2015	Egypt	North Africa	411	>60	187 (45.5)	46

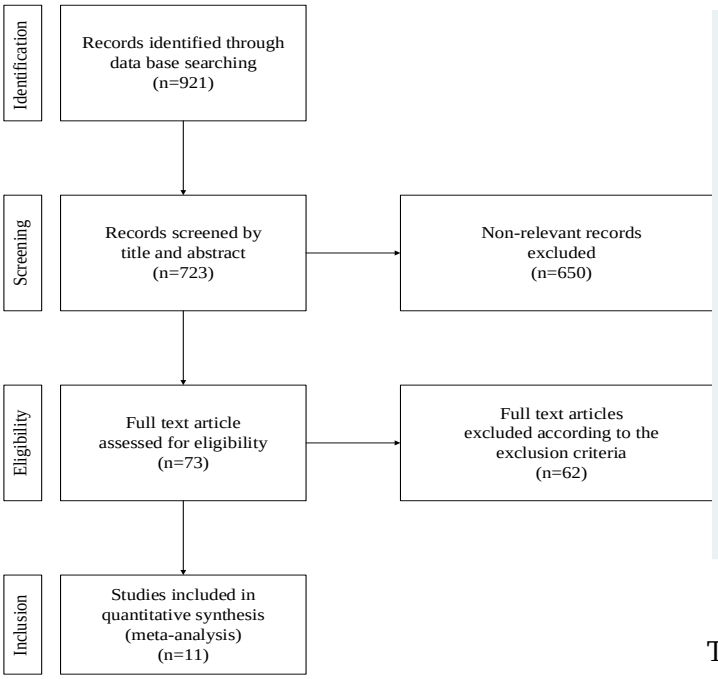

Fig. 1 Flow Chart of the study selection

Study characteristics

The study characteristics are illustrated in Table 1. Four studies were conducted in West Africa, 3 in North Africa, 2 in South Africa, and 2 in East Africa. The study year ranged from 1997 to 2016. The number of participants in the selected studies ranged from 98 to 2,069, totalling 5,815.

Table 1 Summary characteristics of 11 studies included in the meta-analysis

The prevalence of falls ranged from 11.2% to 60.3%. A total of 1,562 (26.9%) participants were identified as fallers.

Egger's regression of publication bias did not reveal publication bias (z = 4.01, p = 0.82). A funnel plot of observed fall prevalence rates is shown in Figure 2.

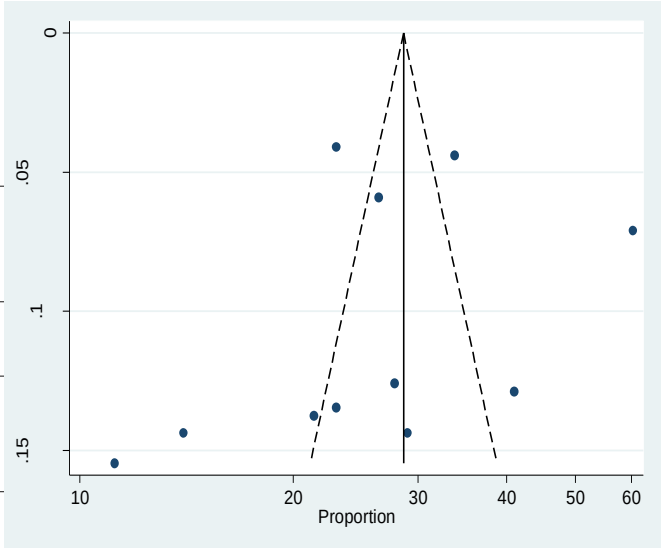

Fig. 2 Funnel plot of publication bias

The meta-analysis revealed a pooled prevalence of fall rate of 24.2% (95% CI: 23.1%-25.3%, I^2 = 95.2%). The meta-analysis together with upper and lower confidence interval limits for the prevalence of falls, are illustrated in Figure 3.

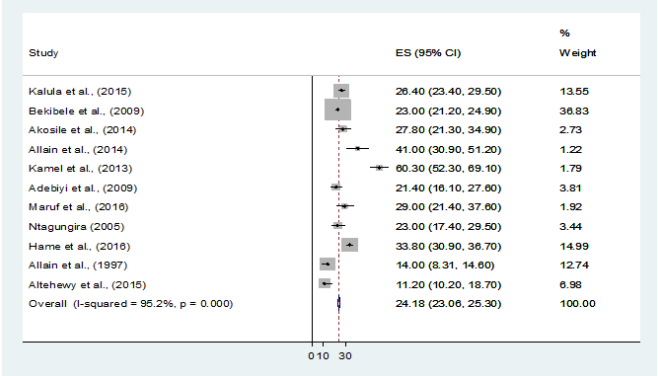

Fig. 3 Forest plot of the prevalence of falls among older adults in Africa

Results of the meta-regression are shown in Table 2. Multivariate meta-regression did not find any moderating effects of study sub-region, study year, and sample size on fall prevalence (p values > 0.05). Also, multivariate binary logistic regression analysis did not show any significant association between the high rate of falls and study sub-region, survey year, and sample size (p values > 0.05).

Table 2 Multivariate logistic regression and meta-regression of the prevalence of falls

	OR	P	95% CI
Sample Size	1.00	0.81	[1.00-1.00]
Study year	1.31	0.23	[0.84-2.03]
Sub-region	0.40	0.48	[0.03-0.5.18]
	exp(b)	P	95% CI
Sample Size	2.9	0.10	[0.01-0.6.9]
Study year	0.91	0.90	[0.15-0.5.6]
Sub-region	172.9	0.20	[0.04-850802.6]

IV. DISCUSSION

This study examines the prevalence of falls among older adults living in Africa. Falls have become a great public health concern for older adults since they are a major cause of morbidity and death. Although several studies have explored the prevalence of falls among older adults, there is very little research into the magnitude and effect of falls among older adults living in Africa. The quality of the included studies was determined with the Newcastle-Ottawa Quality Assessment Scale. For non-randomized studies, a score of 9 stars was found to be of "high quality."

The combined prevalence of falling among older adults living in Africa was 24.2%, significantly higher than in a previous meta-analysis study (17.3%) conducted in western countries[27]. Variations in prevalence rates may be attributable to ethnicity, culture, study design, or other relevant factors. Similar to previous studies[18, 19, 28-30], the prevalence of falling occurred within the range (11% -25%). However, the overall prevalence of falls in Africa was lower than in the study conducted in Egypt (60.3%) [31]. In Egypt, the higher prevalence of falls may be influenced by a series of risk factors associated with falls. In this context, examining the prevalence and risk factors of falls in older adults in Africa is imperative to establish effective risk reduction policies and prevention approaches. The results suggest that about a third (1,562) of older adults have fallen. As a common phenomenon among older adults, healthcare professionals need to focus more on older adults as part of their clinical care routine by screening for falls.

In the studies, the prevalence of falls among older adults ranged from 11.2% to 60.3%. Two separate studies conducted in North Africa (Egypt) recorded the highest (60.3%) and lowest (11.2%) prevalence of falls among older adults. Four studies conducted in West Africa (Nigeria) had a prevalence rate of falls ranging from 21% to 29%. However, in Southern Africa (South Africa, Zimbabwe), the prevalence of falls among older adults was 26.4% and 14%, respectively. Malawi and Rwanda in the Eastern part of Africa recorded a fall prevalence of 41% and 23%, respectively. As mentioned earlier, there may be several factors related to differences in prevalence rates. The definition of fall, sample size, and methods used in the sampling may play a significant role in the variations of prevailing falls in the included studies. For instance, the samples of the included studies ranged from 98 to 2,096 individuals, which may affect their results. While the results of an earlier study revealed that the sample size was a moderating influence on the fall prevalence[32], we did not find this in our study. Concerning the definition of falls, some studies have described a fall to include a fall over the past 12 months, while others have described a fall to include that which has occurred over the past 24 months. Furthermore, our study found no significant moderating effects on the prevalence of falls caused by the study year and region.

There was a higher prevalence of falls among females compared to males in 10 [5, 18, 19, 28, 29, 31, 33-36] out of the 11 studies included in the study. This could depend on various hormonal changes that women experience during aging, leading to a faster bone mass reduction than in males [37]. Another study [14] also confirmed that being a woman is a factor that makes older adults more likely to fall.

As falling in older adults leads to physical disabilities, fall prevention programs should be designed to enhance functionality through the implementation of evidence-based interventions for physical functioning[38]. As most prevention programs concentrate exclusively on home safety[39], we suggest the inclusion of home self-handling. Furthermore, patient and caregiver education is necessary before discharge from the hospital to prevent older adults from falling.

One strength of this meta-analysis is that it is the first study in Africa to investigate the prevalence of falls in older adults. The study had a large sample size gathered. However, it is important to interpret these findings carefully due to certain methodological limitations. The 11 studies included in this study involved only 6 countries, with the majority coming from West Africa, which may limit the generalizability of the results. Also, some of the studies did not provide some important factors associated with falls, such as a universally accepted definition of falls and a specified study duration. Lastly, there was no access to the full text of one study, which may have biased the results to an uncertain degree.

V. CONCLUSION

This meta-analysis found that falling among older adults living in Africa was common. There is a need for continuous research to examine the possible risk factors associated with falls among older adults living in Africa and to establish effective policies and prevention approaches to reduce risk.

Conflict of interest: The authors declare that they have no conflict of interest.

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A Study on Carbapenemase Producing Klebsiella Pneumoniae In Beni Suef University Hospital

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ABSTRACT

Background: Widespread dissemination of *Klebsiella pneumoniae* carbapenemase (KPC) is of major concern in healthcare settings. Resistance to carbapenems involves multiple mechanisms such as the production of carbapenemases, impermeability of outer membrane and efflux pump mechanism.

Objective: The aim of this study was to evaluate the prevalence of carbapenemase-producing *K. pneumoniae* strains among various clinical specimens obtained from different wards and to detect KPC as a mechanism of resistance.

Methods: 100 samples of urine and sputum (55 urine and 45sputum) were collected from outpatients and inpatients attending urology and chest departments in Beni Suef University Hospital aiming to isolate *K.pneumniae* during the period of December 2016 through January 2018. The isolates were tested for susceptability to ertapenem using E test. Resistant isolates were subjected to phenotypic detection of carbapenemase production by MHT and molecular assessment of *KPC* gene by PCR. Phylogentic tree was used to detect their relationship.

Results*: K.pneumonia* were isolated from 31(31%) of the samples taken. Out of them 19(61.8%) were resistant to ertapenem. By MHT,17/19 (89.4%) were positive for carbapenemase; and only 13 out of them (76.4%) were confirmed as KPC by PCR.

Conclusion: High rate of carbapenem- resistance in *K. pneumoniae* by both phenotypic and molecular methods. Initiating appropriate infection control measures along with a strictly implemented antibiotic stewardship program are necessary to prevent their spread.

Keywords: Carbapenemase, Klebsiella Pneumoniae, Infections

I. INTRODUCTION

Carbapenemase-producing Enterobacteriaceae (CPE) have been associated with hospital acquired infections (HAI) resulting incomplicated health problems due to futility of antibiotics in treating such infections.

Widespread dissemination of Klebsiella pneumoniae carbapenemase (KPC) is ofmajor concern in healthcare settings. Resistance to carbapenems involves multiple mechanisms such as the production of carbapenemases, impermeability of outer membrane and efflux pump mechanism.

There is an obvious global increase in antimicrobial resistance (AMR) among Gram-negative pathogens (GNP). For more than 20 years, a high rate of AMR and outbreaks caused by GNP has been reported in Egypt (See et al., 2013). In Egyptian hospitals AMR rates have increased probably due to widespread abuse of antimicrobials including carbapenems and poor implementation of infection control practices.

A current major threat is the increasing carbapenemresistance as they are the last effective choice available for antibiotic therapy against multi-resistant strains (Pitout et al., 2015). WHO has been listed carbapenem-resistant K.pneumoniae (CRKP)as a critical priority pathogen due to high morbidity and mortality (Dong et al., 2018).

Carbapenem resistancemay be attributed to porinmutations, efflux pumps, and/or carbapenemases production. From an epidemiological viewpoint class A carbapenemases of the type Klebsiella pneumoniae carbapenemases (KPC) and class B carbapenemases of the type, New Delhi metallo-beta-lactamases (NDM) are most important (Pesesky et al., 2015).

The modified Hodge test (MHT) and the susceptibility to ertapenem are the most indicated methods to reveal the production of these enzymes, especially in endemic areas (Tsakris et al., 2009).The sensitivity of the test reaches almost the 100% but diversities in specificity values and false positivity of the results are concerning. Molecular techniques are the most indicated methods to confidently confirm KPC production (Arnold et al., 2011).

II. Patients and Methods

A retrospective cross sectional study was conducted on 100 clinical samples collected from 34 outpatients and 66 hospitalized patients admitted to Beni Suef University Hospital. The sputum samples (45) were collected from chest department while urine samples (55) were collected from urology department. The study was carried out in the department of Medical Microbiology and Immunology, Faculty of Medicine, Beni Suef University during the period from December 2016 through January 2018.Age of patients ranged from 10 to 65 years old. Both sexes were involved. All samples were collected after taking a written consent from all patients.

I. Sample collection:

- Sputum samples were collected asmorning sputum samples in screw capped universal containers.
- Midstream urine sampleswere collected from outpatients and inpatients (25 samples) in sterile screw-capped universal containers.
- Thirty catheter specimens of urine (CSU) were collected from hospitalized patients admitted to urology department.

All samples were labeled with the date, patient's name, number, time of collection and specimen type, and then transported immediately to microbiology department.

II. Culture and identification of the isolates:

All samples were cultured on Blood agar and MacConkey's agar plates **(Oxoid Ltd., Basingstoke, and Hampshire, England),** incubated aerobically at 37°C for 24-48 hours

After incubation the growth was identified by conventional methods of identification.

Identification of *K.pneumoniae* up to the species level was done using API 20 E **(BioMérieux, France).**

III. Screening methods for carbapenemase production:

Ertapenem sensitivity:

A strip of ertapenem (BioMérieux, France), was applied to a Muller Hinton agar previously inoculated by *K.pneumoniae* isolate, incubated at 37◦ C for 24 hours.

The pointed end of the inhibition ellipse intersects the side of the strip is the MIC value.The results were interpreted according to the CLSI breakpoints.

IV) Phenotypic confirmatory tests for carbapenemase production:

The Modified Hodge Test (MHT) (*CLSI, 2017*):

Resistant isolates to ertapenem were tested for carbapenemase production by Modified Hodge Test.

Principle:

- A standard strain of *E.coli*ATCC 25922 (obtained from Naval Medical Research Unit Three (NAMRU-3) was suspended in saline to 0.5 McFarland and then overlaid on Muller–Hinton agar plate.
- A disc of ertapenem 10µg (Oxoid, UK) was placed on the plate.
- From an overnight pure culture of a tested strain, three to five colonies were picked up and streaked from the edge of ertapenem disc to the periphery of the plate.
- Three isolates can be tested in the same plate.
- The plate was incubated aerobically for 18-24 hours at 35±2◦ C
- The results of the modified Hodge test were interpreted according to the CLSI guidelines ***(2013)*** as follows: no distortion of the inhibition zone around the ertapenem disk indicates negative carbapenemase producing isolate and any distortion of the *E. coli* ATCC 25922 (strain indicator) inhibition zone around the ertapenem disk indicates positive carbapenemase production.

Uninterpretable results for the isolate, when the inhibition zone of *E. coli* ATCC 25922 is parallel to the isolate streak.

VI) Molecular detection of KPC genes:

This work was done at Biochemistry Department, Faculty of Medicine, Cairo University and Faculty of Pharmacy, Beni Suef University.

For molecular detection of KPC genes, the following steps were followed:

A- DNA extraction.
B- Assessment of DNA integrity by Nano drop spectrophotometer.
C- Amplification of KPC gene by PCR.
D- Agarose gel electrophoresis to resolve amplified PCR products.

Genomic DNA was extracted from 50 µl bacterial suspension using Wizard® Genomic DNA Purification Kit **(Promega, Madison, USA).**The extracted DNA was then diluted with water and the optical density (OD) was measured at 260/OD280 nm using**Nano Drop Technologies Inc., USA.**

The sequence of KPC DNA primers used was5' ATGTCACTGTATCGCCGTC 3' as Forward primer and 5' TTTTCAGAGCCTTACTGCCC 3' as Reverse primer **(Qiagen).**

Amplification was performed in a DNA thermal cycler **(Biometra)** programmed at 95oC (1 min) for initial denaturation step followed by 35 cycles: and final extension step at 72oC for 2 minutes.

Gel electrophoresis was performed in a 2.5% agarose gel at 100 volts for 10 minto visualize gel under UV light.Determination size of fragments was comparingwith 92 bp DNA ladder size marker.

DNA Sequencing Reaction

The procedure was performed on 19 *K.pneunoniae* isolates that were resistant to ertapenem. The results of only seven could be determined. The PCR products were sequenced with forward primer (ATGTCACTGTATCGCCGTC3') using a Big Dye Terminator 3.1 Cycle Sequencing Kit **(Applied Biosystems, Foster City, CA, USA),** according to the manufacturer's instructions.

Briefly; PCR sequencing cycling reaction with final total volume 20 µl which included 8µl big dye terminator, 3.2µl of 1 pmole diluted forward primer, 1µl PCR product and 7.8µl nuclease free water. The thermal profile conditions were 94ºC for 4 minutes and 95ºC for 15 sec, 55ºC for 30 sec and finally 60ºC for 4 minutes for 25 cycles. Fluorescent fragments are generated by incorporation of dye-labeled ddNTPs. Each ddNTP (ddATP, ddCTP, ddGTP, or ddTTP) will carry a different color of dye, and correspond to either A, C, G, or T at the 3´ end.

Data analysis

The sequences obtained were analyzed using the GenBank BLAST tool. Subsequently, the sequences were edited and aligned using the BioEdit Sequence Alignment.

Phylogenic tree:

The tree is drawn to scale, with branch lengths in the same units as those of the evolutionary distances used to infer the phylogenetic tree. The evolutionary distances were computed using the Kimura 2-parameter method ***(Kimura, 1980)***and are in the units of the number of base substitutions per site. The analysis involved 27 nucleotide sequences.

IV. RESULTS AND DISCUSSION

A retrospective cross sectional study was conducted on 100 different clinical samples (55 urine and 45 sputum samples).

Age of patients ranged from 10 to 65 years old. Both sexes were involved.Clinical isolates from male patients were 55(55%) 20 of them were identified as *Klebsiella pneumoniae* while female patients were 45(45%) and 11 samples were identified as *Klebsiella pneumoniae*.

Out of 100 samples, 31(31%) were identified as *Klebsiella* by conventional methods, while 69(69%) were diversity of other organisms; *Enterobacter*, *E.coli* and *Acinetobacter*.

E-test for ertapenem MIC:

According to CLSI guidelines ***(2013)*** 19(61.8%) of *K. pneumoniae* isolates were ertapenem resistant (MICs ≥2 µg/ml) while 12 (38.2%) were sensitive to ertapenem (MIC<0.5µg/ml). Figure (1) and figure (2) illustrate E test for ertapenem.

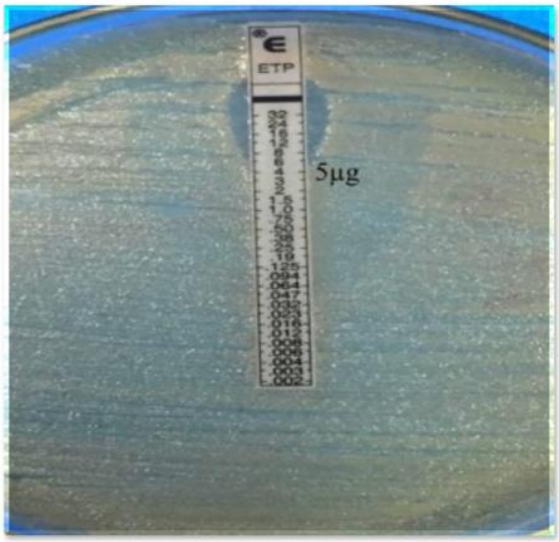

Figure (2) : resistant isolate (MIC 5 µg).

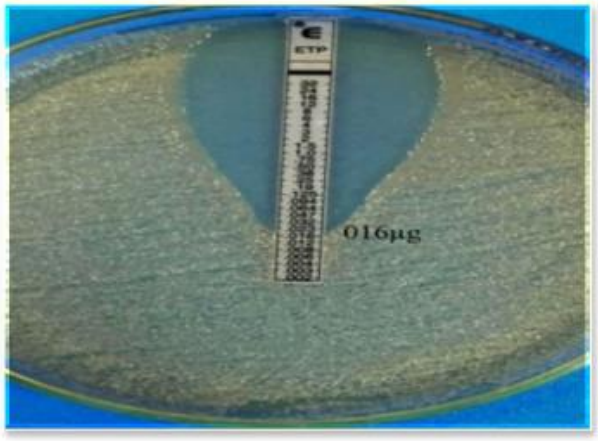

Figure (3) : sensitive isolate (0.016µg).

Table (1) : Distribution of *K. pneumoniae* isolates in relation to age, gender and risk factors:

		NO. of resistant isolates	%	*P* value
sex	**Male**	11	57.8	0.2
	female	8	42.1	
Risk factors				
Inpatient		16	84.2%	0.2
Diabetes		15	36.8%	0.16
Hypertension		5	26.3%	0.016

From male patients, 20 (36.4%) were identified as *K. pneumoniae* compared to 11 (24.4%) isolates from female patients with no significant value ($p>0.05$). Hypertension can be considered a risk factor for infection by carbapenem resistant *K. pneumoniae* as (p value<0.05).Whereas, hospitalization and diabetes did not represent statistically significant risk factors.Resistant isolates were found in 7 patients with catheter (70%).

Modified Hodge test:

Seventeen out of 19 resistant *Klebsiella pneumoniae*isolates (89.4%) were positive by Modified Hodge test.

Molecular detection of *KPC* gene:

Out of 19*K.pneumoniae*, 13 (68.4%) were found to have KPC by PCR, while 6 (31.5%) were negativeFigure (4).

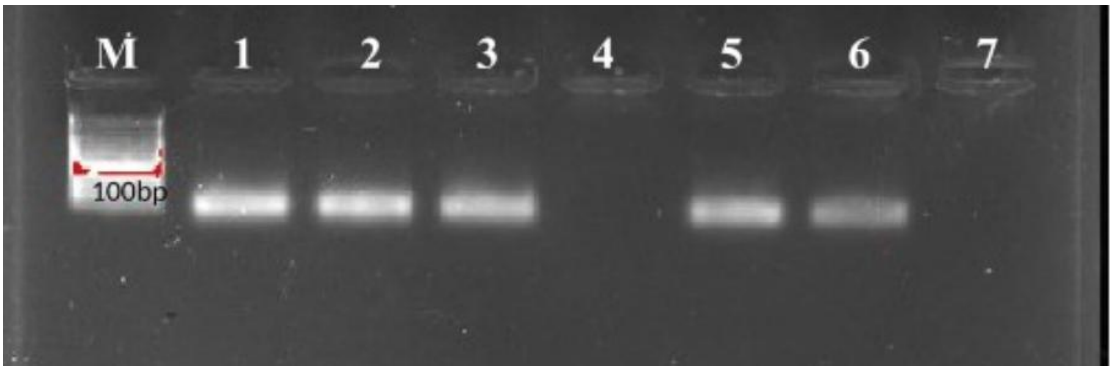

Figure (4): Agarose gel electrophoresis showed PCR product of KPC gene.
M: DNA ladder,1 lane: positive control,7 lane negative control,2,3,5,6 positive samples, 4 lane negative sample

Table (2): Correlation between phenotypic (MHT) and molecular methods for detection of carbapenemase (PCR)

Considering PCR as a gold standard for detection of KPC,13 isolates were carbapenemase producers. The sensitivity and specificity of MHT in relation to PCR were 100% and 33% respectively. The positive predictive value and negative predictive value were 40.26% and 100% respectively as shown in table (2).

	PCR	MHT
Positive	13 (68.4%)	17 (89.4%)
Negative	6 (31.5)	2 (10.5)
Sensitivity	100% (CI 75.29% to 100%)	
Specificity	33.4% (CI 4.33% to 77.72%)	
Positive predictive value*	40.26% (CI 27.68% to 54.27%)	
Negative predictive value*	100%	
Accuracy	54% (CI 30.05% to 76.66%)	

Sequencing of *KPC* gene:

All resistant to ertapenem were submitted to gene sequencing and only seven isolates could be determined. The result obtained was analyzed through NCBI purposing for identifying similarities between strains.Sequencing confirmed the presence of the carbapenemase gene *bla*KPC in all 7 isolates with the accession numbers MT636778.1, DQ223685.1, MT452422.1. The phylogenetic analyses of the available data using MEGA7are summarized in figure (5).

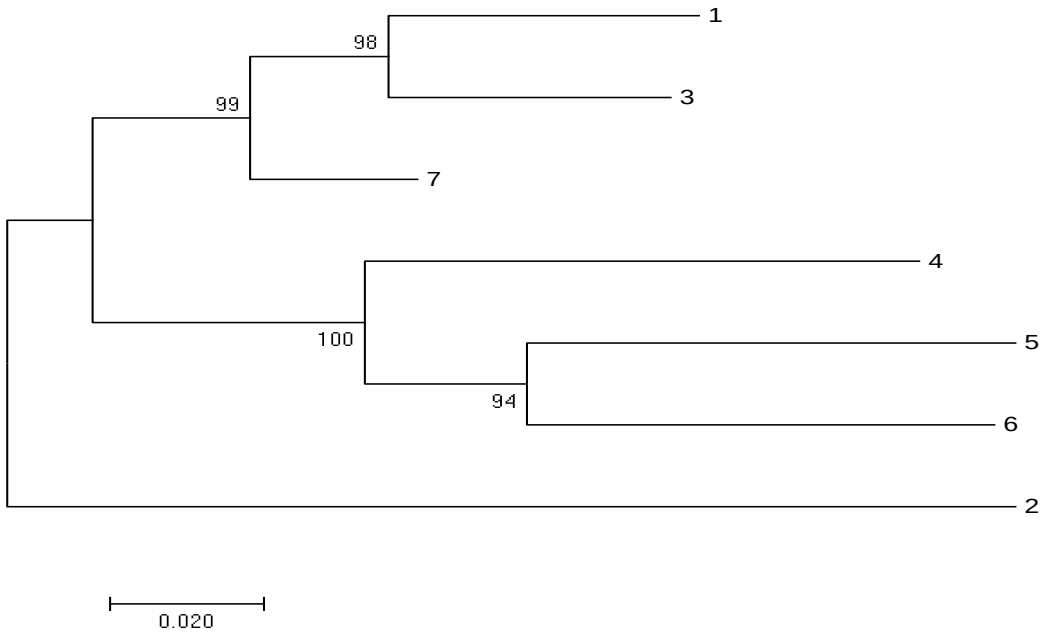

Figure (4): Evolutionary relationships of taxa

Discussion

A current major threat is the emergence of increasing resistance to carbapenems which complicates the management of infections caused by *K. pneumoniae*. Carbapenems were considered the last effective options available for antibiotic therapy against multi-resistant strains *(Pitout et al., 2015).*The mortalityrate associated with infections caused by Carbapenem-resistant *Klebsiella pneumoniae* may reach up to75%. KPC is one of carbapenemases which hydrolyse carbapenems and it shows rapid and wide spread dissemination.

In this study, *Klebsiella pneumoniae* have been identified in 31 isolates (31%) of out of 100 samples collected from patients attending Beni Suef University Hospital. While *Kotb et al., (2020)* estimated that *K. pneumoniae* was isolated from 902 samples out of 3836 with percentage of 23.5% which is higher than our result.

Resistance to ertapenem is a sensitive screening test for detecting carbapenemases. However, resistance to this carbapenem is not a direct indicator for the production of carbapenemases *(El Mahallawy et al., 2018).*

In this study, ertapenem resistance was found in 19 isolates (61.3%) while 12 (38.7%) were sensitive (MIC≤ 0.5µg/ml). In contrast,*Kotb et al., (2016)* reported that 19 (19%) of studied isolates were ertapenem resistant.The resistance to ertapenem was lower than that of *Vivas et al.*,*(2020)* who proved that ertapenem is a good marker for the suspected production of carbapenemases as the isolate was considered resistant to ertapenem with MIC of >0.5 µg/ml. These discrepancies in frequency of carbapenem resistant *K. pneumoniae* may be due to geographical differences, patterns of antibiotic use and the population selected in different studies.

Among 19 resistant strains, 11(57.8%) were isolated from male and 8 (42.1%) from female patients with no statistically significant difference. This is supported by *Hatem et al., (2012)* who identified 53.2% of isolates from men, and 46.8 % were from women, with no statistically significant difference.

As regards specimen; 10 out of 19 CRKP strains (52.6%) were isolated from urine and 9 from sputum (47.3%). This finding was similar to that of *Jayakumar et al., (2017)* where urine was 9(32%), sputum was 5 (18%).Meanwhile, resistant strains were more frequently associated with urinary catheter taken from 7 hospitalized patients (70%).

In this study, univariate analysis showed that the risk factors as hypertension was associated with CRKP as (*p* value = 0.016), while diabetes (p value=0.169) and hospitalization (*p* value =0.219) had no significant association.

Similar findings have been noted by *Yuan et al., (2020)* who found that diabetes was associated in 30.6% of patients and was not significant associated risk factors for CRKP (*p v*alue=0.89) whereas invasive procedure as catheter was proved to be associated with CRKP as (*p* value was 0.001).

The modified Hodge test was recommended by*CLSI* in detecting KPC producers among *Enterobacteriaceae (CLSI, 2017).* In the present study, 17(89.4%) of resistant isolates to ertapenem were proved to be carbapenemase producer by MHT.

However, only 13 (76.4%) were positive KPCgene when investigated by PCR. This means that MHT gave false positive results in 4 (23.5%) isolates, in agreement with the explanation of *Wozniak et al., (2012)* who reported that these strains act *via* other mechanisms of resistance; these negative strains most likely produced CTX-M or produced AmpC in association with porin loss. Another possibility is that these isolates produced carbapenemases other than KPC.

The present study revealed that MHT showed sensitivity of 100% and specificity of 31.6%. The results of this study was close to that of *Morsi, (2016)* where MHT was positive in 34 isolates; only 27 isolates were confirmed to produce carbapenemase by molecular methodsgiving sensitivity, specificity,

PPV and NPV of 100%, 47.06%, 73.53% and 100% respectively.

In Egypt, a recent study of Elkholy et al., (2020), KPC gene was isolated from only 2 isolates of *Klebsiella pneumoniae* indicating low prevalence of the gene in tertiary hospitals in Egypt. Whereas, Metwally, (2016) determined the prevalence as 31%. WHO (2011) explained the high rate of antibiotic resistance in Egypt is essentially due to inappropriate use of antimicrobials in human and animal health care.

Bacterial typing is an important method to identifythe route of pathogen transmission. In the current study, all isolates identified in clusters presented an average genomic similarityratio of >89.45%. The isolates were significantly differentfrom each other in the percentage of similarity. This suggests that dissemination of KPC resistance is due to horizontal gene transfer rather than clonal spread which may require plasmid extraction for mapping.

V. CONCLUSION

Antimicrobial resistance resulting from continuous selective pressure due to wide spread of antibiotic use is a growing health problem. KPC producing *Klebsiella pneumoniae* is emerging as an important mechanism of resistance. Phenotypic detection of KPC by MHT is of great importance to guide the clinicians and help to control the spread of infections caused byCRE.Molecular methods including PCR for KPC genes can be used as a confirmatory gold standard test. Antimicrobial policy and its strict implementation with regular surveillance of KPC producing isolates are needed along with appropriate infection control measures to curtail its emergence and spread.

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Design of a Novel Network Framework for Traffic Identification by Using Deep Packet Inspection and Machine Learning

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ABSTRACT

This paper presents an investigation, involving experiments, which shows that current network intrusion, detection, and prevention systems (NIDPSs) have several shortcomings in detecting or preventing rising unwanted traffic and have several threats in high-speed environments. Precise organization traffic recognizable proof is a significant reason for network traffic checking and information investigation, and is the way to work on the nature of client administration. In this paper, through the examination of two organization traffic ID strategies in light of machine learning and profound parcel review, an organization traffic distinguishing proof strategy in view of machine learning and profound bundle examination is proposed. This strategy utilizes profound parcel assessment innovation to distinguish most organization traffic, diminishes the responsibility that should be recognized by machine learning. This paper presents an investigation, involving experiments, which shows that current network intrusion, detection, and prevention systems (NIDPSs) have several shortcomings in detecting or preventing rising unwanted traffic and have several threats in high-speed environments. It shows that the NIDPS performance can be weak in the face of high-speed and high-load malicious traffic in terms of packet drops, outstanding packets without analysis, and failing to detect/prevent unwanted traffic. A novel quality of service (QoS) architecture has been designed to increase the intrusion detection and prevention performance. Our exploration has proposed and assessed an answer involving an original QoS setup in a multi-facet change to sort out parcels/traffic and equal procedures to build the bundle handling speed. The new engineering was tried under various traffic velocities, types, and errands. The trial results show that the design works on the organization and security execution which is can conceal to 8 Gb/s with 0 bundles dropped. This paper likewise shows that this number (8Gb/s) can be improved, yet it relies upon the framework limit which is constantly restricted.

Keywords: Intrusion detection, traffic identification, MDIP, network security, open source, quality of service, security.

I. INTRODUCTION

With the quick advancement of organization innovation, network clients are requesting increasingly high speed and nature of organization administrations. Hence, it has become one of the difficulties in the field of organization activity and support the executives to oversee and control different organization business traffic through compelling specialized implies, recognize various administrations, give different quality confirmation, and meet clients' business needs. Network traffic recognizable proof gives a successful specialized means to recognize traffic of various applications. By characterizing, distinguishing and separating the use of organization traffic, the traffic of various applications can be partitioned to furnish clients with customized network benefits and further develop the organization administration quality and client fulfillment.

Data innovation (IT) inuences pretty much every part of current life. Today, different gadgets are accessible to meet clients' necessities, for example, high machine processor speed, and quick organizations. Close by our rising reliance on IT, there has tragically been an ascent in security episodes. Dangers and assaults might go from taking individual data from a PC or organization server to taking the most highly classified data put away on a Security Insight Administration (Sister). Besides, programmers can sneak around on clients' internet based buys by snooping on their Visa subtleties, or, significantly more alarmingly, wellbeing basic frameworks can be compromised. Complex assaults and dangers have made the execution of safety frameworks really testing. Programmers have advanced alongside the complexity of the IT business. For instance, programmers exploit the improvements in PC processors and organization velocities to expand the volume and speed of vindictive traffic that could comprise a Disavowal of Administration (DoS) or Dispersed Refusal of Administration (DDoS) assault [1]. Network security is in this manner critical and has formed into an industry pointed toward further developing applications and equipment stages to recognize and stop network dangers. Perhaps of the most settled idea in data security is a guard top to bottom methodology which uses a multifaceted underlying model, in which rewalls, weakness evaluation devices (against infections and worms), and IDPS (Interruption Recognition and Counteraction Frameworks) are utilized to forestall any unfriendly undertakings on network frameworks and servers. The Organization Interruption Discovery and Anticipation Framework (NIDPS) has been intended to act as the last place of safeguard in the organization design.

Pioneers have made equipment IDPS to handle a large number of bundles simultaneously [10], [11], however there are restrictions in the capacity to perform specific programming undertakings. What's more, restricted memory size is an issue for equipment based NIDPS arrangements. Moreover, equipment based NIDPS offer a high scope of handling speeds yet are exorbitant. Programming arrangements are famous on the grounds that they are less expensive and offer more exibility than equipment arrangements. This paper centers around open-source programming arrangements. PC organization and web security face expanding difficulties and many organizations depend on NIDPS to get their information sources and frameworks. The need to guarantee that the NIDPS can stay aware of the rising requests because of expanded network utilization, higher speed

organizations and expanded noxious movement, makes this a fascinating area of examination and inspired this review.

II. RELATED WORK

Network traffic identification refers to the identification of bidirectional TCP or UDP flows generated by network communication according to the types of network applications (WWW, FTP, P2P, etc.) in the Internet based on TCP/IP protocol[1]. At present, there are three commonly used methods: Identification based on port matching; Identification based on deep packet detection(DPI); Identification based on machine learning method.

Table 1 Searching Result of the Key Words

Name of search engine	Key word searches conducted	Results of search Subhead
Google Scholar	Traffic recognition with neural networks	32,500
Google Scholar	Network traffic recognition neural	31,700
Google Scholar	Network traffic classification recognition neural network	19,100
Google Scholar	Supervised network traffic classification recognition neural network	4,560
Google Scholar	Supervised network traffic classification recognition neural network after 2005	1,870

Network traffic identification refers to the identification of bidirectional TCP or UDP flows generated by network communication according to the types of network applications (WWW, FTP, P2P, etc.) in the Internet based on TCP/IP protocol [1]. At present, there are three commonly used methods: Identification based on port matching; Identification based on deep packet detection (DPI); Identification based on machine learning method.

Identification Method based on Port Matching: The distinguishing proof technique in light of port matching is to group the application types that are not utilized by the non-obligatory port number suggested by the IANA (The Web Relegated Numbers Authority) [2]. In the beginning phase of Web advancement, HTTP, FTP and different applications can be recognized by port numbers like 80 and 21. At the point when P2P applications were simply arising, BitTorrent and other P2P applications can likewise be recognized by ports, for example, 6346-6347 and 6881-6889. Be that as it may, with the rise of countless new organization administrations and the top to bottom improvement of P2P innovation, an enormous number of arising applications start to involve port cover and dynamic port innovation to cross firewalls or keep away from other obstructing techniques. Hence, the port-based distinguishing proof strategy has extraordinary restrictions, and the ID results are exceptionally wrong.

Identification Method based on Deep Packet Inspection: Every application has its own different component fields, which can be explicit strings or spot successions. The DPI (profound bundle examination) innovation identifies the heap content

of IP parcel during network association or information transmission as indicated by the strategy for design coordinating, and decides the kind of use as per different burden satisfied identification innovation can rapidly distinguish the application sort of organization stream and isn't impacted by port changes. Sen et al. [3] concentrated on the acknowledgment of P2P streams in view of the attributes of payload in information bundles, and checked the exactness vigor and continuous execution of the strategy.

Identification Method based on Machine Learning: Because of various application conventions, network information stream has various attributes as far as information stream term, parcel length, bundle transmission recurrence and bundle rate. As per these attributes of organization stream, the ID innovation in information mining can be utilized to accomplish great traffic distinguishing proof through AI. Bayesian recognizable proof [4], support vector machine (SVM)[5], C4.5[6] and other AI calculations in light of stream measurable attributes have been brought into the use of organization traffic ID.

III. COMPARISON OF NETWORK TRAFFIC IDENTIFICATION METHODS

First and foremost, the port-based traffic distinguishing proof technique doesn't require confounded estimation and examination, and its execution guideline is straightforward. It can meet the necessities of quick distinguishing proof of fast organization. Notwithstanding, because of the improvement of new organization applications, particularly the rise of P2P applications, the vast majority of them utilize irregular ports and disguise ports to safeguard their organization interchanges, which lessens the exactness of port-based traffic ID technique, which has been steadily dispensed with by history.

The recognizable proof strategy in view of component field can distinguish the powerful fields in the heap without depending on the port Settings of the application. It can well distinguish network streams and explicit organization applications, and the location precision is high. This strategy can distinguish network traffic rapidly by just recognizing the initial not many explicit parcels of organization traffic. In any case, since this strategy relies upon the component field of the application convention, it can perceive known applications and can't perceive new applications. Furthermore, this technique can't recognize the organization traffic of burden encryption. The machine learning identification methods technique in light of the stream measurements highlights involves the identification methods innovation in information mining to acknowledge traffic identification methods through the machine learning strategy, which defeats the troubles that can't be addressed by the initial two techniques, is liberated from the impact of port changes and convention highlight changes, and can recognize new applications. In any case, this sort of technique in view of machine learning in both Bayesian distinguishing proof in light of SVM (support vector machine) identification method strategy, can't recognize explicit application, need, contingent upon the kind of various parcel stream to recognize traffic location somewhat falls behind, and effectively impacted by stream length, with under a specific long stream the misdiagnosis rate is high. Furthermore, the precision of this identification methods strategy is handily impacted by powerful organization changes and traffic property set, and the inconvenience of this sort of technique is that it is computationally serious and not reasonable for ongoing traffic recognizable proof of high velocity organization. In light of the examination and correlation of the above traffic distinguishing proof strategies, an organization traffic identification methods strategy in view of machine learning and DPI innovation is proposed by the rule of component

field based ID technique and stream measurements based machine learning strategy.

IV. PREVENTING MALICIOUS PACKETS

In this experiment, TCP/IP food traffic was sent at differing speeds (see Table 2) with 255 malicious UDP packets (threads) also sent at 1 microsecond (1 mSec) intervals. Snort was set to prevent UDP threads by using two rule conditions (TTL and content) as follows: reject udp any any ->any any (msg: ``Prevent Malicious UDP Packets''; ttl: 120; content:j' C2 48 60 AE 97 4F 4B C3 'j; Sid: 100007;). Use of these options will prevent any UDP malicious packet that is matched with the TTL value equal to 120 and a data pattern inside the malicious packet with content ``.H`..OK.''. The hexadecimal number (`C2, 48, 60, AE, 97, 4F, 4B, C3'), which the rule contained, is equal to the ASCII characters (`., H0,,.,., O, K,.'). As shown in Table 2, When 255 malicious UDP packets were sent at a speed of 1 mSec and TCP/IP food traffic at 100 bytes per second (Bps), Snort prevented 100% of the total UDP packets that it analyzed. As the food traffic (speed) was increased to 10000 bytes per second (10000Bps), Snort prevented less than 51% of the total malicious packets analyzed (see Table 2). The number of missed malicious packets increased when the speed increased. The experiment shows that, when the speed was 60000 Bps, Snort only prevented less than 18% of 100% of the malicious packets analyzed (see Table 2).

Table 2. Snort-NIDPS reaction to prevent malicious packets.

Flood traffic(Bps) with 255 udp malicious packets in (1mSec)	Number of packets analsed	Eth packets received of packets analysed	Ip4 analysed of Eth packets analysed	ICMP packets analysed	TCP packets analyzed	UDP malicious packets analysed	UDP malicious packets reject	%maliciou s packets prevent
100 Bps	267032	100.00%	89.066%	28	995	236795	236795	100.00%
1000 Bps	266863	100.00%	99.991%	7	3572	263260	26320	100.00%
10000 Bps	329926	100.00%	99.988%	522	114260	215104	108107	50.258%
60000 Bps	335143	100.00%	99.992%	784	147518	186814	186814	17.564%

V. MACHINE LEARNING AND DPI TECHNICAL IDENTIFICATION METHODS

DPI technology

DPI innovation is a sort of innovation in light of element field recognition. By profoundly perusing the IP parcel load content and redesigning the application layer data, the substance of the whole application layer is gotten. Then, the information stream content is checked and distinguished by the current element library, in order to recognize the particular application information. Profound bundle assessment requires the hardware to have the option to rapidly examine, identify and rearrange application information to keep away from extreme deferral to the application.

DPI innovation by and large comprises of two sections, one is examining calculation, the other is highlight library. The examining calculation is to match the substance and element library of IP bundle load word by word. The string matching calculation

normally utilized in DPI innovation is AC calculation, WUMANBER calculation and SBOM calculation [7]. DPI identification is like component matching in enemy of infection programming. The antivirus programming matches the filtered current document to its own infection library word by word. Assuming a similar trademark code is found, the sort and name of the infection not set in stone.

This approach can precisely recognize network streams in light of the element library, and can be exact to the particular application to which the organization streams have a place, with high location exactness. In any case, DPI can't distinguish application traffic that has not yet been kept in the element library, lingers behind the arrival of new applications, and doesn't perceive scrambled network information streams.

Machine learning identification methods

The center of the organization traffic distinguishing proof strategy in view of AI is that PC projects can continually work on their presentation with the amassing of opportunity for growth, in order to finish responsibilities that can't be finished by customary techniques. In network traffic recognizable proof, this sort of earlier information can be various qualities of organization traffic and administrative data of individuals. Choosing proper AI calculation can really take advantage of earlier information to finish traffic identification method. The progression of organization traffic ID technique in light of AI is displayed in "Fig. 1".Firstly, the preparation informational index is utilized to prepare the distinguishing proof model, and afterward the recognizer is laid out as indicated by the preparation model. After the recognizer is laid out, the ID of traffic can be understood.

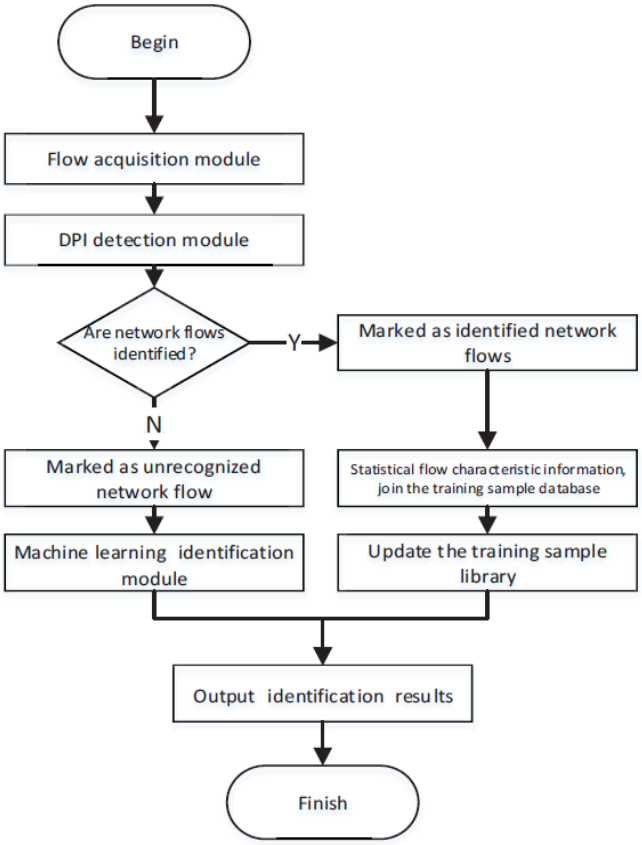

Fig. 1. Network traffic identification process based on DPI and machine learning

VI. NOVEL NIDPS ARCHITECTURE

Critical analyses were done for the experiments presented in sections II(A) and II(B). The figure show that performance of NIDPS throughput is affected when NIDPS is exposed to a high-volume and speed of traffic; more packets will be dropped and left outstanding as the speed of traffic increases. Figure 1 shows that the NIDPS's detection performance decreased when the traffic speed increased. There were more missed alerts and missed logs for packets as the speed of traffic increased. Figure 1 shows that the NIDPS prevention performance decreased when traffic speed increased. When traffic moves through the network interface card (NIC) to the NIDPS node, the packets are stored in the buffer until the other relevant packets have completed transmission to processing nodes. In the event of high-speed and heavy traffic in multiple directions, the buffer will fill

up. Then packets may be dropped or left outstanding [15]. In this case, there is no security concern about the packets dropped; the packets are dropped outside the system. The existence of outstanding packets that are waiting or have not been processed by a security system (i.e. NIDPS node) affects the system efficiency however. Packets can also be lost in a host-based IDPS. Most software tools use a computer program such as the kernel, which manages input/output (I/O) requests from software and decodes the requests into instructions to direct the CPU's data processing. When traffic moves from the interface (NIC) through the kernel's buffer to the processor space, where most of processing nodes are executed, the packets will be held in the kernel buffer before being processed by the CPU. When some nodes experience a high-volume of data, the buffer will fill up and packets may be dropped. Implementing QoS methods, such as queueing, memory reservation, congestion-management, and congestion avoidance techniques, can yield preferential treatment to priority traffic according to its relative importance. Furthermore, QoS technology ensures that network performance is more predictable, and that bandwidth utilization is more effective. QoS is used to improve performance in high speed network events. QoS can be configured on physical interfaces such as ports and switch virtual interfaces (SVI) .

In our review, QoS has been utilized to design a clever engineering to further develop generally speaking organization traffic and security execution. The framework (switch) interface has been arranged to have two info lines and four result lines. The lines' boundaries were summoned to permit lines to deal with traffic collectively of bytes. These heap a bunch of bundles similarly among the lines and separation traffic into equal streams to expand the pace of parcel handling. The framework then, at that point, utilizes equal NIDPS hubs to expand the NIDPS throughput execution and investigations each departure line independently to decide if it is liberated from vindictive codes. A class map and a strategy map were made for each info line. The class map perceives and classes a particular kind of traffic for each info line, while the strategy map controls and coordinates as far as possible for each info line and applies the breaking point to all points of interaction. The data transfer capacity, limit, support, memory reservation, and need (line and traffic) were designed for all entrance and departure lines to treat and control traffic to assist with forestalling clog or complete disappointment through over-burden. One line was arranged as a sped up line. It got focused on QoS administrations and different lines were not overhauled until the data transmission of focused on line arrived at its breaking point.

VII. WORKING MODEL FOR NOVEL ARCHITECTURE

NIDPSs process packets which are carried by IP protocols, e.g. UDP, TCP and ICMP. The IP protocols are checked by NIDPS rules based on a signature database (known signature/ attacks). however, to get the best NIDPS performance, the NIDPS should be implemented in a system which can manage the layer 3 network protocol (IP layer). In our study, a layer 3 switch has been used to support and improve NIDPS performance. The switch supports QoS configuration as well as Differentiated services (DiffServ) architecture.

The parallelization of data (traffic) that was distributed through ingress and egress queues into critical and noncritical is viewed as multiple traffic parallelism (MTP). Critical pre-processing of traffic is performed on queues to create particular groups of packets (threads) before the traffic is examined by an ingress queue algorithm. Non-critical preprocessing occurred after the packets had been matched to ingress and egress queues policies. The NIDPS node component can be parallelized in an either non-functional or functional manner. Component level

parallelism is dened as function parallelism of the NIDPS processing node. Individual components of NIDPS were isolated, and each output queue was given its own processing element. The NIDPS node was configured from a single node NIDPS to a multi-node NIDPS. Each node was conjured to check for a certain type of packet (e.g. UDP, TCP and ICMP) and was able to access discrete parts of a centralized, common rule base to order to carry out its task. he kernel buffer parameters for each NIDPS node was configured as each output queue rate.

When traffic arrives at the ingress interface of system, packets will be classified through a class map that will enable packets to be processed as a group of bytes defined by a policy and ACLs that were matched with DSCP values. A policy map was made to specify required action for each class. The following procedures constitute the method: Classify the traffic with a class map for SVI and ports. Set ACLs rules depending on the kind of traffic/attacks to be detected or prevented. In our experiment, we detect and also prevent UDP malicious packets which came with random high-speed traffic. We allowed UDP traffic to be processed in a separate egress interface (queue) and then analyzed by a parallel NIDPS node. The other traffic (e.g. TCP, ICMP, etc.) was processed in the other egress queues. Organize a rate-limit for the system ingress interface processing speed (Setting a set group of packets in bytes) for the class traffic. The rate depends on the maximum limit of SVI bandwidth including memory. In our system we set ``1.124 million'' bytes (nearly 1Gb of packets) for the set of classes because the maximum limit for each interface in our system is 1Gbps.

VIII. EVALUATION OF NOVEL NIDPS ARCHITECTURE

The experiments that were described in section II are repeated, but here the novel architecture is implemented to test performance in terms of throughput with the support of the proposed solution (QoS and parallel technologies). Each experiment tested Snort NIDPS throughput when analyzing traffic such as TCP/IP headers and then detecting or preventing unwanted traffic (UDP malicious packets) arriving at a high-speed. As shown in Figure 1, when malicious UDP packets were sent at a speed of 1 mSec with different TCP/IP ood traffic at 16 to 60000 bytes per second (Bps), Snort NIDPS started effectively but overall it missed detecting up to 65% of malicious packets that system received (see Table 1). Furthermore, it was unable to prevent all unwanted packets. The experiment shows that, when the speed was 60000 Bps, Snort prevented less than 18% of the malicious packets analyzed. When QoS architecture was implemented, Snort NIDPS detected almost 100% of malicious packets that system received. The experiment results show that Snort NIDPS performance increased greatly when QoS is used. It prevented almost100% of malicious packets that it analyzed.

This section discusses the proposed solution and compares it to related research in parallelism in intrusion detection. Vasiliadis et al. [5] proposed a new model for a multiparallel IDS architecture (MIDeA) for high-performance processing and stateful analysis of network traffic. Their solution offers parallelism at a subcomponent level, with NICs, CPUs and GPUs doing specialized tasks to improve scalability and running time. They showed that processing speeds can reach up to 5.2Gbps with zero packet loss in a multi-processor system. Jiang et al. [6] proposed a parallel design for NIDS on a TILERAGX36 many-core processor. They explored data and pipeline parallelism and optimized the architecture by exploiting existing features of TILERAGX36 to break the bottlenecks in the parallel design. They designed a system for parallel network traffic processing by implementing a NIDS on the TILERAGX36, which has a 36 core processor.

Table 3. Snort-NIDP reaction to detect malicious packets.

Packet sent (TCP/IPFlood traffic(Bps) with 255 UDP malicious packets in (1mSec)	Eth packets received	Ip4 analyzed of Eth packets analyzed	ICMP packets analyzed	TCP packets analyzed	malicious UDP packets analyzed	malicious UDP packets Alerts	malicious UDP packets logged	%Malicious packets Alerts and logged
16 Bps	100%	99.174%	99	1680	999866	999866	999866	100.00%
32 Bps	100%	99.693%	105	4751	899338	894351	894351	99.44%
200 Bps	100%	99.899%	1511	200015	759092	757877	757877	99.84%
1200 Bps	100%	99.999%	1130	565025	433681	430081	430081	99.17%
4800 Bps	100%	98.376%	1003	799012	200995	199789	199789	99.40%
60000 Bps	100%	99.881%	1339	973755	27560	27491	27491	99.75%

The framework was planned by two techniques: initial a crossover equal design was utilized, consolidating information and pipeline parallelism; and furthermore a half breed load-adjusting plan was utilized. They exploited the parallelism presented by joining information, pipeline parallelism and various centers, utilizing both rule-set and ow space apportioning. They demonstrated the way that handling velocities can deal with and reach up to 13.5 Gbps for 512-bytes. Jamshed et al. [2] introduced the Kargus framework which takes advantage of high handling parallelism by adjusting the example coordinating jobs with multi-center computer processors and heterogeneous GPUs. Kargus adjusts its asset utilization relying upon the info rate, to save power. The examination shows that Kargus handles up to 33 Gbps of ordinary traffic and accomplishes 9 to 10 Gbps in any event, when all bundles contain assault marks. The two methodologies depicted in this section are not straightforwardly practically identical as far as throughput as various quantities of processors are utilized in each. In any case, the tests demonstrate the way that high gains can be made by parallelizing NIDPSs to battle issues of higher paces and expanding traffic. Our examination utilizes a multi-facet switch alongside equal innovation to further develop parcels handling execution which builds the capacity to deal with various velocities and information volumes. Further improvements happen while lining is joined with equal processor advances. The methodology of this study has shown how parallelism at a more elevated level of granularity, which is easier to carry out, can likewise make noteworthy enhancements for security execution with regards to throughput and the quantity of dropped bundles. By utilizing 2 machines associated with two connection points, our NIDPS handled up to 8 Gbps with 0 drop for 1KB bundles. This number can be expanded up to 32Gbps which is the full framework limit forward transfer speed by carrying out additional hubs of NIDPS.

Seller organizations are intending to foster security answers for safeguard the undertaking organization. Gear has been intended to meet availability speed and burden guidelines. The upgrades in the throughput of NIDPS displayed in this examination are accomplished by matching the ASA (Versatile Security Apparatus) Cisco hardware [10] with numerous executions of Grunt. The standards of the technique proposed in this exploration could be

applied to other hardware mixes where comparative offices are advertised. To sum up, our exploration varies from past examination as far as the engineering utilized. The examination researches what QoS including DiffServ innovation and parallelism can have mean for in fast and weighty rush hour gridlock networks utilizing an industry standard switch and standard work area processors. This arrangement is a more open approach to getting great outcomes as it very well may be enacted at a more elevated level, specifically at the degree of designing the CISCO switch programming and repeating Grunt on standard machines. Further enhancements could be made on the off chance that better execution gear was utilized. Cost is for the most part a significant concern. The plan proposed in this exploration helps the organization security prerequisites for minimal price.

Table 4: Novel NIDPS architecture reaction to prevent malicious packets

Flood traffic(Bps) with 255 UDP malicious packets in (1mSec)	Number of packets analyses	Eth packets received of packets analyzed	Ip4 analyzed of Eth packets analyzed	ICMP packets analyzed	TCP packets analyzed	UDP malicious packets analyzed	UDP malicious packets reject	%malicious packets prevent
100 Bps	1013836	100.00%	90.076%	228	262037	738999	738999	100.00%
1000 Bps	1502809	100.00%	99.891%	117	823198	678401	678400	99.999%
10000 Bps	1993125	100.00%	99.889%	522	1161022	830578	830578	100.00%
60000 Bps	2505935	100.00%	99.998%	384	1725830	779641	779641	100.00%

IX. EXPERIMENTAL RESULTS AND ANALYSIS

Flow identification algorithm in CentOS system implementation, using Wireshark capture data in the campus local area network, then carries on the processing, only keep BitTorrent, PPStream such type of P2P traffic, and belongs to the WWW HTTP traffic, finally the flow identification method based on DPI and traffic identification method based on this model to analyze traffic data.

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As shown in Table 1, the dpi-based identification method is significantly less sensitive to PPStream traffic than to BitTorrent traffic. This is because BitTorrent P2P file sharing software is open source and its protocol features can be easily found through analysis of its programs and application protocols. DPI technology can be used to identify the corresponding network traffic. For private commercial applications of PPStream, only the protocol features can be obtained by analyzing network packets and decompiling. The accuracy is limited to some extent, which leads to the reduction of identification recognition rate of these traffic. To identify the network flows through the machine learning method which cannot be recognized by DPI, the traffic of BitTorrent and PPStream is judged as P2P traffic, which makes up for the deficiency of DPI recognition. As shown in “table 2”, the traffic generated by BitTorrent and PPStream is judged to be P2P traffic. The identification method adopted in this

study has significantly improved the identification of P2P traffic like BitTorrent and PPStream by combining machine learning algorithm and DPI technology to detect network traffic, thus improving the overall identification rate of network traffic.

Table 5. Traffic Identification Results Based on DPI Algorithm

Protocol name	Actual flow /Byte	Identified traffic /Byte	Traffic identification rate	Actual connection number	Number of connections identified	Connection identification rate
BitTorrent	1070660210	96894749	90.5%	255	240	94.1%
WWW	82945	80290	96.8%	20	20	100%
PPStream	36055060	26680744	74%	250	181	72.4%

Table 6. Traffic Identification Results Based on DPI Algorithm

Protocol name	Actual flow /Byte	Identified traffic /Byte	Traffic identification rate	Actual connection number	Number of connections identified	Connection identification rate
P2P	1180246025	109998929	93.2%	482	453	94.0%
WWW	82945	80290	96.8%	20	20	100%

X. CONCLUSION

Another engineering for NIDPS sending was planned, executed and assessed. There has as of late been gigantic advancement in PC networks with respect to their capacity to deal with various paces and information volumes. Because of this quick turn of events, PC networks are currently more defenseless than any other time in recent memory to rapid assaults and dangers. These can bring significant hardship to PC organizations and frameworks. Network interruptions can be arranged at different levels. Some rapid assaults can be delegated being hard to identify or forestall. It will turn out to be perpetually challenging to examine expanding volumes of traffic because of the quick changes in innovation that are speeding up. As of late, different open-source apparatuses have opened up to cover security necessities for network frameworks and clients. In this paper, the presentation of an open source NIDPS has been assessed with regards to rapid and volume assaults. The motivation behind the assessment was to decide the exhibition of the NIDPS under rapid traffic when limited by off-the-rack equipment, and afterward track down ways of further developing it.

This study zeroed in on the shortcoming of such security frameworks, for example NIDPS in fast organization network. We proposed an answer for lessening this shortcoming and introduced an original engineering in NIDPS improvement that uses QoS and equal advancements to coordinate and further develop network the board and traffic handling execution to work on the exhibition of the NIDPS. With our clever engineering, Grunt's presentation improved uniquely, permitting more parcels to be checked before they were conveyed into the organization. The presentation (investigation, recognition and counteraction pace) of Grunt NIDPS expanded to over close to 100%. By utilizing 2 machines (computers) associated with two 1Gb points of interaction, Grunt NIDPS handled up to 8 Gbps

with 0 drop. This number can be expanded up to 32Gbps which is the full framework limit forward transfer speed by executing more hubs of NIDPS. The exploration zeroed in on laying out a specialized arrangement with a hypothetical establishment. This data sums up the issue and arrangement and consequently empowers the proposed way to deal with be applied all the more effectively to foundations that are different to the proving ground utilized in this exploration.

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A Data Storing and Sharing Solution with Guaranteed Reliability

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ABSTRACT

Digital data certified by a reputable organization are valuable digital data that can be stored or shared on the internet. However, the problems are: (1) How to ensure the anonymity of organizations on issued certificates? (2) How to ensure that valuable digital data are securely stored in the system? and (3)How could people verify the reliability of shared data while still ensuring the confidentiality of its content, and how to ensure that the data sharing process is safe, transparent, and fair? Therefore, we propose data producing, data storing, and data sharing schemas. In the data producing schema, we deploy a group signature scheme for a group of reputable organizations that provide the same type of service, an organization in the group generates a valuable digital data from raw data sent from a data owner and then issues a certificate on the ciphertext of this digital data. In the data storing schema, the data owner uploads his/her data to the public Inter-Planetary File System network and then stores the access address of the stored data and the corresponding certificate on the blockchain ledger. In the data sharing schema, everyone on the system could verify the reliability of shared data before sending a data sharing request to the data owner. The data sharing process is performed via a smart contract, and involved parties have to escrow to encourage honesty. The schemas of data storing and sharing guarantee the security properties including confidentiality, integrity, privacy, non-repudiation, and anonymity.

Keywords: Blockchain, IPFS, data storing, data sharing.

I. INTRODUCTION

There has been exponential data growth in the world, and trusted data are considered one of the most valuable assets of individuals and organizations. The amount of data created and stored globally are predicted to create about 175 zeta bytes by 2025. It is also estimated that by 2025 the global consumers interacting with data everyday will reach 5 billion [1]. Consequently, the demand for valuable data storing and sharing is tremendous, which also poses challenges related to data security in the processes of data storing and sharing. Currently, there are two main architectures used for data storing and sharing, centralized and decentralized architectures

For the centralized architecture, organizations can store data on their data center system. However, these systems have high operating costs and are limited in scalability. Using cloud storage services can reduce costs and can be flexible in system expansion, and more suitable for IoT systems. The combination of IoT and cloud storage services is a matter of studies. To protect the security and privacy of data storing and sharing, encryption algorithms and access control models are proposed, Murat Kantarcioglu et al. proposed SECUREDL for protecting the sensitive data stored in databases. However, the centralized architecture has two limitations including: (1) data security, stored data could be accessed, modified, or removed illegally by system administrators or attackers who compromised the system; (2) availability, when the centralized systems are crashed due to system overload, denial-of-service or distributed denial-of-service (DoS/DDoS) attacks, or system errors, the services are not available for users.

For the decentralized architecture, most solutions use blockchain (BC) technology as the main component in the systems because of its properties such as anonymity, transparency, decentralization, and auditability. However, current solutions do not provide features for verifying the accuracy and the reliability of the shared data on the BC network. Specifically, data verified and certified by a reputable organization (RO) are considered as meaningful data (MD). For instance, in the medical field, a diagnostic result of an electronic medical record is published by a reputable medical organization with highly skilled doctors, which is MD. In the education field, a lecture that is assessed and certified by a professional board of a reputable university is MD. MD needs to be securely stored on the system, besides a data owner (DO) can completely share or commercialize his/her MD to other people or organizations on the network. Data sharing methods must ensure that requesters can verify the reliability and accuracy of shared data before deciding to perform a data-sharing contract. The accuracy and the reliability of the shared data on the BC network. Specifically, data verified and certified by a reputable organization (RO) are considered as meaningful data (MD). For instance, in the medical field, a diagnostic result of an electronic medical record is published by a reputable medical organization with highly skilled doctors, which is MD. In the education field, a lecture that is assessed and certified by a professional board of a reputable university is MD. MD needs to be securely stored on the system, besides a data owner (DO) can completely share or commercialize his/her MD to other people or organizations on the network. Data sharing methods must ensure that requesters can verify the reliability and accuracy of shared data before deciding to perform a data-sharing contract

With the traditional data sharing method, the integrity of shared data is based on trust between the two partners participating in the exchange process. For example, doctors/hospitals absolutely believe that medical records received from their patients are integrity. In some cases, RO needs to ensure anonymity in MD generated by themselves. And the privacy of DO also needs to be protected as they don't want anyone to know which RO's service they used. In addition, the identities of those involved in the sharing process also need to be anonymous; and shared data need to be verified the reliability while still ensuring the privacy of its content.

Data storing and sharing for certified digital data are very necessary, which requires data storage and sharing solutions that need to meet all of the following requirements:

For data storing: The anonymity of certificate authorities and the privacy of DO on stored data must be protected; stored data in the system must be guaranteed confidentiality and integrity.

For data sharing: Everyone on the system can verify the reliability of shared data before submitting a sharing request to DO. Note that everyone can only verify the reliability of the shared data but cannot read its contents. The data sharing process is done directly between DO and DU without depending on

any intermediaries. The system serving data storage and sharing must ensure availability, integrity, and scalability. However, current solutions do not meet all of the above requirements. In this paper, we propose data producing, data storing, and data sharing schemes. We consider RO as a data provider (DP), and DPs providing the same type of service join in a group. In the data producing scheme, a group manager sets up a group of DPs that provide the same type of service. A raw data of DO is produced into MD by a particular DP in the group. Then, DP encrypts MD using a symmetric algorithm along with a secret key. Later, DP generates a certificate on the MD ciphertext (denoted by EMD). Finally, EMD, the certificate, and DP's information will be sent to DO through a secure channel. In the data storing scheme, DO stores EMD on Inter-Planetary File System (IPFS), the access address of EMD on IPFS and related information are stored in a transaction on the blockchain system. However, current solutions do not meet all of the above requirements. In this paper, we propose data producing, data storing, and data sharing schemes. We consider RO as a data provider (DP), and DPs providing the same type of service join in a group. In the data producing scheme, a group manager sets up a group of DPs that provide the same type of service. A raw data of DO is produced into MD by a particular DP in the group. Then, DP encrypts MD using a symmetric algorithm along with a secret key. Later, DP generates a certificate on the MD ciphertext (denoted by EMD). Finally, EMD, the certificate, and DP's information will be sent to DO through a secure channel. In the data storing scheme, DO stores EMD on Inter-Planetary File System (IPFS), the access address of EMD on IPFS and related information are stored in a transaction on the blockchain system.

II. RELATED WORK

Data center network virtualization: A survey: It present a survey of the current state of-the-art in data center networks virtualization, and provide a detailed comparison of the surveyed proposals. We discuss the key research challenges for future research and point out some potential directions for tackling the problems related to data center design.

An IoT-oriented data storage framework in cloud computing platform: A data storage framework integrates both structured and unstructured data in addition to efficiently storing large amounts of IoT data. In order to store and handle the many forms of data gathered by sensors and RFID readers, this data storage framework is able to merge and expand several databases and Hadoop. Additionally, certain parts are created to enhance Hadoop and provide a distributed file repository that can effectively process enormous unstructured file volumes.

Cloud databases for Internet-of-Things data: The proposed solution includes strategies for expressing common IoT data in the form of key-value pairs, as well as a data pre-processing and sharing mechanism to build a Web of Things connecting HTTP-enabled smart devices such as sensors and actuators with virtual "things" such as services, social networks, and APIs. The platform adopts Mongo DB as database server, provides models and interfaces that help to abstract and adopt different types of data and devices. This addressed the challenges related to data that are dynamic, various, massive, and spatial-temporal (i.e., each sample corresponds to a specific time and location). To provide a uniform storage mechanism for heterogeneous sensor data, the system combined the use of the relational model and the key-value model, and was implemented with a PostgreSQL database. Its multi-layer architecture was claimed to reduce the amount of data to be processed at the cloud management layer. Besides, the work also provided several experiments that showed a promising performance when storing and querying a huge volume of data.

Survey of real-time processing technologies of IoT data streams: The survey on emerging technologies toward the real-time utilization of IoT data streams in terms of networking, processing, and content curation

and clarify the open issues. Then we propose a new framework for IoT data streams called the Information Flow of Things (IFoT) that processes, analyzes, and curates massive IoT streams in real-time based on distributed processing among IoT devices.

Uploading and replicating Internet of Things (IoT) data on distributed cloud storage: We model our problem thoroughly based on various parameters such as effective bandwidth of the IoT network, available number and size of data items at each mini-Cloud, and we present our problem as a collection of various sub-problems based on subsets of these parameters. The solution assumes the existence of multiple distributed cloud data centres, called mini-Clouds, among which data can be replicated. We prove that the exact solution to the problem is intractable, and we present a number of heuristic strategies to solve it. Our results show that the performance of any heuristic is bounded by the read and write latency of mini-Clouds and the best we can do is often 12 times the worst we can do for a given number of data items to be uploaded and replicated from the gateways to the mini-Clouds in test setup.

IoT data compression and optimization techniques in cloud storage: Current prospects and future directions: This article presents a detailed survey on different data compression and storage optimization techniques in the cloud, their implications, and discussion over future directions. The development of the smart city or smart home systems lies in the development of the Internet of Things (IoT). With the increasing number of IoT devices, the tremendous volume of data is being generated every single day. Therefore, it is necessary to optimize the system's performance by managing, compressing and mining IoT data for smart decision support systems. In this article, the authors surveyed recent approaches with up-to-date outcomes and findings related to the management, mining, compression, and optimization of IoT data. The authors then discuss the scopes and limitations of present works and finally, this article presents the future perspectives of IoT data management on basis of cloud, fog, and mobile edge computing.

III. METHODOLOGY

Proposed system:

Our proposed scheme for data production, data storage, and information sharing We use a group authentication protocol in the data generating structure for a team of reputable companies that provide the identical sort of service. One of the organizations in the group produces valuable online information from raw data sent by a data owner and then concerns a certificate based on the encrypted message of this digital information.

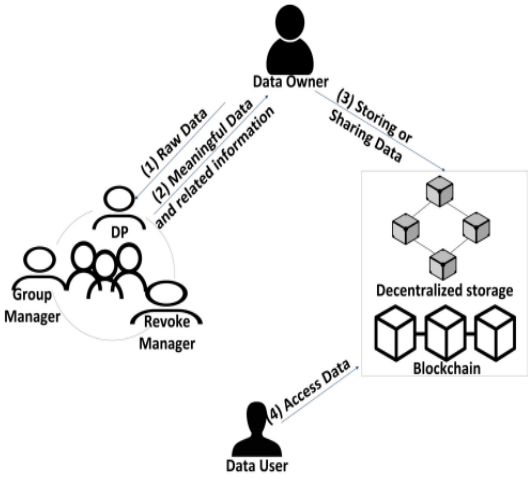


Figure 1: Block diagram

IV. IMPLEMENTATION

The project has implemented by using below listed algorithms.

CLOUD:

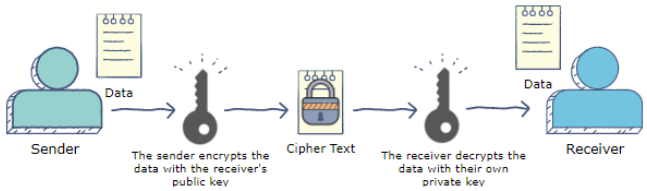
Cloud includes three basic services:

- Infrastructure as a Service (Iaas),
- Platform as a Service (PaaS), and
- Software as a Service (Saas).

Software-as-a-service (SaaS:) entails giving clients access to a software licence. Usually, licences are made available on-demand or on a pay-as-you-go arrangement. This kind of setup is available in Microsoft Office 365.

Infrastructure-as-a-service (IaaS): is a technique for offering anything over IP-based connection as part of an on-demand service, from operating systems to servers and storage. Clients can obtain software and servers through an on-demand, outsourced service rather of having to buy them outright. Microsoft Azure and IBM Cloud are two common IaaS examples.

Platform-as-a-service (PaaS): is said to be the third and most complicated layer of cloud computing. PaaS and SaaS are quite similar, with the main distinction being that PaaS is a platform for developing software that is supplied via the Internet rather than offering software as a service. Platforms like Salesforce.com and Heroku are part of this strategy.



DATA ENCRYPTION:

Data is converted into another form, or code, via data encryption so that only those with a secret key (officially referred to as a decryption key) or password may decipher it. Unencrypted data is referred to as plaintext, whereas encrypted data is frequently referred to as ciphertext. At the moment, corporations employ encryption as one of the most common and successful data security techniques. Asymmetric encryption, commonly referred to as public-key encryption, and symmetric encryption are the two primary methods of data encryption.

PURPOSE:

Data encryption is used to safeguard the secrecy of digital data while it is being stored on computer systems and transported over the internet or other computer networks. Modern encryption methods, which are essential to the security of IT systems and communications, have superseded the obsolete data encryption standard (DES).

These algorithms provide crucial security goals like authentication, integrity, and non-repudiation while also ensuring secrecy. A message's origin may be confirmed by authentication, and its integrity can be demonstrated by showing that its contents haven't changed since it was transmitted. Furthermore, non-repudiation guarantees that the sender of a communication cannot retract their actions.

DATA DECRYPTION

Decryption is the process of restoring the unencrypted version of data after encryption has rendered it unreadable. The system extracts and transforms the jumbled data into sentences and graphics that can be easily understood by both the reader and the system during decryption. The process of decryption can be carried either manually or automatically. A set of keys or a password might also be used to carry it out. Privacy is one of the main justifications for putting in place an encryption-decryption system. Information that is transmitted via the World Wide Web is open to review and access by unauthorized people or organizations. Data is therefore encrypted to decrease data loss and theft. Emails, text files, photos, user data, and directories are a some of the often encrypted goods. A prompt or window asking for a password to access encrypted data is presented to the person in responsibility of decryption.

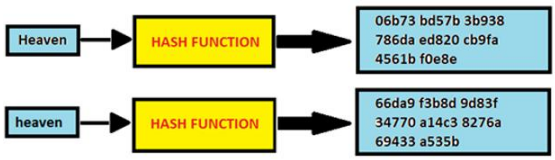
BLOCK CHAIN

Blockchain is a system of recording information in a way that makes it difficult or impossible to change, hack, or cheat the system. A blockchain is essentially a digital ledger of transactions that is duplicated and distributed across the entire network of computer systems on the blockchain. Each block in the chain

contains a number of transactions, and every time a new transaction occurs on the blockchain, a record of that transaction is added to every participant's ledger. The decentralised database managed by multiple participants is known as Distributed Ledger Technology (DLT).Blockchain is a type of DLT in which transactions are recorded with an immutable cryptographic signature called a hash. This means if one block in one chain was changed, it would be immediately apparent it had been tampered with. If hackers wanted to corrupt a blockchain system, they would have to change every block in the chain, across all of the distributed versions of the chain.

SHA Algorithm:

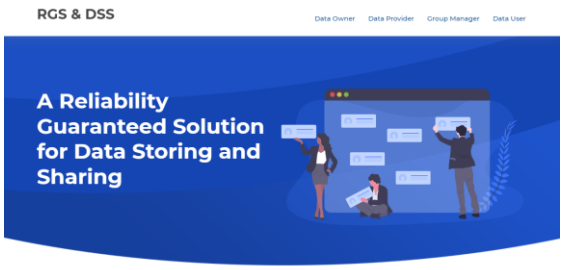
Secure Hashing Algorithm, or SHA. Data and certificates are hashed with SHA, a modified version of MD5. By utilizing bitwise operations, modular additions, and compression functions, a hashing algorithm reduces the input data into a smaller form that is impossible to comprehend. Can hashing be cracked or decrypted, you may wonder? The main distinction between hashing and encryption is that hashing is one-way; once data has been hashed, the resultant hash digest cannot be decrypted unless a brute force assault is applied. To see how the SHA algorithm functions, see the graphic below. SHA is designed to provide a different hash even if only one character in the message changes. For instance, combining two messages that are similar but distinct, such as Heaven and Heaven Is Different The only difference between a capital and tiny letter, though, is size.



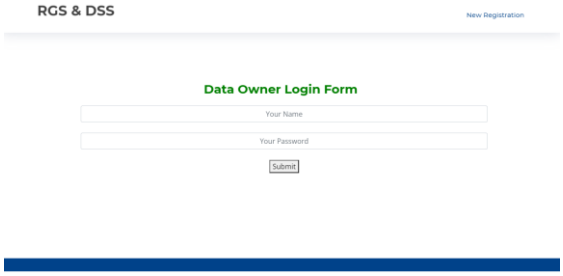
V. Results and Discussion

The following screenshots are depicted the flow and working process of project.

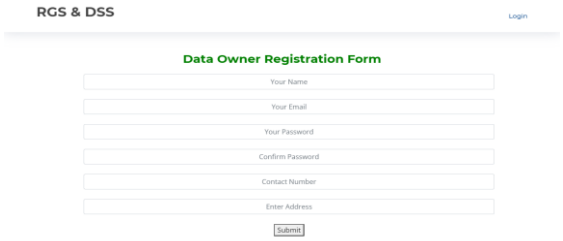
Home page: This is the home page of a reliability guaranteed solution for data storing and sharing.



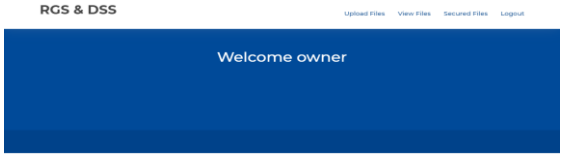
Data Owner Login: Data owner can login with valid credentials.



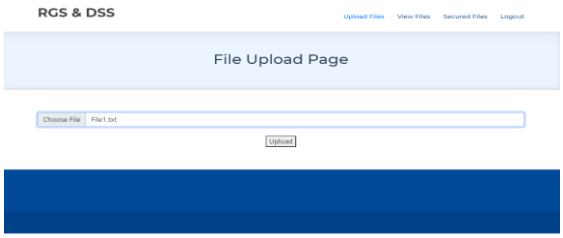
Data Owner Registration Page: Data owner can register with required details.



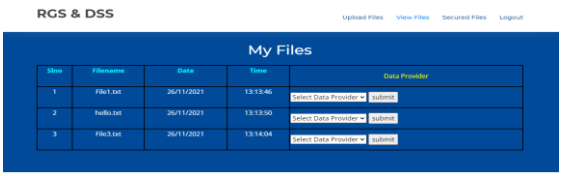
Owner Home Page: After successful login data owner can view the home page.



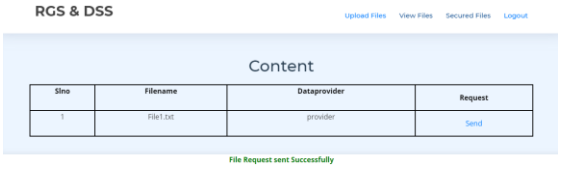
Upload Page: Data can be uploaded here.



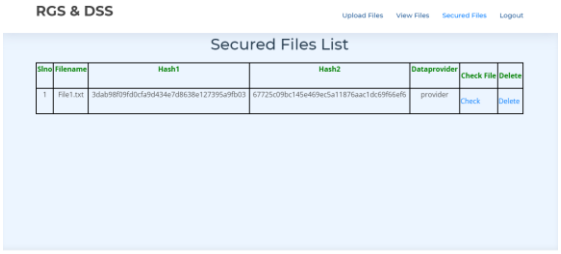
View Files Page: This page displays all the uploaded files.



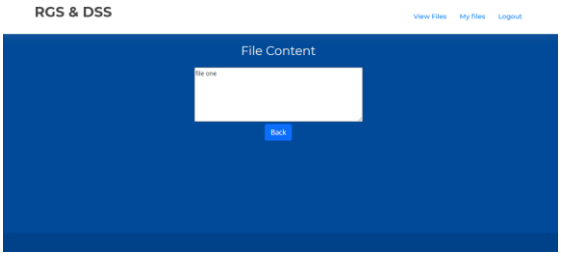
Send Request: This page having requests made by users.



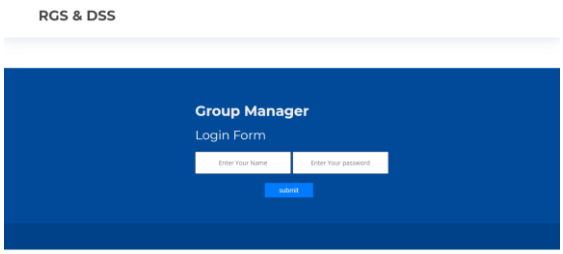
Data owner secured files: Here we can see the secured files of data owner.



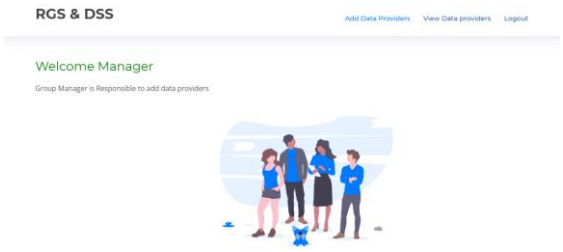
File Content: Here we can see the content of selected file.



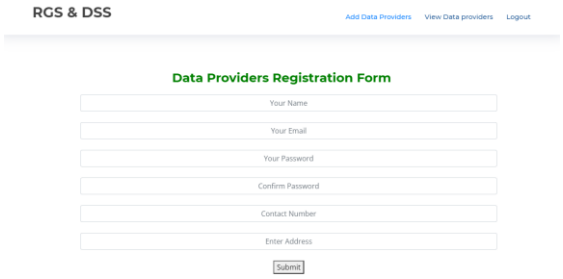
Manager Login Page: Manager can login with valid credentials.



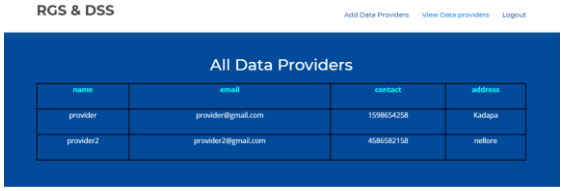
Manager Home Page: Manager can view the home page after successful login.



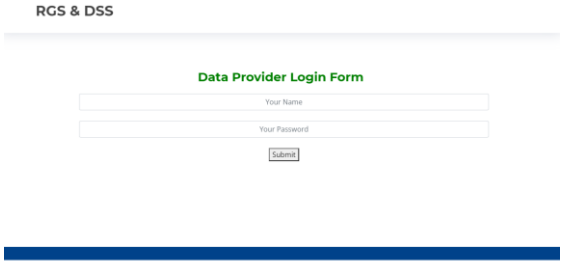
Add Providers page: Data providers will be added by registering here.



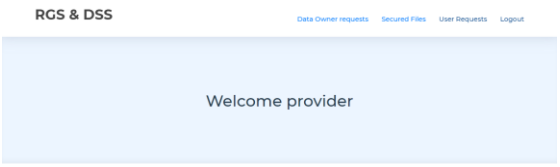
Data Providers list: This page displays all the registered data providers.

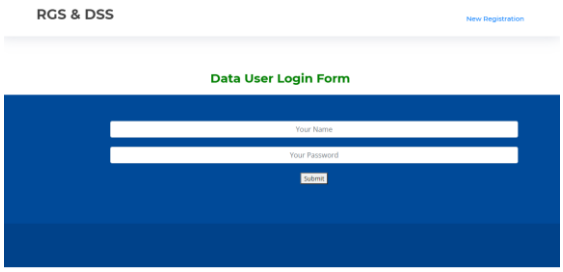


Providers Login Page: Data providers can login with valid credentials.



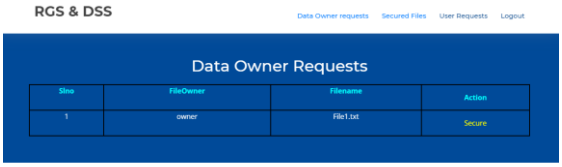
Data providers Home Page: After login data providers can view the home page.

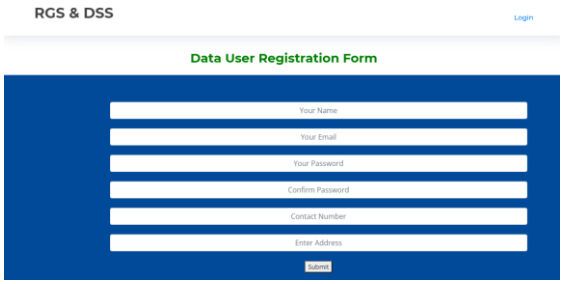




Data User Registration: User can register with required details.

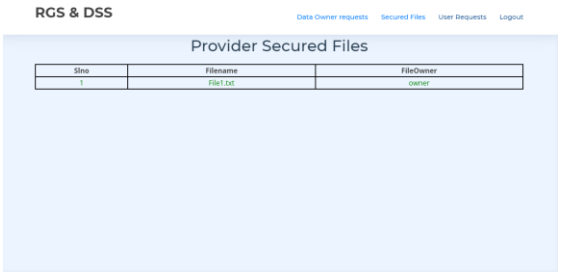
Data Owners Request: Data owner can request for secure file.

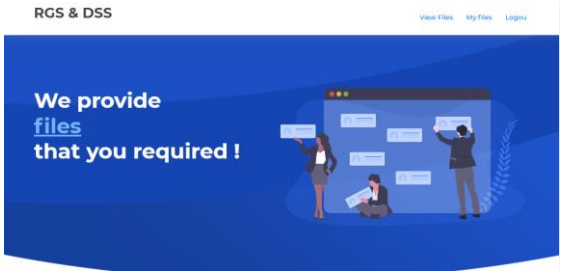




Data User home page: Data user can view the home page after login.

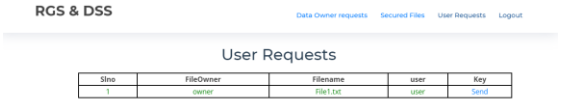
View Secured Files: This page displays the secured file.

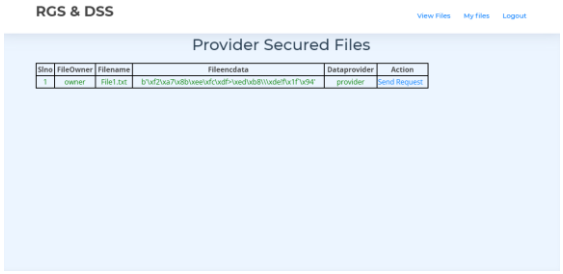




Data User Files: This page contains the files of data user.

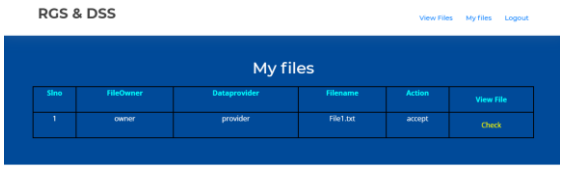
User Requests: User can send the request.



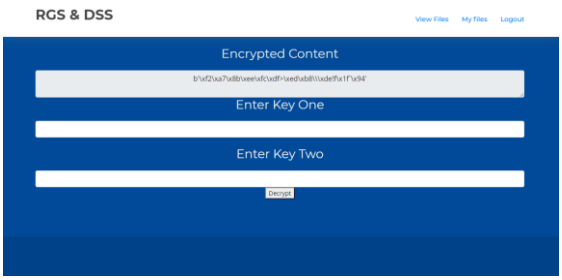


Data User Login Page: User can login with valid credentials.

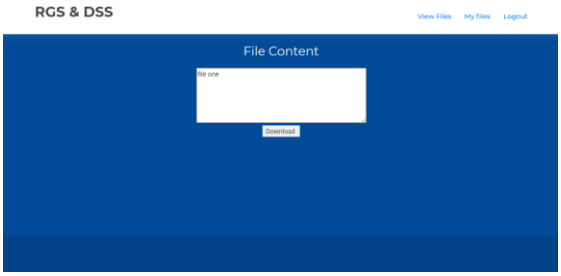
Data User Files: This page contains the content of selected user file.



Data Decrypt Page: This is the page where we can see the decrypted file.



Data User Decrypted Page: Data user can view the decrypted file.



VI. CONCLUSION

In this paper, we propose three schemes: data producing, data storing, and data sharing. In the data producing scheme, we consider RO as DP, a group manager sets up a group of DPs providing the same type of services. DP can generate MD from RD sent from DO, and then issues a certificate on EMD. In the data storing scheme, we provide not only the confidentiality and integrity of the stored data but also the anonymity of DP and the privacy of DO which have not been fulfilled in the existing solutions. In the data sharing scheme, everyone on the system can verify the reliability of shared data before submitting a sharing request to DO. Note that everyone can only verify the reliability of the shared data but cannot read its contents. This property could not be fulfilled by existing solutions. In addition, the data sharing process is done directly between DO and DU without depending on any intermediaries. The results of the security analysis show that the proposed schemes meet the security properties including confidentiality, integrity, privacy, non-repudiation, and anonymity.

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Hierarchical Dynamic Key Generation and Selective Transformation Model for Optimized AES Block Cipher Core

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ABSTRACT

Symmetric key cryptography, Hash functions and public key cryptography. Symmetric key algorithms namely Advanced Encryption Standard (AES), and Data Encryption Standard use the same key for encryption and decryption. This research examined a brand-new rapid picture key extraction from image. To create a key stream with outstanding statistical properties from picture have to use image processing. An effective and safe image based key AES S- is presented in this research. First, an image has to be selected after that by using image. The proposed architecture includes 8-bit data path and five main blocks. We design two specified register banks, Key-Register and State-Register, for storing the plain text, keys, and intermediate data. In order to increase security, the proposed Bio-Metric 256-bit AES method is heavily used for key management. A FPGA implementation therefore reduces power as a result of this. The suggested implementation's proposed throughput (Mbps) using Virtex-7 (xc7vx485tffg1157) FPGA improved.

Keywords : AES (Advanced Encryption Standard), FPGA (field programmable gate array)

I. INTRODUCTION

Data and information communication has become very important ingredient of today's technological life and considered as significant assets of an individual or organization. If the confidentiality of information is compromised, then the information can be used for harmful purposes. Current innovations in information technology and their prolific applications in our life have caused in a gigantic growth in the size of the data being transmitted online. The private information being very sensitive assets require protection from attackers

On December 2001, The Advance Encryption Standard was published by the National Institute of Standards and Technology (NIST) (AES), a symmetric cryptographic block. The encryption and decryption of a fixed data block of 128 bits is performed by this non-Feistel block cypher. Three distinct key lengths exist. For 128-bit keys, 12 processing rounds are used, for 192-bit keys, 14 processing rounds are used, and for 256-bit keys, 14 processing rounds are used.

Ordinary plain text is transformed into unintelligible Using cryptography, you can transfer data between text as well as vice versa. Hash functions, public key cryptography, as well as symmetric key cryptography are the three distinct types of cryptographic techniques. Same key is used for encryption and decryption in the Advanced Encryption Standard (AES) and Data Encryption Standard. It uses fewer processing resources, is simpler to use, and is noticeably sharper.

Data encryption standard (DES)

It has been found vulnerable to very powerful attacks and therefore, the popularity of DES has been found slightly on the decline. Since DES is an encryption algorithm, it encrypts in 64 bits each. As a result, DES receives 64 bits of clear text as input and outputs 64 bits of cipher - text. Despite a few minor variations, the same algorithm and key are utilized for encryption as well as decryption. The key length is 56 bits. Actually, the initial key consists of 64 bits. However, before the DES process even starts, every 8th bit of the key is discarded to produce a 56-bit key. That is bit positions 8, 16, 24, 32, 40, 48, 56, and 64 are discarded.

Thus, the discarding of every 8th bit of the key produces a 56-bit key from the original 64-bit key. DES is based on the two fundamental attributes of cryptography: substitution (also called confusion) and transposition (also called diffusion). DES consists of 16 steps, each of which is called a round. Each round performs the steps of substitution and transposition. Let us now discuss the broad-level steps in DES.

1. In the beginning step, a 64-bit simple text fragment is supplied to an initial permutation (IP) algorithm.
2. Text in plain text is used for the initial permutation.

   3. The two sides of the permuted blocks (RPT) are created by the initial permutations (IP), Left Plain Text (LPT), and Right Plain Text (RPT).

   4. For each LPT and RPT, the encryption process now completes 16 cycles.

   5. The united block is then put in via a Final Permutation when LPT and RPT are properly re-joined (FP).

   6.This procedure generates 64-bit ciphertext as the end result.

Cryptography is the science of secret, or hidden writing.

It has two main Components:

- Encryption
  Practice of hiding messages so that they cannot be read by anyone other than the intended recipient
- Authentication & Integrity
  Ensuring that users of data/resources are the persons they claim to be and that a message has not been surreptitiously altered

Requirements of secure communication

- Secrecy
  Only intended receiver understands the message
- Authentication
  Sender and receiver need to confirm each other's identity
- Message Integrity

Ensure that their communication has not been altered, either maliciously or by accident during transmission

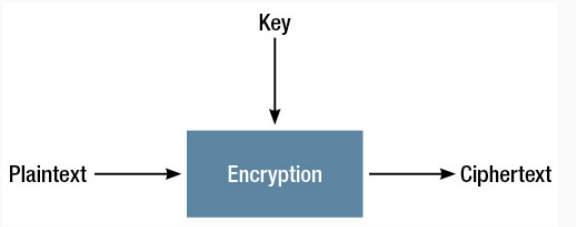


Fig 1: Block diagram of Encryption

Data confidentiality is protected by encryption, one of many security controls. Data that needs to be protected (plaintext) is transformed mathematically into a form that is difficult for machines or unauthorized individuals to understand (ciphertext).

The plaintext is random-looking and contains no information about the content of the original data after being converted into ciphertext. After being encrypted, the data cannot be read by a person (or machine) in a way that would reveal anything about the original data's content.

A bidirectional conversion is encryption. It only serves a purpose when it is possible to convert encrypted data (ciphertext) back to its old, unencrypted state (plaintext). The encrypted data are regarded as unreadable and useless if the encryption is not reversible. Decryption is the procedure of going backwards. Decryption is the method of restoring encrypted data (also known as ciphertext) towards its original state after encryption (plaintext).

An appropriate cryptographic key is necessary for each encryption as well as decryption operation. A series of binary digits is referred to as a cryptographic key and serves as the input for encryption and decryption processes. The encryption as well as decryption functions must employ the exact same cryptographic key in order for the encryption function to convert the plaintext into ciphertext and the decryption method to convert the ciphertext back to its original form. A symmetric key is what this is. The Advanced Encryption Standard's encryption functionalities are extensively supported by modern hardware as well as software.

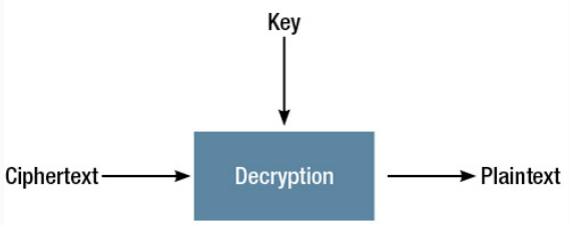


Fig 2: Block Diagram of Decryption

Decryption is the process of reversing the encryption of data. The process of encryption is typically reversed. Since decryption needs a secret key or password, it decodes the encrypted messages ensuring that only a permitted user can do so.

Confidentiality is a factor in the implementation of an encryption-decryption system. It's important to check the access from illegal organisations or people as information goes through the Internet. The data is encrypted as a result to lessen theft and data loss. Text files, photos, emails, user data, and directories are some examples of often encrypted stuff.

The person who receives decryption gets a prompt or window where they can input a code to access the encrypted data. In order to decipher the data, the method extracts and turns it into phrases and visuals that may be easily understood by both a reader and a system. Either manually or automatically decrypting data is feasible. It might also be accomplished by using a password or a set of keys.

The Hill cypher combines encryption and decryption is one of the most widely used methods of conventional cryptography. Most significant and well-liked techniques because it produces a random matrix and fundamentally gives security power. The Hill cipher's matrix must be inverted in order to be decrypted. Inverse of the matrix is not always present, which creates a challenge during decryption. Decrypting the encrypted content is impossible if the matrix is not invertible. That is the main drawback of this. In order to overcome the disadvantages, AES has been invented.

II. EXISTING METHOD

The existing 32-bit AES implementation. We are doing operations per word (32-bits) in each cycle. Number of blocks required for conventional (128 bit) and existing (32-bit) implementation are as follows

1) S box - 16, 4 per clock cycle
2) Mix column block - 4, 1 per clock cycle

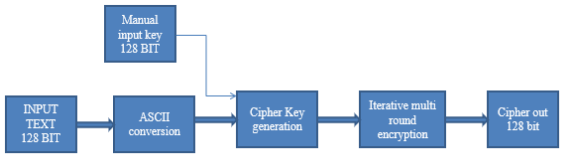


Fig 3: Existing AES functional block diagram

In the existing implementation, we are using the same Sbox hardware with regard to both encryption and decryption. Inverse S-box and S-box (encryption) are identical except for the affine transform (decryption). The Substitution-box and inverse S-box have the same similar encryption and decryption algorithms. Consequently, we are recycling every logic other than the Affine transform for encryption and decryption. Fig.3 shows the mux selection between S-box and inverse S-box. While doing AES encryption S-box path is chosen and while doing AES decryption inverse S-box path is chosen.

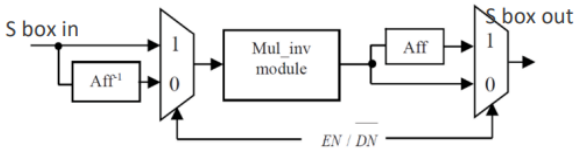


Fig.4 Combined structure of S box and Inverse S box

S box	Shift	Mix	Cycle
		Mix_0	1
Sub_0	-	Mix_1	2
Sub_1	Shift_0	Mix_2	3
Sub_2	Shift_1	Mix_3	4
Sub_3	Shift_2	-	5
Key_2	Shift_3	Mix_0	6
Sub_0	-	Mix_1	7
Sub_1	Shift_0	Mix_2	8
Sub_2	Shift_1	Mix_3	9
Sub_3	Shift_2	-	10
Key_3	Shift_3	Mix_0	11
Sub_0	-	Mix_1	12
Sub_1	Shift_0	Mix_2	13
Sub_2	Shift_1	Mix_3	14
Sub_3	Shift_2	-	15
-	Shift_3	Mix_0	16
.	.	Mix_1	17
Key_14	.	Mix_2	18
Sub_0	-	Mix_3	19
Sub_1	Shift_0	.	.
Sub_2	Shift_1	.	.
Sub_3	Shift_2	-	.
-	Shift_3	Mix_0	71
		Mix_1	72
		Mix_2	73
		Mix_3	74

In existing 32-bit operation method, we are reusing S-box and Mix Column blocks. In existing design Mix Column and Add Round Key We referred to the group as Mix block.

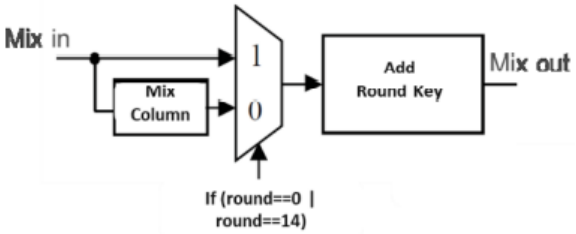


Fig.5 Mix Column as well as Add Round Key Structure Combined - Mix

Pipelined structure of existing method

the pipeline structure of the existing design, where each color represents different round as follows, Mix – round 0

Mix – round 1

Mix – round 2

Mix – round 3 and Mix – round 14

Each word having a size of 32 bits. In cycle 1, we are doing Mix operation of word 0 (mix_0). We can denote this as cycle1 [round0 (mix_0)].

Hence this 32-bit word is available to undergo 32- bit Sub operation. Hence in cycle 2 we are doing sub operation of word 0 (sub_0) and Mix operation of word 1 (mix_1). We have valid input for sub block word 0 in clock cycle 2, and hence we don't need to wait for all the 4 words mix block operation to complete. We can denote this as cycle2[round1(sub_0), round0(mix_1)].

In clock cycle 3, we are doing sub operation for word 1 (sub_1), shift operation of word 0 (shift_0) and mix operation of word 2 (mix_2), and. We can denote this as cycle3[round1 (sub_1, shift_0), round0(mix_2)].

In clock cycle 4, we are doing sub operation for word 2 (sub_2) and shift operation for word 1 (shift_1) and mix operation for word 3 (mix_3). We can denote this as cycle4[round1(sub_2, shift_1), round0(mix_3)].

Since all 128-bit (4 words) round 0 mix operation completed, we don't have mix operation in cycle 5. In clock cycle 5, we are doing sub operation for word 3 (sub_3) and shift operation for word 2 (shift_2). We can denote this as cycle5[round1(sub_3, shift_2)].

Since all 128-bit (4 words) round 0 sub operation completed, we don't have sub operation in cycle 6. In

clock cycle 6, we are doing round 1 shift operation of word 3 (shift_3) and mix operation of word 0 (mix_0) and. Since we already have the last byte value from sub_3, we are using that for mix_0. In this way we don't need to wait extra one cycle of shift operation to start the mix operation. We can denote this as cycle6[round1(shift_3, mix_0)].

In clock cycle 7, we are doing sub operation for word 0 (sub_0) and mix operation for word 1 (mix_1). We can denote this as cycle7[round2(sub_0), round1(mix_1)].

In clock cycle 8, we are doing sub operation for word 1 (sub_1) shift operation for word 0 (shift_0) and mix operation for word 2 (mix_2). We can denote this as cycle8[round2(sub_1, shift_0), round1(mix_2)].

In clock cycle 9, we are doing sub operation for word 2 (sub_2), shift operation for word 1 (shift_1) and mix operation for word 3 (mix_3). We can denote this as cycle9[round2 (sub_2, shift_1), round1 (mix_3)].

In clock cycle 10, we are doing sub operation for word 3 (sub_3) shift operation for word 2 (shift_2). The same order of execution repeats for all 14 rounds. We can denote this as cycle10[round2(sub_3, shift_2)]. The same sequence repeats for all 14 rounds.

In cycle 6 we are using sub bytes S box for key generation block, because of this we don't need extra S box for key generation block. We are generating 128-bit key for every 5 cycles, so that it requires only 4 S box in one cycle. In conventional method, we need 8 S box for key generation block. 128-bit key generated in cycle 6 will be used in cycle 14 mix operation. Similarly, key generated in cycle 11 used in mix operation of cycle 19.

In cycle 9 we have valid output for round 1 (cycle 5 to 9), so we need 5 cycles to perform round 1. Total we need 74 clock cycles to complete AES encryption.

III. PROPOSED METHOD

At a high level, the evaluation of a BKG requires designers to show that two properties hold: correctness and security. Intuitively, a scheme that achieves correctness is one that is usable for a high percentage of the population. That is, the biometric of choice can be reliably extracted to within some threshold of tolerance, and when combined with the template the correct key is output with high probability. As correctness is well understood, and is always presented when discussing the feasibility of a proposed BKG, we do not address it further.

In the context of biometric key generation, security is not as easily defined as correctness. Loosely speaking, a secure BKG outputs a key that "looks random" to any adversary that cannot guess the biometric. In addition, the templates and keys derived by the BKG should not leak any information about the biometric that was used to create them. We enumerate a set of three security requirements for biometric key generators, and examine the components that should be analysed mathematically (i.e., the template and key) and empirically (i.e., the biometric and auxiliary information). While the necessity of the first two requirements has been understood to some degree, we will highlight and analyse how previous evaluations of these requirements are lacking. Additionally, we discuss a requirement that is often overlooked in the practical literature, but one which we believe is necessary for a secure and practical BKG.

We consider a BKG secure if it meets the following three requirements for each enrollable user in a population:

- Key Randomness: The keys output by a BKG appear random to any adversary who has access to auxiliary information and the template used to derive the key. For instance, we might require that the key be statistically or computationally indistinguishable from random.
- Weak Biometric *Privacy*: An adversary learns no useful information about a biometric given

auxiliary information and the template used to derive the key. For instance, no computationally bounded adversary should be able to compute any function of the biometric.

- Strong Biometric Privacy: An adversary learns no useful information about a biometric given auxiliary information, the template used to derive the key, and the key itself. For instance, no computationally bounded adversary should be able to compute any function of the biometric

Even more problematic is that many approaches for demonstrating biometric security merely provide some sort of measure of entropy of a biometric (or key) based on variation across a population. For example, one common approach is to compute biometric features for each user in a population, and compute the entropy over the output of these features. However, such analyses are generally lacking on two counts. For one, if the correlation between features is not accounted for, the reported entropy of the scheme being evaluated could be much higher than what an adversary must overcome in practice. Second, such techniques fail to compute entropy as a function of the biometric templates, which we argue should be assumed to be publicly available. Consequently, such calculations would declare a BKG "secure" even if, say, the template leaked information about the derived key. For example, suppose that a BKG uses only one feature and simply quantizes the feature space, outputting as a key the region of the feature space that contains the majority of the measurements of a specific user's feature. The quantization is likely to vary between users, and so the partitioning information would need to be stored in each user's template. Possession of the template thus reduces the set of possible keys, as it defines how the feature space is partitioned.

In our demonstration, we show how the choice of key size Cryptographic algorithms' safety could be considerably compromised by both and the amount of computing cycles. It is imperative that lengthen the encryption key in order to optimize security and level of resistance. Different transformations can also be utilized to reduce the design complexity without sacrificing security. In order to achieve reduced complexity and enhanced unpredictability over the cypher text conversion process, this work uses AES with 256 key size and incorporates various combinations of transformations for each round. A fully automated key generation system based on digital biometrics is developed to solve the key management issue with AES core. This automatic key creation uses hierarchical phases that contain various AES confusion level metrics.

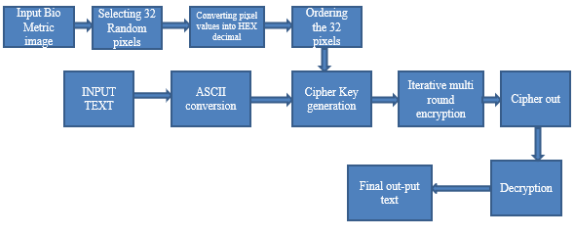


Figure 6: Pipelined structure of proposed method

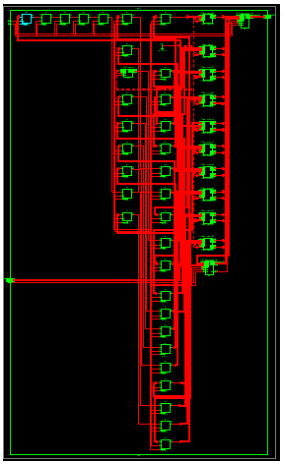
There will be more Pixels accessible in an individual photograph. Therefore, it is quite difficult to determine which pixels we are using as our key. Even if someone can determine the number of pixels and their locations, they still need to understand how the pixels are organized. The KEY's place of genesis is unknown.

IV. RESULTS AND DISCUSSION

The recommended AES algorithm as well as the present AES technique have both undergone functional testing using the Xilinx 14.7 version. The current proposal has a greater area than the current design when compared to it. without sacrificing the other characteristics. While utilizing dynamic key, the proposed solution will reduce area while enhancing architecture performance.

Biometric Image

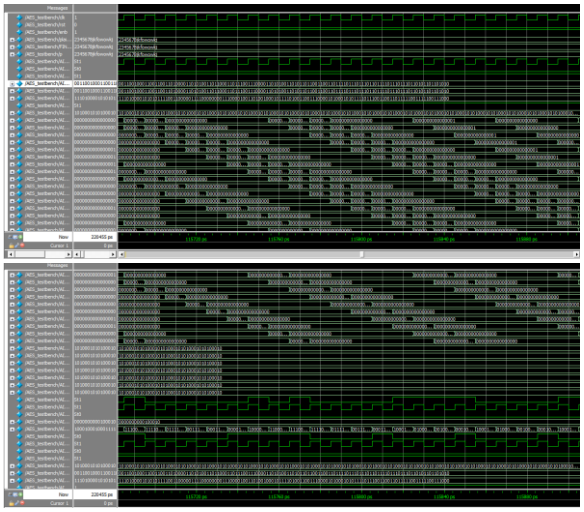
From an above image, the MATLAB software will read the all pixels in the form of digital data and it will be stored in one text file. Among all data we have to select random data for key generation. Once the data is collected, we have to do concatenation of random data in different order.



RTL Schematic

Technology Schematic

Simulation Results:



Evaluation of Area, Delay report:

	Area	Delay
Existing	5716	32.346ns
Proposed	5286	14.377ns

V. CONCLUSION

The AES algorithm with a key derived from a image is presented in this study as a generalized design and practical implementation. The suggested strategy outperformed the static key approach about safety. Utilizing Xilinx 14.7, the functionality of the new AES algorithm and the present AES algorithm were both tested. The aforementioned results show that, in contrast to the current design, the proposed design requires less space and moves more quickly.

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Design And Implementation of High-Performance Timing-Error-Tolerant Circuit Using 45nm

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ABSTRACT

This work uses the clock technique to show timing error and timing error tolerant circuits. Timing faults are recognized, and fixed by adjusting the clock of the flip flop while changing the system clock and using the fewest logics available. To deal with a timing error, numerous techniques have been introduced. Conventional strategies that can minimize a timing issue, on the other end, were indeed concentrated mainly on time-delaying signaling pathways & overly complicated processes, culminating in some kind of a timing difficulty for clock-based devices while also peripheral devices operating costs. In this paper, we report a novel timing-error-tolerant paradigm based on a simple way for asynchronously clarifying a timing issue. To heal a temporal lag, the procedure involves investing time in a clock-based application and changing the clock within a flip-flop. The suggested model, in particular, has considerably decreased memory requirements due to its compact construction, as compared to earlier timing-error-tolerant devices that can truly recover the fault instantly. In order to examine this text, it is also necessary to be familiar with a number of other basic terms, including channel estimate, error systems, softness error, time error tolerant system, and timing error.

Keywords : Error tolerant, bit-interleaving, clock gating, error correction and detection, time borrowing.

I. INTRODUCTION

Timing mistakes are a development is necessary of operational challenges in Nano scale technology, high complexity, and inter frequency ICs. A new localized error detection and correction technique based on bit flipping flip-flops has been proposed in this study. When a timing issue is discovered, the accompanying flip-output flop's is supplied to remedy the problem. Like the clock frequency rises, the quantity of timing errors rises with it. Technical requirements in the design are often more vulnerable to timing errors when the clock period is decreased. Differences in the CMOS process, power supply, and temperature also affect the performance of current IC's resulting in a high rate of timing errors. The latency of the circuit can differ significantly from the normal scenario once the supply voltage falls. The worst case of process,

voltage, and temperature conditions. One of the major difficulties confronting the semiconductor industry right now is process variability in device and circuit parameters.

Dynamic parameter differences can occur during chip functioning as a response to environmental and work changes, as opposed to static parameter changes that can occur during chip manufacturing. Active variations include supply voltage hang-ups, temperature swings, and transistor fading deterioration. Variations change the timing and power cost advantages of the circuit, and if not managed effectively, they can adversely affect performance of the system, energy, and overall reliability [2].

Even though increasing safety factors helps to handle fluctuations, also it results in substantial loss in performance or power consumption. Adapting strategies that adjust for variances have already been explored as a result. Critical path replication devices having durations that are highly associated with the critical path delays of the actual logic block are an appealing solution. Tolerate timing variation while operating at decreased safety margins, apply in-situ errors identification and repair systems in timing-critical paths. When the chance of critical-path activation is large, however, the performance in terms of energy overheads of error correction can be significant.

Connecting wire helps to fan-out delay by expanding the number of output connections. Ability to control parameters in a si fabricator technician, influencing battery topography and transistor measurements by a Mobile phone library developer and a Programmable logic chip designer, controlling synthesis, place & route, and cell selection with CAD tools, and controlling RTL and Layout generator by a designer can all be used to control the delay. Provisions for setting input arrival timings (related to the clock) and output parameters will be included in tools that are expected to do something about the timing behaviors (such as synthesisers) (set-up times of next stage). For outputs, setup time is deduced by what it connections to, whereas clk-to-q for circuit inputs is determined by where it originated. The delay caused by the first latch causes setup time, while the disruption caused by the second latching causes setup time. Clock A delay caused by the second latch in Flip flops leads to a Q delay.

This research presents a strategy for anticipating timing mistakes in a pipelined program to enhance endurance to logic phase lag time variations when performing at a clock cycle smaller than that of the critical path propagation delay having lower service effect (just over a clock cycle). This strategy is to reduce timing issues, this integrates the sense of time borrow with cutting-edge circuitry. Times borrow is a well-known notion in pipelines with pulsed latching or soft-edge flip-flops, in which legal signal transitions are allowed even beyond the clock edge (within the limited transparent time period), resulting in accurate values propagating to the next stage. Pipelines with lowest power-delay combination could be required to optimize the transparent windows of pulsed latches.

II. EARLIER WORK

The development of a new timing-error-tolerant technology that can correct a timing issue is underway. When a timing problem creates a delay in the arrival of an input on a flip-flop, the recommended method can detect it and the flip-flop passes through the data by making a translucent window.

Timing error tolerant circuit:

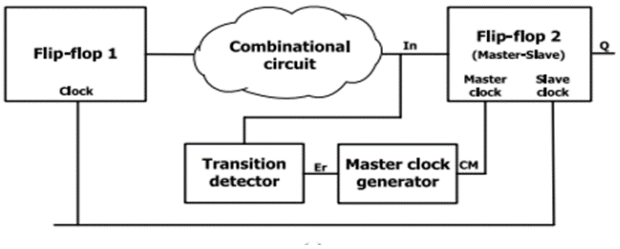

Fig.1: Block diagram of timing error tolerant circuit

A transition detectors and just a master clock generator are included in present scheme, as shown in Fig. The transition detectors recognises a flip-input flop's transition & generates an error-flagged signal pulse. The master clock generator generates a pulse for a predefined timeframe once the clock is high, based on the output of the transition detector. The flip-flop passes the input to the output whereas a pulse is 1, since the pulse controls a master clock in the flip-flop, which creates a transparent window. As a result, the flip-abnormal flop's data can be restored using delayed normal data. To avoid a hold time violation, a pulse is created with the shortest time possible.

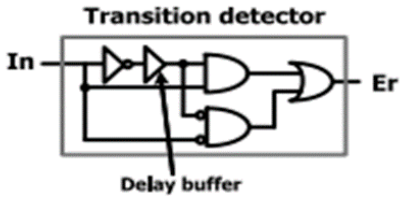

Fig. 2 (a)

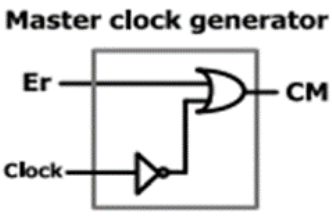

Fig.2 (b)

Fig. 2 Internal circuits of (a): transition detector (b): master clock generator

A Transition detector's internal circuit is illustrated above. The transition detector consists of an inverter to which the buffer is linked, and also the buffer's output is sent to one of the inputs for the AND ass well as Bubbled AND gates, while the gates' inputs are obtained from the input. The OR gates, which emit the error signal, are coupled to the output of these gates. When the shift from low to high and high to zero occurs, the error occurred. The master clock generator of the master latch takes this erroneous signal as an input. That's the master clock generator's internal design. It is made up of an OR gate having error & clock signal inputs that are coupled via an inverter. It generates a signal known as CM, which is used as the Master Latch's clock input.

Result in delayed input data, whenever a timing fault appears on the flip-flop 2's data input, the flip-flop 2 stores irregular data to the output Q. A changeover detectors, which would be situated between a combinational circuit and the flip-flop 2, emits an error pulse after the delay normal data have arrived on the input of flip-flop 2. By detecting both a rising and falling edge in the data, the transitional detector can identify simultaneously up - and - down edges the delayed normal input. the AND gate as well as an inverter Moreover, through adding a delay buffer into to the transitional detectors, the transition detector provides a custom period of a pulses, allowing the transparent window to be maintained for a good length of time. Based on the error pulses as well as clock, the master clock generator generates a clock for the master (CM).

After a timing error, a CM is elevated for just a short time due to the OR gate as well as inverter with in master clock generator. The flip-flop 2 becomes transparent whenever the CM is high, and t is saved by flip-flop 2. As a result, the normal input is used to fix the erroneous output Q. The suggested system detects and corrects the timing mistake while the clock is high, because the timing problem usually occurs after a rising edge of the clock. Whenever the combinational circuit's latency exceeds the half-time of the clock period, the suggested methodology is used in essential pathways. Because the master latch is transparent during the pulse time, all postponed incoming data signal is retrieved in the case of a single-stage fault. However, because the second flip-

flop lacks setup time, a sequential error occurs, and the late arriving data signal in the second phase cannot be stored due to the setup-time violation. To deal with the successive-stage error, the time-borrowing approach was developed. A period circuit is included in the next phase, as shown.

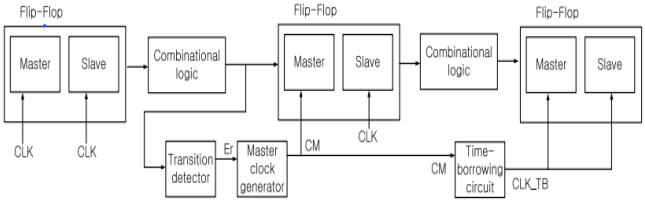

Fig.3 Block diagram of proposed timing error

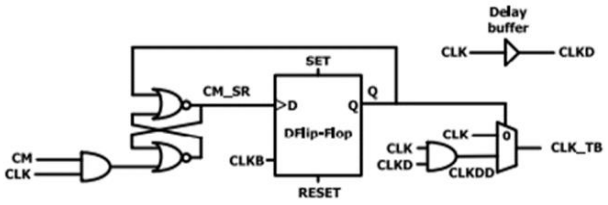

Fig.4: Internal circuit of Time borrow circuit.

Whenever a timing error in first stage's input data occurs, the CM signal is set to 1, causing the CM SR high level to be induced. Q is set to 1 once CLK has fallen IN the second step, the delayed CLK (CLKDD) is selected as the primary CLK, with the Q signal determining the high period. After all, the new CLK maintains a transparent window open for a long enough amount of time. After a timing issue, the CM remains high for a given amount of time. As a result, the postponed information can be stored in the same way that regular data is. Any place could be used with the time-borrowing system. The flip-flop just takes a few seconds to set up.

III. PROPOSED WORK

Inside this article, researchers use the clock gating technique to demonstrate a timing error tolerant circuit and a timing error with time borrowing circuit. Clock gating is a low-power approach that can help you save even more energy. Clock gating is implemented using a logical AND gate with two inputs: one is for clock and one for enable. Enable Pin can be used to provide controlling action to the circuit.

VLSI chips are still evolving, with engineers seeking for ways to improve IC performance, such as reducing area and power consumption. Fault current, which can be caused by gate generated drain leakage current, sub - threshold leakage, the hot electron effect, gate tunneling, and other factors, is one of the most critical problems that designers face.

Dynamic power, short circuit power, and static power could all be added together just to calculate CMOS' total power usage. The amount of power dissipated by a chip per unit area is referred to as power density. Static and dynamic are the two categories. When switching activity occurs in the inputs and outputs of a chip, each CMOS device dissipates power. When compared to transistors that switch slowly, transistors that switch quickly dissipate more energy. The clock signal employed in the circuit is the primary cause of dynamic power dissipation.

Low-power approaches such as power gating and clocks gating are used to limit leaky energy dissipation. The above are the principles of energy gating and clock gating: Various solutions have indeed been devised to reduce the clock switching activities. One of them is clock-gating. It is based on the idea of turning off the clock to flip-flops or memory sections that aren't in use at the time, hence avoiding unnecessary shifting and conserving dynamic power.

The leakage currents in the MOSFET device are primarily responsible for the static power consumption. It occurs when an undesirable current (sub threshold current) flows through a transistor's channel even when the transistor is turned off. The threshold voltage of the transistors in the circuits is considerably influenced as a result of this.

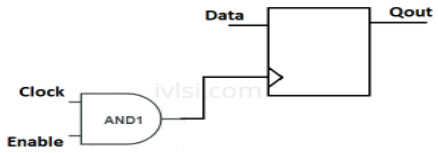

Fig.5: Block diagram of Clock gating

The timing error tolerant circuit that uses clock gating is depicted in the diagram below.

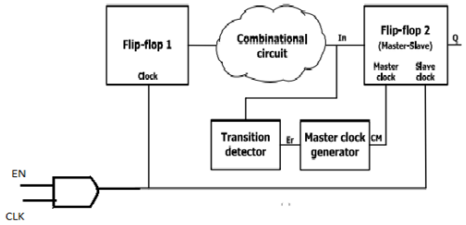

Fig.6: Timing error tolerant circuit using clock gating

Nevertheless, when a consecutive error occurs so because 2nd stage flip-flop lack setup time, the delayed arriving data signal in the second stage cannot be stored due to the setup-time violation. To combat with the successive-stage miscalculation, the time-borrowing approach was devised. A time-borrowing circuit is depicted in the second stage.

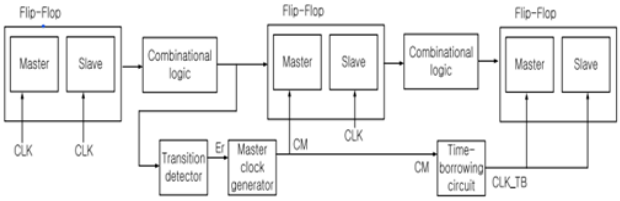

Fig.7: Block diagram of proposed timing error using clock gating.

IV. EXPERIMENTAL RESULTS

The Tanner EDA Tool was used to simulate utilising 45nm CMOS technology. The same fan-in and fan-out were used in all simulations.

For the suggested schematic of block diagram using clock gating.

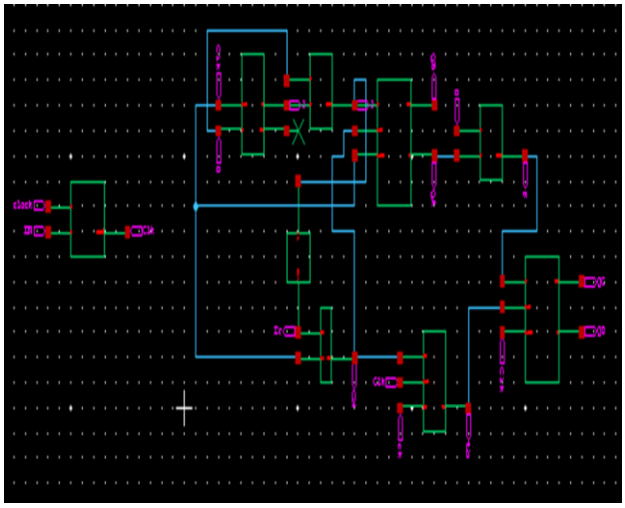

Fig8: schematic of proposed circuit.

Whereas Figure 9 shows the suggested clock gating circuit, a transient analysis was performed.

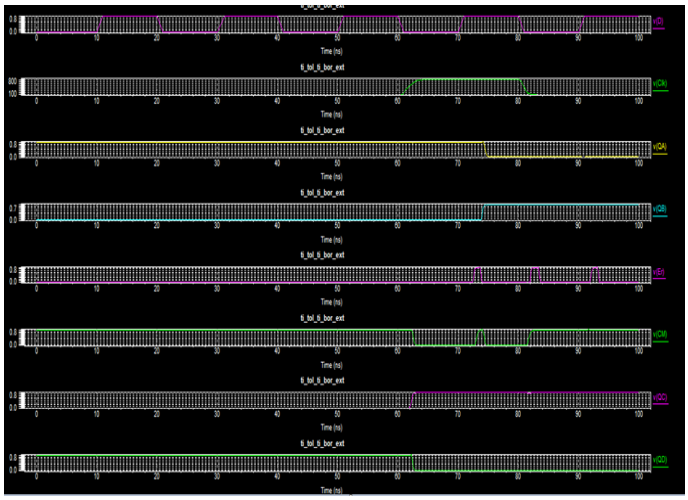

Fig9: Transient results of proposed circuit.

Comparison between existing and proposed methods of Timing error tolerant circuit.

	Area	Power	Delay
Existing	216	3.841mW	72.09ns
Proposed	222	1.343mW	41.8ns

Table 1: comparison between conventional and proposed methods.

From the results observed from the table-1, we can conclude that the proposed circuit is better in terms of

power and delay by employing clock gating method in the tolerant circuit.

V. CONCLUSION

In this work, we offer a timing-error-tolerant approach that uses clock gating to instantly repair a timing fault in a compact circuit topology. Using the Timing error tolerant circuit and Tolerant circuit with Time borrowed methodology, we had presented an effective technique for identifying and correcting timing faults. The improper data transition that after clock's edge can be recognized and repaired in the critical route by managing the clock's transparent window. A small number of logics are used to effectively rectify the timing error.

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The Influence of Perceived Ease Of Use, Perceived Benefit, And User Innovation, On Intention To Re-Use Gopay Mediated By The Role of Customer Attitude In Jakarta

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ABSTRACT

The purpose of this study was to determine the effect of Perceived Ease of Use, Perceived Benefit, and User Innovation, on Gopay's Intention to Re-Use mediated by the role of user attitudes in Jakarta. This research method uses quantitative research methods with a population in this study of 245 Gopay users in Jakarta to be sampled in accordance with the research limitations made by the author, namely at least have used Gopay for at least 1 year and domiciled in Jakarta. This research method uses quantitative research methods with a population in this study of 245 Gopay users in Jakarta to be sampled in accordance with the research limitations made by the author, namely at least have used Gopay for at least 1 year and domiciled in Jakarta.

Keywords : Go pay, E Wallet, Social Influence, Continuing Use Intention

I. INTRODUCTION

The social restrictions that occurred during the Covid-19 coronavirus pandemic have created an e-commerce boom in the world, including Southeast Asia. Market research firm eMarketer estimates that e-commerce growth in Southeast Asia will reach 14.3% in 2021. Retail sales through e-commerce in six Southeast Asian countries are also estimated to reach US$ 45.07 billion in 2021. Of that amount, as much as US$ 20.21 billion came from Indonesia, as well as being the largest in the region. Thailand is in second position with projected retail sales through e-commerce of US$ 7.84 billion this year. After that, there are Malaysia and Vietnam with US$ 7.4 billion and US$ 4.38 billion respectively. Retail sales through e-commerce in Singapore are estimated to reach US$ 3.47 billion. Temporary,

Meanwhile, the Philippines is estimated to have the highest growth in retail sales through e-commerce in Southeast Asia this year, which is 20%. After that, there was Vietnam, which grew by 18%. Retail sales through e-commerce in Indonesia and Malaysia both grew 15% this year. Meanwhile, Thailand and Singapore increased 12% and 7%, respectively. However, eMarketer said that e-commerce in Southeast Asia only contributes 4.6% of total retail sales which is estimated at US$ 970.83 billion in 2021. This means that the potential for e-commerce in the region to grow bigger is still wide open. (Read: Southeast Asian e-Commerce Transactions Projected to Reach IDR 1,469 Trillion in 2025)

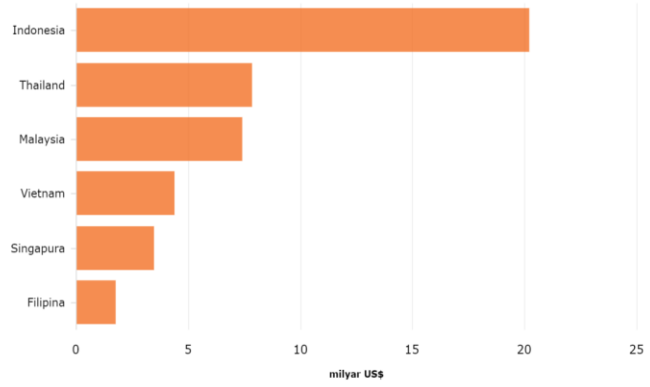

Figure 1. Southeast Asian e-commerce transactions (eMarketer, 2021)

Table 1. Most Popular Electronic Money in Indonesia 2017

Go-pay (Gojek)	50%
E-money (Bank Mandiri)	46%
LinkAja (T-Cash)	40%
Flazz (Bank BCA)	25%
Line Pay (Line)	17%
OVO (Lippo)	15%
BRIZZI (BRI Bank)	13%
Others	4%

Source: katadata.co.id (2017)

[1] The increasing growth of e-commerce cannot be separated from the increasing number of internet users in Indonesia. Bank Indonesia (BI) projects the value of e-commerce transactions to reach Rp. 395 trillion in 2021. Even during the first half of this year, the value of e-commerce transactions has reached Rp. 186 trillion, which makes the government continue to encourage MSMEs to go e-commerce.

[2] Along with the increasing growth of internet and smartphone users, technology is increasingly developing and can be used for various aspects of life, one of which is the economic payment system.

At first the payment method that was only made with cash payments began to shift to cashless payments in the form of electronic money The payment system that originally used cash as a means of payment has now developed into non-cash payments and can be used for online purchases, online transaction facilities, payments bills, storage of money balances with a certain nominal value in an application. [3] With the existence of fintech technology, many people intend to adopt technological advances, the intention of adopting fintech is because users find it easy and fast, generally only bring a smartphone and in seconds can go through various transactions, it is not complicated to carry a wallet or cash because users can put money into fintech-based applications or electronic money.

According to katadata.co.id, the most frequently used electronic money circulation in Indonesia in 2017 was GO-PAY. Then followed by Mandiri E-money, LinkAja (t-cash), Flazz, LINE Pay, OVO and Brizzi. This data is taken from the results of the JakPat survey in the Startup Report 2017 DailySocial.Id. From the table above, many enthusiasts use digital wallets in many transactions because they are cashless and the process is also fast. [4] Electronic payments through digital wallets are safe because they are regulated by Bank Indonesia to facilitate cashless transactions.

Based on the survey results, ShopeePay is listed as the most frequently used e-wallet (50%). The next ranks are Ovo (23%), Gopay (12%), Dana (12%), and LinkAja (3%). “The five brands are now the most widely used by consumers to make digital payments. The brand is popular because it is diligent in promoting and cooperating with various merchants. Data last September noted that 68% of respondents used ShopeePay to make payments, increasing to 72% of respondents using ShopeePay in December. The final result in December ShopeePay outperformed other brands, such as OVO which fell from 56% of respondents in September to 55% in December. Meanwhile, Gopay (September 56%, decreased to December 52%), Dana (September 42%, decreased in December 40%), and LinkAja (September 19%,

Based on the results of the latest survey, it shows that there is a decrease in consumer preferences in using e-wallet products. When Gopay was first launched, it showed that Gopay showed the top rank, but after 2020 it now shows that Gopay user preferences have decreased to third place. Although it has decreased, Go-Pay still has the potential to increase again after Gojek is merged with Tokopedia. In addition, in 2019, Go-Jek as the parent company has 2 million driver partners, 400 thousand merchants, 1.5 million agents, and 600 thousand service providers. In addition, Go-Pay features are increasing day by day. This is of course to provide the most complete service for its users. In addition, there are more and more virtual wallet users in Indonesia.

H1: User innovation has a positive and significant influence on Attitude
H2: Perceived Ease of Use has a positive and significant effect on Attitude
H3: Perceived Benefit has a positive and significant influence on Attitude
H4: User innovation has a positive and significant effect on Intention to Re-Use
H5: Perceived Ease of Use has a positive and significant effect on Intention to Re-Use
H6: Perceived Benefit has a positive and significant influence on Intention to Re-Use
H7: Attitude has a positive and significant effect on Intention to Re-Use

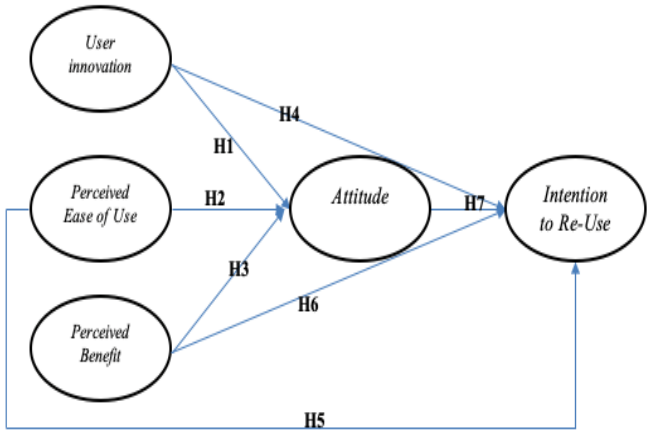

Figure 2. Thinking Framework

II. METHODS AND MATERIALS

The sampling technique in this study used a purposive sampling technique. The sample in this study were all Gopay users in Jakarta to be used as samples according to the research limitations made by the author, namely at least 152 people have used Gopay for at least 1 year. The research hypothesis was tested using a Structural Equation Model (SEM) approach based on Partial Least Square (PLS).

III. RESULTS AND DISCUSSION

3.1 Respondent Description

In this study, taking Go Pay consumer data from 152 respondents.

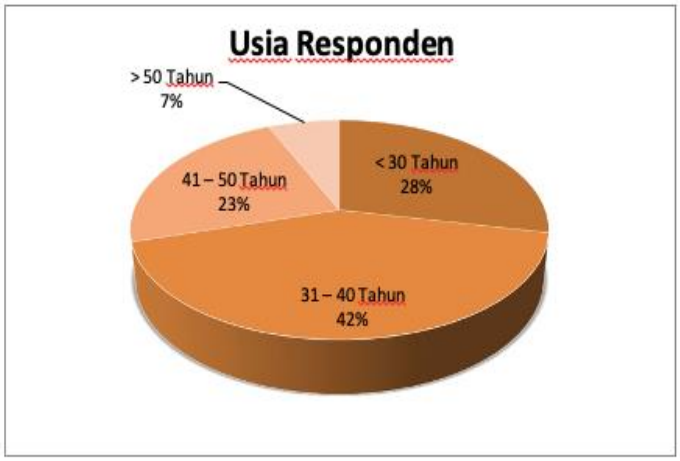

Figure 3. Characteristics of Respondents

3.2 Data Analysis Results

3.2.1 Outer Model

3.2.1.1 Convergent Validity Test

The value of the outer model or the correlation between the construct and the initial variable does not meet convergent validity because there are still quite a lot of indicators that have a loading factor value below 0.60.

Table 2. Convergent Validity Test Results

Indikator	Attitude	Intention to Re-Use	Perceived Benefit	Perceived Ease of Use	User innovation
AT.1	0.916				
AT.2	0.742				
AT.3	0.831				
IRU.1		0.718			
IRU.2		0.869			
IRU.3		0.836			
IRU.4		0.828			
PB.1			0.711		
PB.2			0.860		
PB.3			0.876		
PEU.1				0.810	
PEU.2				0.846	
PEU.4				0.870	
PEU.5				0.778	
PEU.6				0.819	
UI.1					0.840
UI.2					0.816
UI.3					0.726

Source: Primary Data Smart PLS Program (2022)

In the table 2 it can be seen that all loading factors have values above 0.60, so the constructs for all variables have not been removed from the model. It can be concluded that the construct has met the criteria of convergent validity.

3.2.1.2 Discriminant Validity Results

Discriminant validity is carried out to ensure that each concept of each latent model is different from other variables.

Table 3. Discriminant Validity Results

Variables	Attitude	Intention to Re-Use	Perceived Benefit	Perceived Ease of Use	User innovation
Attitude	0.833				
Intention to Re-Use	0.541	0.815			
Perceived Benefit	0.654	0.644	0.819		
Perceived Ease of Use	0.568	0.858	0.807	0.825	
User innovation	0.560	0.843	0.651	0.758	0.796

Source: Primary Data Smart PLS Program (2022)

Table 3 shows that all Heterotrait-Monotrait values are well below the 0.85 threshold, so it can be concluded that all indicators used in this research model have sufficient discrimination to measure their respective constructs.

3.2.2 Inner Model

3.2.2.1 Collinearity test

Collinearity is a term to describe the correlation between latent variables in the model, the predictive power is not reliable and unstable. The reason is because of the repetition of correlation from one variable to another. High collinearity can cause errors in estimating weights and errors in assessing significance.

Table 4. Collinearity Test Results

Variables	Attitude	Intention to Re-Use	Perceived Benefit	Perceived Ease of Use	User innovation
Attitude	1.000				
Intention to Re-Use	0.541	1.000			
Perceived Benefit	0.654	0.644	1.000		
Perceived Ease of Use	0.568	0.858	0.807	1.000	
User innovation	0.560	0.843	0.651	0.758	1.000

Source: Primary Data Smart PLS Program (2022)

The collinearity indicator occurs when the VIF value is > 5 then the variable must be excluded from the measurement model. Based on the table above, it can be seen that there is no collinearity in the model.

3.2.2.2 R Square

The value of R2 is the value of the determinant coefficient where this value will describe the predictive power of endogenous variables from the structural model. The value of R-Squares is the result of a linear regression test, namely the amount of endogenous variability that can be explained by exogenous variables.

Table 5. R-Square . Test Results

	R Square	Information
Attitude	0.460	Currently
Intention to Re-Use	0.837	Tall

Source: Primary Data Smart PLS Program (2022)

Based on the table above, it is known that R2Attitudeas big as 0.460, and R2Intention to Re-Useas big as0.837. Based on these data, it shows that the determinant coefficientAttitudeis Medium and the determinant coefficientIntention to Re-UseisTall.

3.2.2.3 F-Square

The f-square value is used to determine the effect of the predictor variable on the dependent variable.

Table 6. F-Square . Test Results

Variable	f-square	Category
Attitude	0.010	Weak
Intention to Re-Use	0	Weak
Perceived Benefits	0.088	Weak
Perceived Ease of Use	0.680	Strong
User innovation	0.510	Strong

Source: Primary Data Smart PLS Program (2022)

Just like the division of categories in q2 , the f2 category is also divided into three, namely 0.02 is a weak influence, 0.15 is a moderate influence, and 0.35 is a strong influence. From table 4.6. above it is known that all variables have a weak influence in the structural model.

3.2.2.4 Model Fit Analysis

The fit model in this study was carried out using two test models, namely [5] standardized root mean square residual (SRMR) and normed fit index (NFI) that the model will be considered to have a good fit if the standard root mean square residual (SRMR) is below 0.10.

Table 7. Analysis of Fit Model

	Saturated Model	Estimated Model
SRMR	0.092	0.092
Chi-Square	748,174	748,174
NFI	0.661	0.661

Source: Primary Data Smart PLS Program (2022)

The results show that the model in this study has a good fit because it has a standard root mean square residual (SRMR) value below 0.10 and the normal fit index (NFI) value indicates that the model in this study is 66.1% (0.661) better than the null model.

3.2.2.5 Hypothesis Testing

The cut-off value of T-statistic > 1.645 (one-way with alpha 0.05) was used as a criterion to determine whether the hypothesis was significant or not.

Table 8. Hypothesis Testing Results

Hypothesis	Standardized Coefficient	T-statistics	P-values	Results
H1: User innovation -> Attitude	0.106	2.412	0.016	Hypothesis Supported
H2: Perceived Ease of Use -> Attitude	0.153	0.363	0.716	Hypothesis not supported
H3: Perceived Benefits -> Attitude	0.120	4.447	0.000	Hypothesis Supported
H4: User innovation -> Intention to Re-Use	0.058	7.868	0.000	Hypothesis Supported
H5: Perceived Ease of Use -> Intention to Re-Use	0.075	8.829	0.000	Hypothesis Supported
H6: Perceived Benefit -> Intention to Re-Use	0.069	3.203	0.001	Hypothesis Supported
H7: Attitude -> Intention to Re-Use	0.054	1.041	0.298	Hypothesis not supported

Source: Primary Data Smart PLS Program (2022)

H1: User innovation has a positive and significant effect on Attitude (Supported)
H2: Perceived Ease of Use has a positive and significant effect on Attitude (Not Supported)
H3: Perceived Benefit has a positive and significant influence on Attitude (Supported)
H4: User innovation has a positive and significant effect on Intention to Re-Use (Supported)
H5: Perceived Ease of Use has a positive and significant influence on Intention to Re-Use (Supported)
H6: Perceived Benefit has a positive and significant effect on Intention to Re-Use (Supported)
H7: Attitude has a positive and significant effect on Intention to Re-Use (Not Supported)

IV. CONCLUSION

1. The findings show that the relationship between User innovation variables shows a positive and significant relationship to Attitude which means that it is in accordance with the first hypothesis where User innovation directly encourages Attitude.
2. The findings show that the relationship between the Perceived Ease of Use variable shows a negative and insignificant relationship to Attitude, which means it is not in accordance with the second hypothesis where Perceived Ease of Use directly encourages Attitude.
3. The findings show that the relationship between Perceived Benefit variables shows a positive and significant relationship to Attitude which means that it is in accordance with the third hypothesis where Perceived Benefit directly encourages Attitude.
4. The findings show that the relationship between User innovation variables shows a positive and significant relationship to Intention to Re-Use which means that it is in accordance with the fourth hypothesis where User innovation directly encourages Intention to Re-Use.
5. The findings show that the relationship between the Perceived Ease of Use variable shows a positive and significant relationship to Intention to Re-Use which means that it is in accordance with the fifth hypothesis where Perceived Ease of Use directly encourages Intention to Re-Use.
6. The findings show that the relationship between the Perceived Benefit variable shows a positive and significant relationship to Intention to Re-Use which means that it is in accordance with the sixth hypothesis where Perceived Benefit encourages Intention to Re-Use directly.
7. The findings show that the relationship between the Attitude variable shows a positive and insignificant relationship with Intention to Re-Use which means it is not in accordance with the seventh hypothesis where Attitude encourages Intention to Re-Use directly.

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Fire Fighter Drone CO_2 Ball Dropping Mechanism using Arduino Uno

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ABSTRACT

Unmanned Aerial automobiles usually referred to as Quad copters are aerial vehicles operated via a remote manage gadget to fly independently. They are referred to as rotorcrafts as it work's with a fixed of revolving twisted chord aerofoil's. Quad copter is getting more excessively used because of many reasons including easy to build and bring together, complexity is much less. Normally in maximum of the instances drones are used in Transporting gadgets, military, spying, educational use, rescue and many others. The main target of this paper is to provide an explanation for the use of drone for fire combating and rescue. It additionally explains about the maximum weight lifting potential of the Quadcopter and the alternative diverse parameters relevant to transmitter-receiver, gyroscope, digital velocity controllers (ESCs), PID manipulate and many others. The paper emphasize on making Quadcopter fee-effective and dependable together with making it distinctly stabilized in windy and dusty environment.

Keywords : Transmitter-Receiver, Gyroscope, Digital Velocity Controllers

I. INTRODUCTION

The base utility of Arduino Uno in Quadcopter is an open supply physical computing platform used for building virtual devices and interactive gadgets that can sense and control gadgets in bodily world. It's a micro controller, based on AT mega 328P, Arduino IDE (included development surroundings) is use to upload packages to the Arduino boards and further those programmed boards can be used to perform meant tasks. This device will both use a GPS machine or it's going to use a camera for identity of course being travelled by it. This device will be controlled by way of a far flung machine or a transmitter by using sitting inside our home, office, or any place inside its transmitter range. The quadcopter is useful for in many situations. From the scope of the quadcopter, it's used for aerial photography, protection and rescue, industrial inspection and much greater. We are using Arduino based Quadcopter in an progressive way to

create a mechanism to launch a hearth extinguishing CO2 ball within the desired location with a view to save you hearth or directly extinguish them, it's miles specifically beneficial for hearth men to keep lifestyles in fireplace injuries.

II. PROPOSED DESIGN

Quadcopter is one of flying unit used to lift the object from one place to another in lesser time or can be used for surveillance purpose. Quadcopter is an assistive device which has a high call for within the commercial & surveillance sector. At industry level applications, quadcopter is made using KK board module which comes with pre-programmed KK board and balanced gyroscope module which is not economical for smaller applications. It's not a cost-effective method. To make the quadcopter economical and efficient for small level applications this work is proposed, which design and develop a quadcopter using Arduino Uno board instead of pre-programmed KK flight Controller board. we are using Arduino based Quadcopter in an innovative manner to create a mechanism to release a fire extinguishing CO2 ball in the desired location that will prevent fire or directly extinguish them it is mainly useful for fire men to save life in fire accidents. he quadcopter uses an Arduino microcontroller Atmel328 as the core controller and is designed and developed to achieve the real time operating system. The hardware consists of simple Arduino board with an At mega 328, propellers, ESCs & flight controller board (FCB), transmitter & receiver and gyroscope for a balanced flight.

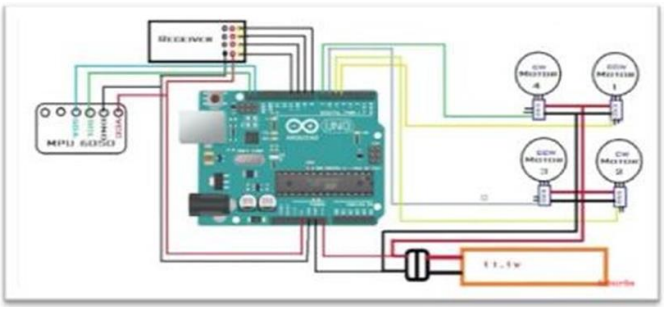

Fig 1: Hardware description of quadcopter

Hardware is programmed in C language. The controller board and ESC's work together. FCB gives the command to ESCs which is further connected to BLDC motors for the rotation.

A Working principle

Quadcopter device works on the principle of air lifting phenomena with excessive stress. The propellers pressure the air in downward with excessive strain because of which an uplift force is created and as a result action response law is carried out on the complete machine. While this uplift pressure dominates the earth's gravitational pressure, the entire machine starts flying within the air. But there is a hassle with the rotation of propellers. If we rotate the propellers in clock smart route then due to this rotation, a torque can be applied over the complete machine in a single route. Andsimilarly, if we rotate the propellers in anti-clock clever route then additionally a torque can be produced over the complete machine and the complete machine will start rotating anticlockwise. To conquer this hassle, we rotate propellers in clockwise route and closing propellers in anticlockwise direction. This phenomenon produces torque in opposite course and that they get balanced and the device remains strong at the same time as flying. Two primary phenomena are used for movement of quadcopter,thrust and torque. Quadcopter makes use of its four propellers connected to motors which creates thrust and help quadcopter to raise high. Motion of quadcopter are defined based totally on the input values (x, y, z, θ, ϕ, ψ) given to it. Out of 4 motor connected with propellers, two automobiles rotate in clockwise (CW) course while other two in counter clockwise (CCW) direction. Movement of quadcopter is therefore managed specifically via three movements. These movements are classified as

Yaw Rotation (ψ)

Yaw is defined as movement of quadcopter either to left or right and it is controlled by throttle stick

of transmitter. Yaw decides the direction of quadcopter.

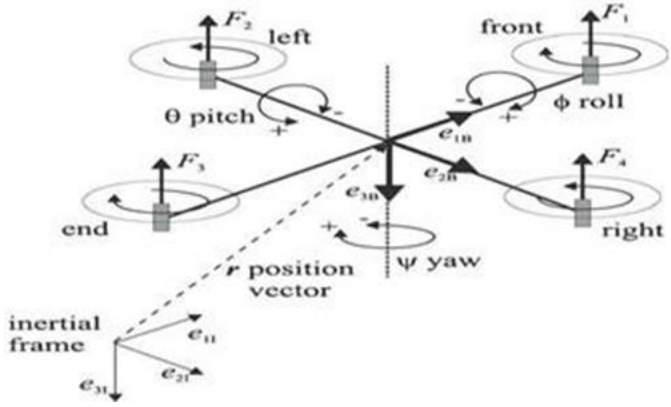

Fig.2: Yaw, Pitch & Roll rotation

Pitch Rotation (θ)

Pitch is described as the entire motion of quadcopter both in forward course or in backward direction It's also controlled by throttle of receiver. Moving the throttle inforward direction moves quadcopter in forward direction while moving throttlebackward moves quadcopter in backward direction [5].

Roll Rotation (ϕ)

The movement about the longitudinal axis of quadcopter is known as roll motion. Left or right movement of throttle stick is followed with the aid of quadcopter, it movements in towards right when throttle pass to right and movements to left while throttle stick moves in left path.This parameter thus makes quadcopter tofly in left or right direction. [5].

B Design and Methodology

The circuit design and methodology adopted in designing Arduino based quadcopter is shown in below fig:

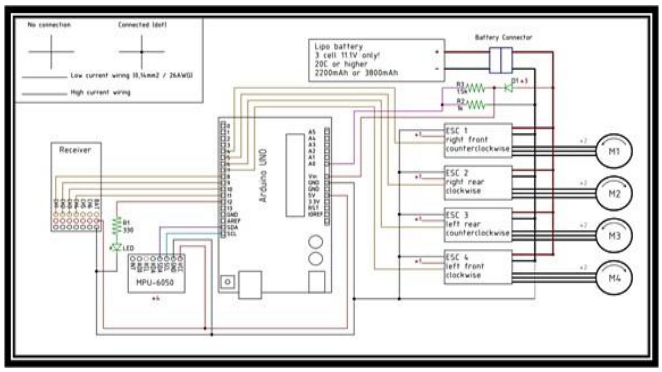

Fig 3: schematic diagram of quadcopter

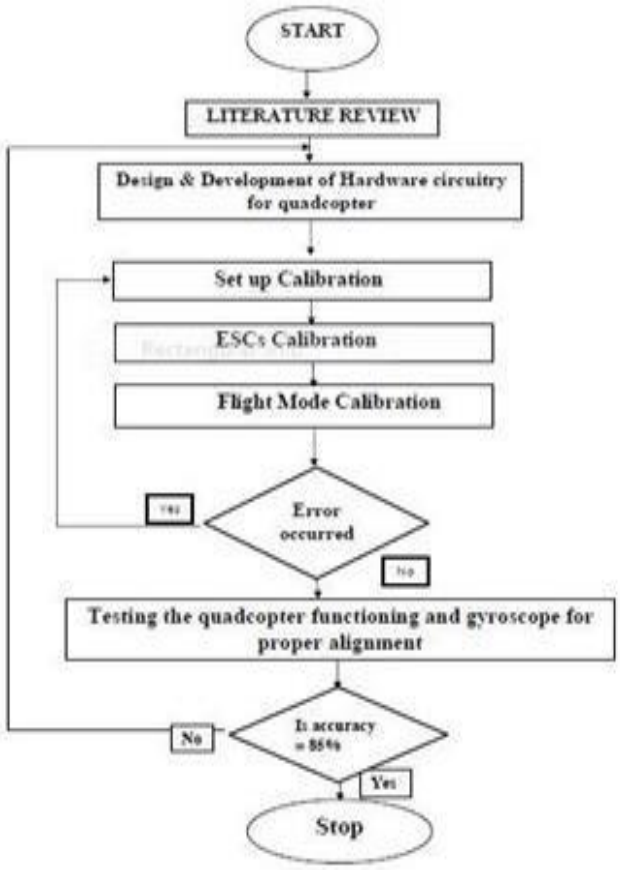

Fig 4: Flow chart for quadcopter designing

III. EXPERIMENTAL RESULTS

The initial flight test the usage of kk board proved that this board can't be used for precision applications and accordingly turned into discarded in initial stages of improvement. The crius aiop was made the platform of choice for developing ISR system, multiwii is used instead of mega pirate as it is more refined and better support is available in case things go wrong.

Fig 5: Final Arduino Uno based fire fighter drone dropping mechanism

The multiwii device has a completely interactive graphical consumer interface that can be assessed in flight the usage of telemetry for lengthy distance and Bluetooth for brief distance flights.

Fig 6 : Top view of Arduino Uno based fire fighter drone dropping mechanism.

The GUI (fig 6) gives real time information of the quadcopter performance, battery level, position on map and other necessary details which are not provided by the kk board and the megapirate system.

IV. CONCLUSION

Our research work yielded a successful development of Arduino Uno based fire fighter drone co2 ball dropping mechanism at a cheaper and affordable amount. Quadcopter which can be easily made from shelf components. It is very helpful for fire men's in fire accidents at towns, forest places at where we cannot reach. It can be used as a low-cost alternative to various applications which includes pesticide sprinkling, end to end delivery within the transmitter's RF range, surveillance in defence and other sensitive places like nation border, mapping via remote sensing, etc. with very high level of precision.

Our team dreams have been to layout, test, and construct a quadcopter package with co2 losing mechanism. There are numerous feasible up-gradation in future based on its application which includes:

• adding a sonic sensor module to controller board for extra accurate altitude determination. • enforcing a GPS module on kit for monitoring &secret agent-based totally programs.

• This design can employ Motor driver of high rating or Relay driving force can be used for its commercial applications.

• can be used for real estate images by using employing camera on it. Other programs include inspection, surveillance and monitoring a huge location by digicam equipped quadcopter.

• pesticides sprinkling • digicam is used to drop co2 ball at specific vicinity to forestall fire.

• hearth sensor to track exact area.

• based totally on the weight lifting calculations we are able to use our single in your price range Quadcopter to raise those special modules enjoyable the weight lifting standards.

• convey things from one area to another.

• hearth evidence materials to avoid damages.

• The cage layout from another opportunity nevertheless stays attached to the quadcopter and just the rails are delivered. The rails will serve to manual the hearth extinguishing ball to its target while on the identical time keeps the quadcopter at a secure distance from the flames. A servo motor controls the angle at which the railing machine goes to rotate. This could offer manage over the rate at which the fireplace extinguishing grenade is released.

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Compact Mean Labeling

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ABSTRACT
Labeling of graphs is the procedure of assigning numbers to the nodes, lines, or both in accordance with an applicable rule. In this study, we demonstrate that the complete graph K_n (n=3) is a compact mean-labeled graph. We also explored graph K_4 is compact mean-labeled graphs
Keywords: Labeling of graphs, complete graph, Cycle graph, Mean labeled graph, Compact mean labeled graphs
2020 Mathematical subject classification Number: 05C78.

I. INTRODUCTION

In 1966, Rosa [11] introduced β - valuation of a graph. Golomb subsequently called such a labeling graceful. In 1980, Graham and Sloane [3] introduced the harmonious labeling of a graph. In 2003 [12], Somasundaram and Ponraj introduced the mean labeling of a graph. On similar lines, Maheswari V et al., [6] proved relaxed mean labeling on path, star, bistar graphs.

RESULTS AND OBSERVATIONS OF COMPACT MEAN LABELING OF COMPLETE GRAPHS

Definition 1.1: A complete graph is a graph that has an edge between every single vertex in the graph; we represent a complete graph with n vertices using the symbol Kn.

Definition 1.2:[6] A graph G = (V, E) with p vertices and q edges is said to be a relaxed mean graph if there exists a function f from the vertex set of G to {0, 1, 2, 3, …, q − 1, q + 1} and relaxing the vertex label q such that the induced map f* from the edge set of G to {1, 2, 3, …, q}
defined by

$$f^*(e = uv) = \begin{cases} \frac{f(u)+f(v)}{2} & \text{if } f(u)+f(v) \text{ is even} \\ \frac{f(u)+f(v)+1}{2} & \text{if } f(u)+f(v) \text{ is odd, then} \end{cases}$$

the resulting vertex labels and edge labels are distinct.

Main Definition1.3: A graph G with P vertices and Q edges is said to be a compact mean labeled graph if it is possible to label the vertices $x \epsilon v$ with distinct elements $f(x)$ from $\{0, 1, 2, \ldots . 2q - p\}$ in such a way that when each edge $e = uv$ is labeled with $\frac{f(u)+f(v)}{2}$ if $f(u) + f(v)$ is even and $\frac{f(u)+f(v)+1}{2}$ if $f(u) + f(v)$ is odd, then the resulting edge label $\{0, 1, 2, \ldots . q\}$ are distinct. Then f is called a compact mean labeling of G.

Theorem 1.4: Prove that the graph K_n is a compact mean labeled graph for $n = 3$.

Proof: Let K_n be a complete graph with distinct vertices u_1, u_2, u_3 and edges e_1, e_2, e_3.

Define a mapping $f: V(K_n) \rightarrow \{0, 1, 2, \ldots . 2q - p\}$

by $f(u_i) = \begin{cases} i - 1 \; for \; i = 1, 3 \; (odd) \\ 2i - 1 \; for \; i = 2 \; (even) \end{cases}$

The vertex labels are,

When $i = 1, f(u_1) = 0$,

$i = 2, f(u_2) = 3$,

$i = 3, f(u_3) = 2$,

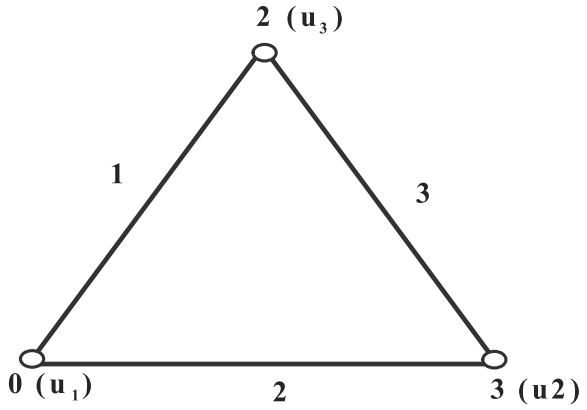

Figure 1

The label of the edge $u_1u_3 = 1$

The label of the edge $u_1u_2 = 2$

The label of the edge $u_2u_3 = 3$

The label of the edge $u_{n-2}u_n = 1$

The label of the edge $u_{n-2}u_{n-1} = 2$

The label of the edge $u_{n-1}u_n = 3$

All the edge values are distinct. Hence K_3 is a complete graph.

Theorem 1.5: Prove that the graph K_4 admits the compact mean labeling.

Proof: Let K_4 be the complete graph with vertices u_1, u_2, u_3, u_4 and edges $e_1, e_2, e_3, e_4, e_5, e_6$.

Define mapping $f: V(K_n) \rightarrow \{0, 1, 2, \ldots . 2q - p\}$

Such that $f(u_i) = \begin{cases} 2i - 2 \;\; \forall \;\; i = 1, 2, 3 \\ i + 4 \;\; when \;\; i = 4 \end{cases}$

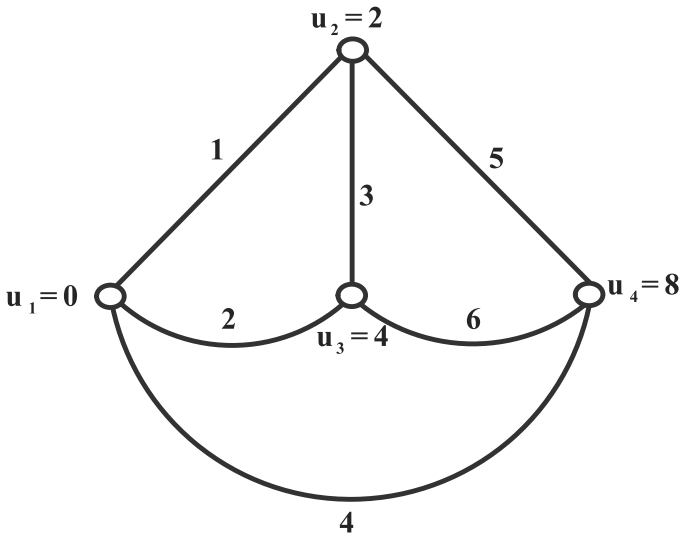

Figure:2

From the mapping $f: V(K_n) \rightarrow \{0, 1, 2, 3, 4, 5, 6, 7, 8\}$.

The assigned vertex label are

When$i = 1, f(u_1) = 0$,

$i = 2, f(u_2) = 2$,

$i = 3, f(u_3) = 4$,

$i = 4, f(u_4) = 8$,

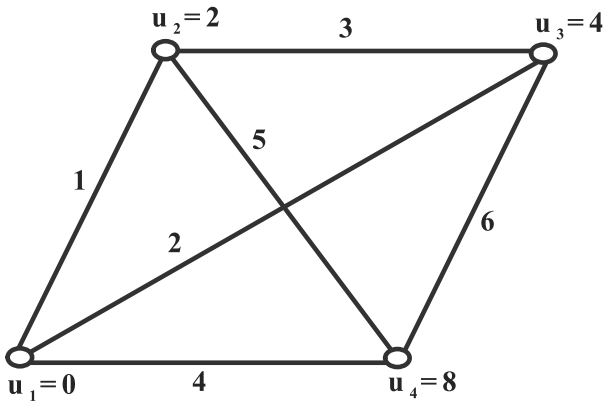

Figure:3

The induced edge labels are,

$u_{n-3}u_{n-2} = u_1u_2 = 1$

$u_{n-3}u_{n-1} = u_1u_3 = 2$

$u_{n-2}u_4 = u_2u_4 = 5$

$u_{n-3}u_n = u_1u_4 = 4$

$u_{n-2}u_{n-1} = u_2u_3 = 3$

$u_{n-1}u_4 = u_3u_4 = 6$

∴ All the values of edges are distinct from $\{1, 2, \ldots q\}$.

∴ Then graph K_4 admits compact mean labeling.

II. Conclusion

In this research article, the exploration of compact mean labeling for the complete graphs was verified. Identified the distinct edge values using the appropriate labeling rule gives unique weights to the vertices and edges. In further research, we review the bounds for the complete graphs.

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Review on Hook Worm Infections : Ancylostomiasis

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ABSTRACT

The present review mainly highlighted on hookworm infections and the Ancylostoma species distribution, infection rate, epidemiology, prevalence, pathophysiology, diagnosis and treatments were analyzed. Hook Worms are located in the intestinal tract and/or tissues. Several investigations have reported the interesting phenomenon that the infective larvae of canine hookworm, Ancylostoma canium and other species. The immune response to worm infections also depends upon the location of infestation. Gastrointestinal nematode infections have always been a major animal health problem of domestic animals and/or ruminant livestock. Hosts with nematode infections present a series of pathological effects these changes include tissue damage, alterations in blood constituents, elevation or decrease of enzymatic levels. Hookworm diseases are most common in tropical and subtropical climatic conditions and the infections were observed in both animals and humans. As per the available information globally more than 740 million peoples are infected with hookworm. In sub-Saharan Africa, Asia, approximately 200 million people have been infected with hookworm, 90 million of them were children. The main objective of this review was to identify the prevalence, epidemiology and determinant factors of hookworm infection. Diagnostic methods that differentiate between hookworm species, including molecular methods, need to be developed for widespread use in control programmes to elucidate key features of hookworm epidemiology and control.

Keywords: Hook worm infections, Ancylostomiasis, Prevalence, Epidemiology

I. INTRODUCTION

Hookworms are small (less than 0.5 inches long) parasitic worms that can cause infections in the small intestines. The major species of hookworms associated with infections in humans are Ancylostoma duodenale and Necator americanus. They get their name from the teeth ("hooks") or cutting plates in their mouths by which they attach themselves to the intestinal wall. In areas where hookworm infections are common, improving sanitation can reduce the number of infections. This includes using better sewage-disposal systems and reducing the frequency of outdoor human defecation. The damp tropics and

subtropics are prone to hookworm disease. Many children in underdeveloped countries die as a result of the sickness because it makes them more susceptible to infections that their bodies would ordinarily be able to fend off (Croese *et al.*, 1994; Landmann, 2003; Carroll and Grove, 1986; Anten and Zuidema, 1964).
These infections develop after a person has contact with soil contaminated with human feces. Children are at high risk because they often play barefoot in areas with contaminated soil. In soil, hookworm eggs hatch and form larvae, which then burrow through the skin of a person's foot and crawl into the blood. The blood carries the larvae to the lungs, where they enter into the air sacs. The hookworms then crawl up the breathing tubes to the throat, where they are swallowed. The larvae pass through the stomach and mature into adult worms in the bowel. The worm holds onto the bowel wall with hooks, which cause minor bleeding. Adult hookworms live in the bowel and lay eggs that pass out of the child with the stool.
Intestinal hookworm disease in humans is caused by *Ancylostoma duodenale, A. ceylanicum,* and *Necator americanus.* Classically, *A. duodenale* and *N. americanus* were considered the two primary intestinal hookworm species worldwide, but newer studies show that a parasite infecting animals, *A. ceylanicum*, is also an important emerging parasite infecting humans in some regions. Occasionally larvae of *A. caninum*, normally a parasite of canids, may partially develop in the human intestine and cause eosinophilic enteritis, but this species does not appear to reach reproductive maturity in humans (Chan *et al.*, 1994; de Silva *et al.*, 2003; Hotez, 2009).

Skin-penetrating hookworms from a different species that infects animals can cause cutaneous larva migrans in humans (*A. braziliense, A. caninum, Uncinaria stenocephala*). These parasites, with the exception of *A. caninum*, stop growing once their larvae enter human skin. For more info, see extraintestinal hookworms.

The primary risk factor for contracting the disease is being barefoot on land that has been exposed to hookworm-infected people's excrement. The worm's larvae, or young form, invade the skin. The bloodstream transports the larvae to the lungs, where they enter the airways. The worms are about one-half inch (1 centimeter) long. After traveling up the windpipe, the larvae are swallowed. After the larvae are swallowed, they infect the small intestine. They develop into adult worms and live there for 1 or more years. The worms attach to the intestinal wall and suck blood, which can result in iron deficiency anemia.

The species Ancylostoma duodenale and Necator americanus, which cause ancylostomiasis and necatoriasis, respectively, are two prevalent hookworm infections in humans. People with hookworm infection pass hookworm eggs in their faeces. If these are exposed to the environment, they have the potential to spawn larvae (immature worms) that can pierce the skin. Another way for one type to spread is through tainted food. Walking barefoot in warm climates with insufficient sanitation is one risk factor (Albonico *et al.*, 1994; Crompton, 2000).

The present Nematode parasites, including hookworm, are found in the small intestines of humans, dogs, and cats. There are two primary species of hookworm are Ancylostoma duodenale and Necator americanus. The latter is the main causative factor for hookworm infection (Hotez *et al.*, 2011; Ngui *et al.*, 2012). Here the interesting thing that one of the neglected tropical illnesses mentioned by the WHO is hookworm. Neglected tropical illnesses are the fourth biggest cause of contagious diseases, accounting for 46–57 million years of lost life due to disability (Jeremiah *et al.*, 2012). Hookworm can leave permanent sequel on cognitive performance and growth of children's, hookworm decreases the school performance of children by 20 % (Jeremiah *et al.*, 2012; Fred *et al.*, 2013).

Ancylostoma caninum, *Ancylostoma braziliense*, and *Uncinaria stenocephala* are common hookworm infections in dogs. Cats are commonly infected by *Ancylostoma tubaeforme* and *A. braziliense,* but rarely by *U. stenocephala*. *A. caninum* and *A. tubaeforme* are found most frequently in tropical and subtropical areas; *A. braziliense* in warm coastal areas, Central and South America; and *U. stenocephala* in cooler areas like the northern United States, Canada, and Europe. The prevalence of hookworm infections has changed over the years. In a large study of his 1,213,061 dogs examined at 547 private veterinary clinics in his 44 states in the United States, 4.5% of his samples contained eggs of the Ancyclostoma species. In areas and animals at risk, infection rates can be much higher. For example, in a study in Florida, A. tubeeforme and A. brasiliense was detected in the faeces of 75% and 33% of cats tested, respectively (Cheesbrough, 1998; Gasser *et al.*, 1993; Verweij *et al.*, 2001).

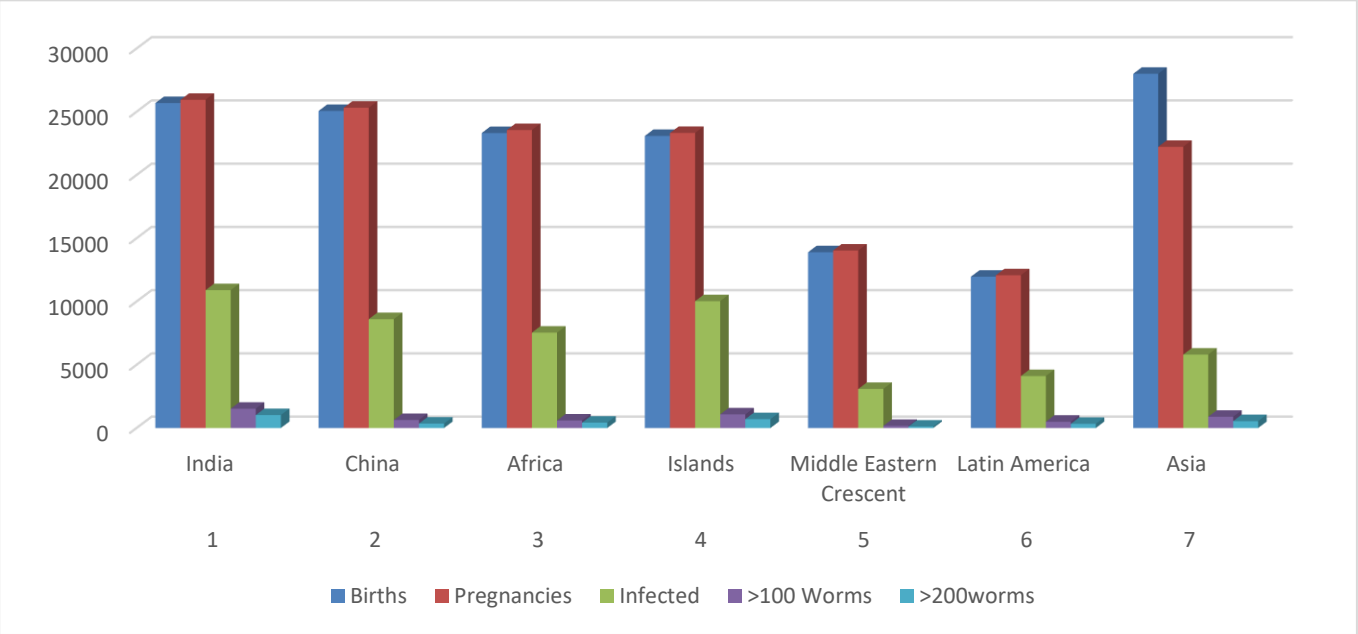
Epidemiology of Ancylostoma

Hookworm is a soil-transmitted helminth (STH) and is one of the most common roundworm of humans. Infection is caused by the nematode parasites Necator americanus and Ancylostoma duodenale. Hookworm infections often occur in areas where human feces are used as fertilizer or where defecation onto soil happens. A. caninum girls are normally 14–sixteen mm (0.55–0.sixty three in) lengthy and 0.five mm (0.02 in) wide, even as the men are smaller at 10–12 mm (0.39–0.forty seven in) in duration and 0.36 mm (0.01 in) in width. Males have a copulatory bursa , which includes spine-like spicules placed on 3 muscular rays that draw close the lady at some point of mating. As with different nematodes, the sperm lack flagella. The copulatory bursa is a completely unique characteristic of Strongylida individuals, as a consequence making it a beneficial method for figuring out individuals of this suborder; it's also used to differentiate individuals inside the suborder because of variations in bursa look among species. The vulva of A. caninum girls is positioned on the boundary of the second one and very last thirds of the frame. A. caninum has an alimentary canal made of an esophagus, intestine, and rectum – the esophagus is tremendously muscular, reflecting its function in pulling intestinal mucosa into the frame whilst it feeds. Esophageal and anal jewelry of A. caninum are the supply of nerve fibres that make bigger for the duration of the frame to innervate sensory organs, consisting of amphids and phasmids (*Animal Diversity Web, 2013; Marquardt,2000; Olsen, 1986*).

The severity of hookworm pathology is directly related to the number of worms a person carries. We found that the intensity of hookworm infection had a sporadic distribution. Although most of the population was infected, only 9% of him had infections >3,000 EPG, putting him at the highest risk of hookworm-related anemia. Predicted numbers infected with hookworm and at risk of morbidity in different regions of world (According to WHO) showed in figure-1.

Related patterns have been reported in other hookworm endemic areas such as Papua New Guinea (Pritchard et al. 1990), West Bengal (Nawalinski et al. 1978) and Zimbabwe (Bradley et al. 1993). The intensity of infection was determined by quantitative counting of oocytes in feces. This is a commonly used indirect measure of worm load. A weakness of this method is that very severe infections may show a partially density-dependent decrease in fertility. Thus, as the parasite load increases, the number of eggs laid per individual nematode decreases (Anderson & Schad 1985). However, a recent study in schoolchildren of Sansavari found that hookworm egg counts reflected parasite load and were indeed strongly linearly associated with anemia and iron deficiency anemia. (Stolzfus et al. 1997).

Figure -1 : Predicted numbers infected with hookworm and at risk of morbidity in different regions of world (According to WHO)



In India, the hookworm prevalence is estimated to be 71 million cases and *A. lumbricoides* contributes 140 million and *T. trichiura* 73 million cases. As per the studies in India, the maximum prevalence is seen in Karnataka (47%) followed by Andhra Pradesh (40%). The prevalence rate in Tamil Nadu is 3.2% whereas in Puducherry, it is 4.8%. The other study done in Vizianagaram, Andhra Pradesh, showed 55.6% STH prevalence and the most common parasite was *Entamoeba* (37.7%) followed by hookworm (8.7%) and the most common age group affected is 8–10 years. Various authors reveals that the information on hook worm in Andhra Pradesh also showed similar prevalence (49%). A recent stusy was done in Vellore the prevalence rates for hookworm (8.4%) was reported by many authors. (Ananthakrishnan *et al.*, 1997; Panda, 2012; Padmaja *et al.*, 2014; Karthikeyan, 2016).

Reports in Karaikal region of Puducherry, the overall prevalence of parasitic infection is found to be 30%, of which 35% was due to hookworm. The overall prevalence of parasitic diseases in Puducherry in 1998 was 67% in slum children aged 1–10 years. In 1987, a hospital-based study done in Puducherry showed the overall parasitic prevalence was 38%. Of these, hookworm constitutes 44% followed by *T. trichiura*, 26% and *A. lumbricoides*, 22%. In a study from Puducherry which was done in school children to find out the prevalence of parasitic infections, the estimated prevalence was 34.56% and the most common infection was *A. lumbricoides* (43.21%) followed by hookworm (28.8%), *T. trichura* (10.87%), and *Hymenolepis nana* (7.68%). It was found that polyparasitism was common among the infected children and out of 28.8% of microscopically positive stool samples for hookworm, 55.5% was positive by stool culture. Another hospital-based study done in Puducherry showed the overall parasitic prevalence of 16%, in which 68% had helminth infection. The most common helminthic infection was due to hookworm (86%) followed by *Strongyloides stercoralis* (6.3%) and *A. lumbricoides* (2.8%) (Rau *et al.*, 1988; Parija and Rao, 1987; Ragunathan *et al.*, 2010; Sunil *et al.*, 2011)

1) Global distribution of hookworm genera and species

Of 1987 unique records identified through the search strategies, 1935 (97·4%) records were excluded following screening, leaving 52 studies to be included in the first systematic review. The studies included approximately

9361 people with hookworm and 6463 people for whom species of hookworm were identified. The most prevalent hookworm species was *N americanus* (pooled proportion 79%, 95% CI 67–89%).

The proportion of people with *Ancylostoma* spp infection was significantly lower (32%, 20–45%). The proportion of people with mixed *N americanus* and *Ancylostoma* spp infections was 5% (1–10%). In studies that identified the species of *Ancylostoma*, a higher proportion of hookworm-infected people had *Ancylostoma ceylanicum* (11%, 3–21%) than *Ancylostoma duodenale* (7%, 0–20%), although these studies were mainly in the Asia-Pacific region (Table-1).

Table-1 Report on Prevalence rate of hook worms in various regions

Sl. No	Provence/ Area/ Region	Caused by	Rate of infection	Reference
1	Darjeeling, Hooghly District, West Bengal, India	*N. americanus*	43%	(Pal *et al.* 2007)[36]
2	Xiulongkan Village, Hainan Province, China	*N. americanus*	60%	(Gandhi *et al.* 2001)
3	Hòa Bình, Northwest Vietnam	*N. americanus*	52%	(Verle *et al.* 2003)[38]
4	Minas Gerais, Brazil	*N. americanus*	63%	(Fleming *et al.* 2006)[39]
5	KwaZulu-Natal, South Africa	*N. americanus*	63%	(Mabaso *et al.* 2004)[40]
6	Lowndes County, Alabama, United States	*N. americanus*	35%	41, 42
7	Asia-Pacific	*Ancylostoma* **sps.**	45%	Archie C A Clements, Kefyalew Addis Alene, 2021
8	Africa	*Ancylostoma* **sps.**	13%	Archie C A Clements, Kefyalew Addis Alene, 2021
9	Americas	*Ancylostoma* **sps.**	15%	Archie C A Clements, Kefyalew Addis Alene, 2021
10	Asia-Pacific Africa Americas	N. americanus Ancylostoma spp. Mixed N. americanus/ Ancylostoma A. duodenale A. ceylanicum	30%	Archie C A Clements, Kefyalew Addis Alene, 2021
11	Karnataka, Andhra Pradesh, Tamilnadu,	*A. lumbricoides*	47% 40% 3.2%	AnathaKrishnan et al., 1997

	Pondicherry		4.8%	
12	Vizianagarm, Andhra Pradesh	Entamoeba	55.6%	Panda, 2012
13	Karikal, Puduchery	Ancylostoma	35%	Karthikeyan,2016
14	Vellore	Ancylostoma	8.4%	AnathaKrishnan et al., 1997; Karthikeyan,2016

It is estimated that over 1.5 billion people worldwide are at risk of contracting acystic and other STHs. Half of the infections occur in the Asia-Pacific region, which has tropical climates, high population density, poor sanitation and poor sanitation. The risk of hookworm infection varies with age, gender, toilet availability, shoe wear, education level, maternal education level, low household income, poor personal hygiene, hand washing, place of residence and water source. (Fred *et al*., 2013; Janice *et al*., 2014).

Incubation period

In general Ancylostoma species migrates within 10 days. Here within 24-48 hours, they develop to first stage larvae (L1) and Latch. Larvae-1, Larvae -2, Larvae-3 stages. During the next week (5 to 10 days) L1 will molt to infections third stage larvae L-3. Three to five weeks after skin penetration the larvae will migrate to the intestinal tract where they will mature into an adult worm. Adult worms may live in the intestine for 1-5 years depending on the species.

The onset of lesions is generally 5–15 days with a range of 0–120 days. Only two previous case reports have documented incubation periods up to 5 months. The cause of variability in incubation period remains unclear; however, it has been postulated that as yet undetermined host factors may play a role. Also, helminth strain differences might be possible. Further investigations are needed to understand this phenomenon (Hochedez, and Caumes, 2007; Archer, 2009; Siriez *et al*., 2010).

Pathophysiology

Acanthosis, a hookworm infection, soil-borne helminth (STH), also known as miner's anemia, tunnel's disease or brickworker's anemia, is predominant in low socioeconomic status countries located in tropical and subtropical regions of the world. The outer surface of helminths contains important molecules of excretory/secretory (ES) products. Hookworm ES products contain a wide range of structurally and functionally diverse molecules, primarily proteins, but also lipids and carbohydrates. These molecules also play important roles in parasite development and survival. These molecules help the parasite survive and evade host immune responses by inhibiting inflammatory responses, promoting effector cell apoptosis, and distorting the immune response phenotype. The biological roles and molecular properties of hookworm ES products are still unclear, despite intensive studies over the years (Peduzzi R, Piffaretti, 1983; Crompton and Whitehead, 1993; Abuzeid *et al*., 2020).

The most serious symptoms of Ancylostoma infection develop during the last phase when the adult worms establish themselves in the human intestine. Using their buccal capsule and teeth, the adult worms attach to the mucosa and rupture capillaries and arterioles to feed, and this results in blood and protein loss.

Human hookworm disease is a common helminth infection worldwide that is predominantly caused by the nematode parasites *Necator*

americanus and *Ancylostoma duodenale*; organisms that play a lesser role include *Ancylostoma ceylanicum, Ancylostoma braziliense*, and *Ancylostoma caninum*. Hookworm infection is acquired through skin exposure to larvae in soil contaminated by human feces. Soil becomes infectious around 5-10 days after contamination and remains so for 3-4 weeks, depending on conditions.

Hookworm infection is generally considered to be asymptomatic, but as Norman Stoll described in 1962, it is an extremely dangerous infection because its damage is "silent and insidious." An individual may experience general symptoms soon after infection. Ground-itch, which is an allergic reaction at the site of parasitic penetration and entry, is common in patients infected with *N. americanus*.Additionally, cough and pneumonitis may result as the larvae begin to break into the alveoli and travel up the trachea. Then once the larvae reach the small intestine of the host and begin to mature, the infected individual will experience diarrhea and other gastrointestinal discomfort (Edward *et al.*, 2006; Stoll, 1962).

Recently, more attention has been paid to other important consequences of hookworm infections that play an important role in public health. It is now widely accepted that children with chronic hookworm infection may experience growth retardation as well as intellectual and cognitive impairment. The disease has been associated with a 1/3 to 1/2 inch long nematode (Ankylostoma duodenalis) in the intestine, primarily through the work of Theodor Bilharz and Griesinger (1854) in Egypt. Symptoms may be related to intestinal inflammation stimulated by feeding hookworms, such as nausea, abdominal pain, and intermittent diarrhea, and progressive anemia with long-term illness. , palpitations, threadlike pulses, cold skin, pale mucous membranes, fatigue and weakness, shortness of breath, and in case of death, dysentery, hemorrhage and edema (Hotez *et al.*, 2005; Hotez *et al.*, 1995). CDC, 2008; Bethony *et al.*, 2006).

Recently, more attention has been given to other important outcomes of hookworm infection that play a large role in public health. It is now widely accepted that children who have chronic hookworm infection can experience growth retardation as well as intellectual and cognitive impairments. Additionally, recent research has focused on the potential of adverse maternal-fetal outcomes when the mother is infected with hookworm during pregnancy. The disease was linked to nematode worms (*Ankylostoma duodenalis*) from one-third to half an inch long in the intestine chiefly through the labours of Theodor Bilharz and Griesinger in Egypt (1854). The symptoms can be linked to inflammation in the gut stimulated by feeding hookworms, such as nausea, abdominal pain and intermittent diarrhea, and to progressive anemia in prolonged disease: capricious appetite, pica/geophagy (or dirt-eating), obstinate constipation followed by diarrhea, palpitations, thready pulse, coldness of the skin, pallor of the mucous membranes, fatigue and weakness, shortness of breath and in cases running a fatal course, dysentery, hemorrhages and edema (Hotez *et al.*, 2005; Hotez *et al.*, 1995; CDC, 2008; Bethony *et al.*, 2006)

An interesting consequence of this in the case of Ancylostoma duodenale infection is translactational transmission of infection: the skin-invasive larvae of this species do not all immediately pass through the lungs and on into the gut, but spread around the body via the circulation, to become dormant inside muscle fibers. In a pregnant woman, after childbirth some or all of these larvae are stimulated to re-enter the circulation (presumably by sudden hormonal changes), then to pass into the mammary glands, so that the newborn baby can receive a large dose of infective larvae through its mother's milk (Hawdon and Hotez, 1996; IDB, 2009; Global Initiative 2008; Pal, 2007 Gandhi *et al.*, 2001).

This accounts for otherwise inexplicable cases of very heavy, even fatal, hookworm infections in children a month or so of age, in places such as China, India and northern Australia. An identical phenomenon is much more commonly seen with *Ancylostoma caninum* infections in dogs, where the newborn pups can even die of hemorrhaging from their intestines caused by massive numbers of feeding hookworms. This also reflects the close evolutionary link between the human and canine parasites, which probably have a common ancestor dating back to when humans and dogs first started living closely together. Filariform larvae is the infective stage of the parasite: infection occurs when larvae in soil penetrate the skin, or when they are ingested through contaminated food and water following skin penetration (Verle *et al.*, 2003; Flemimg *et al.*, 2006; Mabaso *et al.*, 2004; McKenna *et al.*, 2017; Pilkington, 2017).

Diagnosis

Traditional stool tests, such as the Kato-Katz method and formalin-ether enrichment, are the gold standard for diagnosing ancilostoma infection by detecting the presence of eggs and adults. A. duodenale, A. ceylanicum, and N. americanus produce thin-shelled, oval eggs that are readily detected in fresh stool. An enrichment procedure is required to diagnose mild infections. If the stool is not cooled and examined within a few hours, the eggs may hatch and release larvae that must be distinguished from nematode larvae. Her three species of hookworms that infect humans are distinguishable by molecular probes, but the ova are not, and no species-specific diagnosis is made in the clinical laboratory (Hotez, 2005).

Diagnosis depends on microscopic examination of stool showing characteristic parasite eggs, which is not possible in early infection. Limb dragging and anal itching are early signs of infection in most dogs. Eggs are ovoid or oval, 60 x 40 μm in size, colorless, unstained with bile, and have a thin transparent hyaline membrane. When released by worms in the gut, eggs contain unsegmented oocytes. Eggs passed in the faeces have segmented ovules and usually 4 to 8 blastomeres because the ovules develop during passage through the intestine. Eggs of Ancylostoma and Necator (and most other hookworm species) are indistinguishable, so laboratory identification of the genus requires culturing the larvae to allow them to hatch. If a fecal sample is left in a tropical environment for more than a day, the larvae may hatch and the eggs may disappear. In such cases, it is important to distinguish between hookworm and nematode larvae. The latter infection has more serious consequences and requires different management. Larvae of the two hookworm species can also be distinguished microscopically, but this is mainly done for research purposes rather than routinely. Adults are rarely seen (except by endoscopy, surgery, or autopsy), but when found allow definitive identification of the species. Classification can be based on the length of the oral cavity, the space between the oral cavity and the esophagus.

Recent research has focused on developing DNA-based tools for diagnosing infectious diseases, identifying hookworms, and analyzing genetic variation within hookworm populations. Because hookworm eggs are often indistinguishable from those of other parasites, PCR assays may serve as a molecular approach to accurately diagnose hookworms in faeces (Hotez, 2005).

Prevention

The infective larvae develop and survive in an environment of damp dirt, particularly sandy and loamy soil. They cannot survive in clay or muck. The main lines of precaution are those dictated by good hygiene behaviors: Do not defecate in the open, but rather in toilets., Do not use untreated human excreta or raw sewage as fertilizer in agriculture, Do not walk barefoot in known infected areas, Deworm pet dogs and cats. Canine and feline hookworms rarely develop to adulthood in humans. *Ancylostoma caninum*, the common dog hookworm, occasionally develops into an adult to cause eosinophilic

enteritis in people, but their invasive larvae can cause an itchy rash called cutaneous larva migrans, Moxidectin is available in the United States as (imidacloprid + moxidectin) topical solution for dogs and cats. It utilizes moxidectin for control and prevention of roundworms, hookworms, heartworms, and whipworms.

Treatment

The drugs are usually taken once by him to treat an infection. Wear shoes when walking outdoors, especially where there may be feces on the ground. Drink clean water, wash food clean, cook properly, and practice good hand washing. A. duodenale, A. ceylanicum, and N. americanus produce thin-shelled, oval eggs that are readily detected in fresh stool. An enrichment procedure is required to diagnose mild infections. If the stool is not cooled and examined within a few hours, the eggs may hatch and release larvae that must be distinguished from nematode larvae. Her three species of hookworms that infect humans are distinguishable by molecular probes, but the ova are not, and no species-specific diagnosis is made in the clinical laboratory. Eosinophilia is common in people infected with hookworm (Albonico *et al.*, 1994; Crompton, 2000). . During the pre-infectious stage (ie, 5-9 weeks from larval infestation to appearance of eggs in stool), eosinophilia may be the only laboratory abnormality. Hookworm prevalence is an important aspect in the differential diagnosis of eosinophilia in immigrants or travelers returning from endemic areas with poor sanitation. One cause of eosinophilic gastroenteritis is human infection with the canine hookworm Ancylostoma caninum. Gastrointestinal pain, nausea, vomiting, diarrhea, and bowel obstruction are common, most often with eosinophilia and leukocytosis. Egg cells are not produced, but adult worms may be seen during endoscopy. Patients respond to standard therapy with mebendazole 100 mg twice daily for 3 days.

Anthelmintic drugs

The most common treatments for hookworms are benzimidazoles, especially albendazole and mebendazole. BZA kills adult worms by binding to nematode β-tubulin and subsequently inhibiting microtubule polymerization within the parasite. Levamisole and pyrantel pamoate can be used in certain situations. A review found that single-dose treatment efficacy for hookworm infections was 72% with albendazole, 15% with mebendazole, and 31% with pyrantel pamoate. This supports previous claims that albendazole is much more effective than mebendazole against hookworm infections (Hotez, 2005). It is also worth noting that the World Health Organization recommends anthelmintic treatment for women in the first trimester of pregnancy. It is also recommended to be administered at the same time. This should continue until hemoglobin levels return to normal. This can take up to 3 months. In the 1910s, common hookworm treatments included thymol, 2-naphthol, chloroform, gasoline, and eucalyptus oil. In the 1940s, in the fasting state he used 3–4 cc of tetrachlorethylene, followed by his treatment of choice with 30–45 g of sodium sulfate. Tetrachlorethylene is reported to have an 80% cure rate for Necator infections, but a 25% cure rate for Ancylostoma infections and often causes mild poisoning in patients.

Discussion

Hookworm infections in dogs, cats and other animals typically come from a different species than the one that infects humans. Animal hookworms can sometimes penetrate a person's skin, but they don't mature or lay eggs inside a human host. Animal hookworms can cause a rash as they move under the skin. This itchy rash, called *cutaneous larva migrans*, shows up as a thin, raised red line that spreads across the skin (*Bravata*, 2001). Hookworm-infected people with *N. americanus* and Ancylostoma spp infections, finding a lower proportion of *N. americanus* and a higher proportion of Ancylostoma spp. infections in

the Asia-Pacific region relative to Africa and Latin America. Lower proportions of people were infected with *Ancylostoma* spp. and mixed infections in the 2000s and 2010s compared to the 1990s.

Various reports in children only had significantly higher rates of *A. duodenale* infection and lower rates of *A. ceylanicum* infection than studies in adults (all age groups). Interestingly, in multivariate models, the proportions of people infected with various hookworm genera and species were not statistically different between tropical and non-tropical regions. A meta-analysis of severe anemia found no difference in the risk of severe anemia among infections (and co-infections) caused by hookworm species (Verle *et al.*, 2003; Flemimg *et al.*, 2006; Mabaso *et al.*, 2004; McKenna *et al.*, 2017; Pilkington, 2017).

In previous reports for the deworming program of community dogs in Thailand, an oral dose of 10 mg/kg BW of pyrantel pamoate and the subcutaneous injection of 0.2–0.4 mg/kg BW ivermectin have been regularly administered for deworming; however, the efficacy of these regimens against *A. ceylanicum* in dogs remains unclear. Currently, many commercial drugs against *A. ceylanicum* infection in dogs have been tested at the laboratory level and exhibited greater than 99% efficacy within 3–7 days, including a combination of 15 mg/kg BW of febantel and 14.4 mg/kg BW of pyrantel embonate (Drontal Plus, Bayer Animal health), a spot-on of 2.5 mg/kg BW moxidectin (Advocate®, Bayer Animal health), and 0.5 mg/kg BW milbemycin oxime (NexGard Spectra®, Boehringer Ingelheim) (Taweethavonsawat *et al.*, 2010; Taweethavonsawat *et al.*, 2010; Tielemans *et al.*, 2017).

Ancylostoma caninum infection can be acquired by vertical (transmammary) infection, percutaneous penetration, or ingestion from infective 3rd instar larvae or paratheneal hosts. In adult dogs that have acquired some immunity, infected larvae do not develop directly into adult dogs, but instead migrate to somatic tissues such as the kidneys and skeletal muscle, where they undergo prolonged quiescence. These arrested larvae are most commonly reactivated by hormones of pregnancy and lactation, and the larvae infect nursing puppies in the milk of bitches. Hookworm infections can be seen in dogs of all ages. However, puppies and young pets are more likely to show clinical signs such as anemia, weakness, melena, anorexia, weight loss and poor growth. As with most parasites, clinical symptoms are exacerbated by malnutrition, stress, or complications.

Hookworm is classified into four different syndromes that depend on the animal's age, route of infection, or general health. In hyperacute ankylosing anastomosis, nursing puppies die of severe anemia at about 2-3 weeks of age. It has no clinical signs due to overwhelming hookworm infection via the mammary route. Acute ankylosis affects slightly older or weaned puppies, which survive long enough to develop signs of melena and severe anemia. Again, transmammary transmission is the usual route. The remaining two categories of ankylosing anastomosis occur in adult dogs that are repeatedly exposed to the L3 phase or continuously reinfected with larvae activated from the arrested somatic cell pool. Decompensated ankylosis occurs when malnutrition or comorbidities prevent animals from coping with hookworm infestations through immunological or general defense mechanisms (Taweethavonsawat *et al.*, 2010; Taweethavonsawat *et al.*, 2010). In contrast, no clinical signs are seen in dogs with *compensated* ancylostomosis, which is a term used to describe recurrent infections that are partially controlled, but not eliminated, by host mechanisms. Compensated ancylostomosis is typically recognized when fecal examinations after repeated treatments document the incessant reappearance of hookworm eggs. Diagnostic methods that differentiate between hookworm species, including molecular methods, need to be developed for widespread use in control programmes to elucidate key features of hookworm epidemiology and control.

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Compact Mean Labeling on Bipartite Graphs

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ABSTRACT
Labeling of graphs is the procedure of assigning numbers to the nodes, lines, or both in accordance with an applicable rule. In this study, we demonstrate that the bipartite graph $K_{n,n}$ is a compact mean-labeled graph. We also explored graphs $K_{2,2}$ and $K_{2,3}$, $K_{2,4}$ are compact mean-labeled graphs
Keywords : Labeling of graphs, complete graph, Bipartite graph ,complete bipartite graph graph, Mean labeled graph, Compact mean labeled graphs
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I. INTRODUCTION

In 1966, Rosa [11] introduced β - valuation of a graph. Golomb subsequently called such a labeling graceful. In 1980, Graham and Sloane [3] introduced the harmonious labeling of a graph. In 2003 [12], Somasundaram and Ponraj introduced the mean labeling of a graph. On similar lines, Maheswari V et al., [6] proved relaxed mean labeling on path, star, bistar graphs.

RESULTS AND OBSERVATIONS OF COMPACT MEAN LABELING OF COMPLETE BIPARTITE GRAPHS

Definition 1.1: Bipartite Graph:
A graph G=(V, E) is called a bipartite graph if its vertices V can be partitioned into two subsets V_1 and V_2 such that each edge of G connects a vertex of V_1 to a vertex V_2.It is denoted by Kmn, where m and n are the numbers of vertices in V_1 and V_2 respectively.

Definition 1.2: Complete bipartite graph
A graph G = (V, E) is called a complete bipartite graph if its vertices V can be partitioned into two subsets V_1 and V_2 such that each vertex of V_1 is connected to each vertex of V_2. The number of edges in a complete bipartite graph is mn as each of the m vertices is connected to each of the n vertices.

Theorem 1,3: Prove that the graph $K_{2,2}$ admits compact mean labeling
Proof: Let V_1 , V_2 be the bipartition of $K_{2,2}$
$where\ V_1 = \{u, v\}$, $V_2 = \{u_1, u_2\}$

Define the mapping $f: V(K_{2,n}) \rightarrow \{0,1,\ldots..2q-p\}$

By $f(ui) = \begin{cases} 2\text{i} - 2\,, \forall\ \text{i} = 1,2,3 \\ \text{i} - 1 \text{ when i} = 4 \end{cases}$

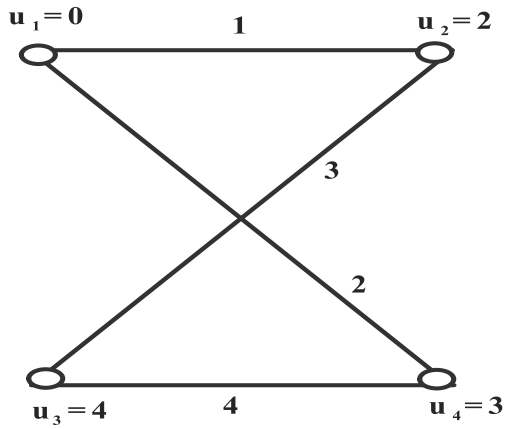
By the mapping $f: V(K_{2,n}) \rightarrow \{0,1,2,3,4\}$

When $i = 1 \quad f(u_1) = 2i - 2 = 0$

$i = 2 \quad f(u_2) = 2i - 2 = 2$

$i = 3 \quad f(u_3) = 2i - 2 = 4$

$i = 4 \quad f(u_4) = i - 1 = 3$



Compact mean labeling of $K_{2,2}$

Figure 1

The corresponding edge labels are as follows

$u_1u_2 = 1 \ (ie) \ 1 \le i \le 3$

$U_{n-3}\, U_{n-2} = 1$

$U_{n-3}\, U_n = 2$

$U_{n-2}\, U_{n-1} = 3$

$U_{n-1}\, U_n = 4$

Theorem 2: Prove that the graph $K_{2,3}$ is a compact mean labeled graph

Proof: Let V_1, V_2 be the partition of $K_{2,3}$ where $V_1 = \{u, v\}\,, V_2 = \{u_1, u_2, u_3\}$

Define the mapping $f: V(K_{2,3}) \rightarrow \{0,1,\ldots..2q-p\}$

$f: V(K_{2,3}) \rightarrow \{0,1,2,3,4,5,6,7\}$

By $f(u) = 0, f(v) = n + 3$

The label of vertices V_2 is

$f(V_i) = \{2i \quad 1 \le i \le n - 2$

The values of vertices V_1, V_2, V_3 are given below

$i = 1 \rightarrow f(V_1) = 2$

$i = 2 \rightarrow f(V_2) = 4$

$i = 3 \rightarrow f(V_3) = 6$

The corresponding edge labels are as follows

The label of the edge uv_1 is 1

The label of the edge uv_{i+1} is $i + 1$ for $1 \le i \le n - 1$

The label of the edge $VV_1 = 4$

The label of the edge $V_2 = 5\,, VV_3 = 6$

Hence $K_{2,3}$ is a compact mean labeled graph

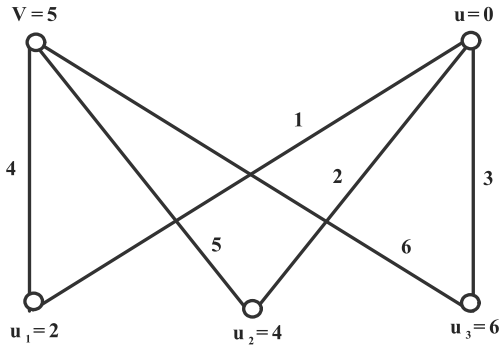


Figure2

Theorem 3 : Prove that the graph $K_{2,4}$ is compact mean labeled graph

Proof : Let V_1, V_2 be the partition of $K_{2,4}$ where $V_1 = \{v, u\}\,, V2 = \{u_1, u_2, u_3, u_4\}$

Define of mapping $f: V(K_{2,4}) \rightarrow \{0,1,2,\ldots..2q-p\}$

$f: V(K_{2,4}) \rightarrow \{0,1,2,3,4,5,6,7,8,9,10\}$

$f(u) = 0\,, f(V) = 3n + 2$

The label of vertices u_r is

$f(u_i) = \{2i - 1\ for\ 1 \le i \le n$

The values of the vertex labels $f(u_1) = 1$

$f(u_2) = 3, \ f(u_3) = 5, \ f(u_4) = 7$

(or)

$F(u_i) = 1, f(u_i + 1) = 3, f(u_i + 2) = 5, f(u_i + 3) = 7$

The corresponding edge labels are as follows

The label of the edge $Vu_1 = n + 1$

The label of the edge $Vu_2 = n + 2$

The label of the edge $Vu_3 = n + 3$

The label of the edge $Vu_4 = n + 4$

Hence $k_{2,4}$ is a compact mean labeling of $K_{2,4}$

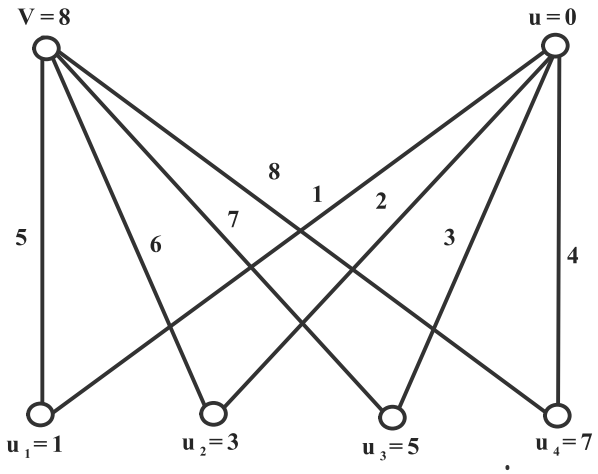


Figure3

$u_{n-5}u_{n-8} = u_5u_2 = 8$
$u_{n-7}u_{n-5} = u_3u_5 = 9$
$u_{n-6}u_{n-5} = u_4u_5 = 10$

∴ All the values of edges are distinct values of the set $\{1, 2, 3, 4, 5, 6 \ldots 10\}$.

∴ Then graph K_5 admits compact mean labeling graph.

Conclusion

In this research article, the exploration of compact mean labeling for the bipartite graphs was verified. Identified the distinct edge values using the appropriate labeling rule gives unique weights to the vertices and edges. In further research, we review the bounds for the complete bipartite graphs.

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Tragic Tale of Suffering Humanity : Douloti the Bountiful

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ABSTRACT

Mahasweta Devi is a literary stalwart who has written vehemently for a social cause. As an activist writer, she has explored, studied and presented an authentic portrait of the tumults of the lives of tribal community in India. Her texts present a rare critique of our socio-political-economic structure that is blind towards its own discrepancies. Douloti, the bountiful is yet another piece of work by the writer that seems to explain 'all about tribal life'– the cycle of exploitation, chronic poverty, hunger, deprivation, bonded slavery, prostitution, marginalisation, the pernicious nexus amongst the rich, powerful and power-mongering elites and so on. The present paper is an attempt to make a deep study of the work and to trace the modus operandi of exploitation, as shown by the writer, with special emphasis on how women are made to suffer differently.

Keywords : Bonded Slavery, Prostitution, Marginalization, Power-Mongering Elites, Modus Operandi.

The locale of the story is Palamau, a backward tribal region in Jharkhand/Bihar, which according to the writer "is a mirror of India" (Bitter Soil, vii)1. A mirror indeed because it reflects the real face of the regions on the margins- a face without make-ups or filters or masks, so that all the scars on the otherwise clean and clear face are visible with untainted clarity once one embarks on the journey to explore; and with writers like Mahasweta at work, the visibility is not much difficult. Obviously, it becomes difficult to face all this for a sensitive reader and activists like the writer herself, and hence there is a sort of dis-satisfaction and anger, as Devi puts it herself: "...For I believe in anger....and so I peel the mask off the face of the India which is projected by the government, to expose its naked brutality, savagery and caste and class exploitation." (Bitter Soil, ix-x) 2

The story can be studied as a rare narrative that explains many things, like- the structure and functioning of the village economy and land system, whole scenario of bonded slavery, situation of tribal women in this whole system and the way their bodies and being is ruthlessly dragged in the lucrative profit-making fun game of the rich. Analysis of these points one by one would lead to an understanding of the modus operandi of exploitation of the marginalised people and also of the real theme and motif of the story.

Consisting large number of tribal population and small number of so-called high-caste people, Seora is a typical Indian village where resources are limited and

the available meagre resources are also concentrated in the hands of the few. "In Palamau, the communities of Nagesia's and Parhaias are small. The bigger communities are Bhuyians, Dusads, Ganjus, Oraons, Mundas. The village is called Seora. Its owner is Munabar Singh, A Chandela Rajput."(Imaginary Maps 19)3 How Raputs- minorities in number, became omnipotent masters of such tribal majority villages is the story that explains the beginning of exploitation. It is the story of unequal resource-allocation in pre-independence India that continued afterwards. Dulan in Mahasweta Devi's story Rudali explains this very aspect in the context of Rajput's domination in the entire region of Chhotanagpur plateau:

Raja of Chhotanagpur...sent his Rajput sardars in the sparsely populated Tahad region. He told them take as much as land is covered by throwing your sword in the air....claim as much land as you can in this way, then live it off. That's how Rajputs settled in Tahad and how they came to be masters of this region."(Metamorphosis of Rudali 94) 4

As Dulan further explains, Rajputs are accustomed of usurping resources in the same manner henceforth, not by throwing swords but by firing bullets at tribal people and by burning their settlements.

The colonial masters left the country in 1947 but it could not change the situation on the ground because it was mere a replacement of white skinned masters by the brown-skinned ones. The mind-set, the imperialist intent and practices remained the same. The land-holder class of such villages have everything in plenty."They have elephants, horses, livestock, illegitimate children, kept women, venereal disease and a philosophy that he who owns the gun owns the land."(Rudali, 95)5 Hence, by virtue of this prevalent tradition and unwritten rule, tribal community- the real stakeholders of resources is pushed to the margins and becomes ultimate losers in terms of rights over everything that is worth claiming.

Tribal community is therefore left with no support or scope to fulfil their livelihood requirements. In such a situation of helplessness and utter destitute they are forced to borrow from the rural masters and hence fell in the trap of bonded slavery. Every member of a tribal household is, in some or the other way, victim of this ruthless system:

The reality of bonded labor....constitutes the crux of the story. It is a system in which when a poor worker borrows a certain sum of money from a landlord or moneylender and is unable to repay it in cash; s/he instead agrees to provide his or her labor free of charge as a form of repayment. The agreement is supposed to last till the payment of principal and interest is recovered. (Majumdar 156) 6

The amount taken as loan is never so big that the whole family can be tied up as bonded labourer throughout their lives, but this happens because all landlords, without exception resort to cheating and wrong doings: "The system thrives on the established fact of the illiteracy and powerlessness of indigent workers. The worker not only does not have any say regarding the terms of agreement, he is in no position to know if even the terms that are heavily loaded against him are honestly followed by the moneylender."(156)7

Thus, bonded slavery is a system of perpetual and systematic exploitation of the poor, devised, evolved and maintained by constant efforts of the privileged class-caste to ensure smooth fulfilment of their selfish motifs. The chronic poverty and deprivation of the tribal masses is a sort of imposed disability by the people like Munabar Singh and is seen by them as being inevitable for their prosperity and also for the very existence of their dynasty.

Hence, Munabar Singh keeps a close watch on his subjects; no tribal is allowed to shake off the chains of bonded slavery or earn a little comfort. "First a Nagesia should'nt have money. If he does, he should not raise a roof. If you raise a roof or buy a water-buffalo, master will notice it. If you buy land master will grab it. If you buy cattle, the master will snatch them."(Imaginary Maps 23)8 Bono Nagesia had gone out to a city to earn and hence had somehow freed

himself from Munabar's clutches, but when he returned with some money and tried to build a house, it was burnt down to ashes by Munabar's goons, he was beaten and forced to take loan and become a bonded slave like other tribals.

Every tribal individual is somehow forced to enter into the bonded slavery system and bear inhuman atrocities. Ganori Nagesia, Douloti's father, has become Crooked Nagesia because his "carelessness sends Munabar's plough steer into tiger's belly". And thus "His back is stooped, and he has to limp on his right foot when he walks"(Imaginary Maps 33).9 Every villager has to live on Master's mercy and even exercise their right to vote as per his directions. Munabar's support to a candidate ensures his victory in the elections, since he controls the election results through his muscle and money power. Hence democracy is not allowed to function and no awareness regarding the world outside is allowed to reach to the grass-root level. People are strategically kept aloof of the idea of elections, democracy, political rights and even the Nation itself. Tribals are pushed at the receiving ends in terms of social, political, economic rights.

The situation of nearby cities is also the same for the subalterns. In search of better livelihood when Bono Nagesia went to a mining area in the city, there was similar story of gruesome exploitation:

Government- unine- contractor- slum landlord- market trader- shopkeeper- post office, each is the other's friend....The unine didn't do a thing. Talk to government officer, he laughs. The slum lord takes out rent. The trader and the shopkeeper will zoom down like a hungry wolf. They will falsify your account. Everyone sucks the coolie's blood. If a note comes from home, the postman doesn't give it without money. Send money home, the mail clerk says give me a cut. (Imaginary Maps 24) 10

Thus, there is same story everywhere; they become vulnerable and feel trapped in a situation where there is absolutely no other way to go. The bonded labour system hurts women differently especially when the victim is a young girl. The trauma and sufferings of women in this system is portrayed so poignantly in the story. Numberless tortures that they go through, how this works as a close system with absolutely no exit door, the acute deprivation and struggle for survival that the individual and her children born out of repeated rapes in the brothel go through, almost all aspects are depicted in a realistic manner.

Douloti, the fourteen year old daughter of Ganori Nagesia is the protagonist of the narrative. The narrative shows how her already miserable life worsens the moment lusty eyes of a rich-high caste man falls on her. The story especially underscores how the pattern of exploitation of land, resources and women is quite identical. Hence the connection between societal perception about nature and women needs to be understood properly in order to understand the whole phenomenon of exploitation of women. As Nasrullah Mambrol in "Ecocriticism an essay", explains "Western thought has often held a more or less utilitarian attitude to nature – nature is for serving human needs."11

This, anthropocentric view is the basis of colonial and capitalist mindset that exploits all the natural resources with the purpose to gain maximum profit. It is a highly utilitarian approach that leads to patriarchal hegemony and over-exploitation of both women and nature. Women are traditionally seen as impulsive and uncontrolled like Nature and thus are considered to be subjects of utmost discipline that is to be imposed by the community that is more rational and strict. With such a mindset, androcentric attitude towards women and Nature gradually developed. In this line of thought later comes eco-feminism. As Susan Bukingham puts it, "bringing together feminism and environmentalism, ecofeminism argues that domination of women and degradation of environment are consequences of patriarchy and capitalism."12

The cultural eco-feminists also laid emphasis on "women's inherent and caring or nurturing nature and on a shared subjugation under patriarchal

system"(Bukingham).13 This patriarchal, colonial and capitalist mind-set operates in a complex and implicit manner and the writer in this text has subtly portrayed the ways in which it becomes instrumental in the exploitation of numerous Doulotis across the country.

This also leads to "the essentialist perspective, often adopting an ideal of women as earth mother/ goddess"(Bukingham).14 Mother/Nature/women are expected to be caring, self-effacing and behave like one who feels proud in offering everything to her sons without complain or demand- even if her gifts are misused and she is harmed while serving her selfish, ever-demanding sons. Thus, there is open plunder of daulat i.e. wealth causing "shared subjugation" of land and aboriginal women:

"The boss has turned them into land
The boss ploughs and ploughs their land and raises the crop.
They are all Paramananda's Kamiya..." (Imaginary Maps 60). 15

And as Mary Cappeli puts it "The prostitute's song demonstrates their isolation from a post-independence India that has turned a deaf ear to their suffering."16 Douloti comes into picture when her father is hospitalised. She takes care of her father along with her mother and is quite disturbed by the inhuman behaviour of the master- Munabar Singh. A caste Brahmin Paramananda often came to see them and Douloti who was too young to understand the 'ways of the rich people', narrated all her plights to the man whose heart seemed to be wet with compassion for the young tribal girl and her poor father. "How the brahman Paramananda tried to show compassion to Crook Nagesia, the kamiya. And what compassion in Munabar Chandela. The kingdom of heaven descended on this sinful earth"(Imaginary Maps 49). 17

After sufficient show of goodwill Paramananda comes to the real point. He gives a proposal of setting Ganori free of his bonded slavery by paying the required money to Munabar Singh and also offers to marry his daughter Douloti. Despite all the protests from the father himself, the 'deal' is finalised- the deal of sale and purchase of a tribal girl between the village-owner Munabar and the supposed well wisher Paramananda. He (Paramananda) was actually owner of a brothel. Douloti is taken to a brothel by this man. There, she is first reserved for a wealthy and valued customer Latiya, who desperately wanted a virgin untouchable girl. Later, after few years when he lost interest in her body she was allowed to take clients on daily basis. The investment done on her clothes and accessories was, as per rule, added in the original amount.

Douloti, like other bonded whores, continued to pay the interest of lone through her body, facing repeated brutal rapes, taking twenty to thirty clients daily and letting their ill-fed, skeletal body be torn by claws of hungry bestial men, every now and then. This continues for decades, the fourteen year old Douloti, is now 27. And due to her stay in brothel Paramanada has earned much more than what he had spent on Douloti. But she is finally allowed to leave the place only when her body starts showing clear signs of some serious ailment. The owner orders her to go and take a treatment on her own and come back only when she is again ready to take clients.

Thus, she is exploited in the best possible manner in order to extract all that her female body could offer and then, like other prostitutes, she is left to die a terrible death. Her venereal disease is incurable, having known this full well, she tries to go back to her own village for once, but on her way to it, her body collapses completely. Thus, Douloti, the once bountiful girl, is reduced to hollow stinking skeletal corpse.

This life and death of Douloti is symbolic in many ways- (i) It shows how men of high caste/class mercilessly exploit the tribal community and especially their women and use them ruthlessly as sex slave, deriving sadistic pleasure,(ii) The parallel between exploitation of land, natural resources and women has been successfully drawn. Tribal men and

women are considered to be properties of the landlords. And even today whole government machinery has not been completely successful in protecting them or providing any sort of empowerment,(iii) Douloti's well-planned exploitation and her tragic end on the day of independence is symbolic of failure of the very idea of independence, since such a huge segment of population does not have any clue of what this word called 'freedom' actually stands for. The writer also presents it as a sort of failure of idea of 'nation', since the aboriginal population has continued to live on the margins and is cut off from most of the positive changes taking place in the nation.

This failure is obviously not visible to the main-stream and this lack of visibility is what Mahasweta Devi tries to underscore in her works. At the end of the story Devi juxtaposes the ideal image of a liberated nation with the real dead body of an innocent bonded whore, who died while many other talked about abolishing bonded slavery. The preparations of celebration are in acute contradiction with the situation on ground, where breathless body of Douloti is spread in the courtyard of the school that is ironically preparing for celebration.

Devi also underscores the trench of divide that separates the suffering India, with the India burgeoning with surplus. This divide creates a clear binary. It is so deep that one segment becomes utterly alien to another; they are unable to communicate with or understand each other. What is disaster for the main-stream is a ray of hope for penny-less marginal. Again, what defines progress for the main-stream is an ill-omen for these enslaved whores. For instance, famine is something that beggar-turned whore Somni eagerly awaits for because only in those 'hard' times her children-born out of repeated rapes in the brothel-could enter the mission and get sufficient food.

Emblems of 'development', i.e. new roads, railway tracks, infrastructure meant devastation for these tribal women for it brought more hungry clients, increase demand for virgin, untouchable girls and more exhaustive labour for women already being exploited in brothels. This inversion of meaning and definition of normally accepted facts is a remarkable aspect that Devi puts forth through the story.

The very name of the protagonist is symbolic like that of Jashoda and Draupadi in other stories by Mahasweta Devi. Jashoda in Breast Giver pays the cost of being a 'good' mother and wife. Dopdi in the story Draupadi is made to suffer like heroine of Epic Mahabharata. Similarly Douloti is made to suffer because she is bountiful and she has those things in plenty that is in great demand in predatory, patriarchal prostitute trade. The name 'Douloti' in Hindi language is derived from the word daulat i.e. wealth. And the story is all about this loot and the mechanisms of its loot.

The systematic exploitation of the untouchable women goes on unabated despite numerous laws and efforts about human rights of women theoretically gaining prominence in public debates and state policy. Eventually, the distance between the main-stream and the margins continues to grow. There is trust deficit and also lack of understanding. This is why even the most concerned activists seem to be unable to understand the urgency and gravity of the situation. Thus, all the efforts that suggest 'reform' or 'welfare' initiatives are categorically denied by the writer by showing how all the people offering possible solutions either fail pathetically or withdraw themselves at the end- be it the missionary man or the school teacher or the tribal activist or Douloti's own uncle Bono Nagesia. They could not bring any change, could not protect even a single Douloti.

For instance, Mohan Srivastava who believed that formation of a law could abolish bonded slavery, "with all his sympathy....remained a schoolmaster at the basic primary school in Bira village, Tohri Block"(Imaginary Maps 89).17 Father Bomfuller, who had started a survey on the 'the Incidence of Bonded labour' in Palamau district and through his work aimed "to build a case for abolishing the bonded

labour system legally…" (Imaginary Maps 86),18 finally left for Delhi. His "survey report reached Delhi and was imprisoned in a file." Similarly, tribal activist Prasad Mahato, when all his hopes from Father Bomfuller and Mohan Srivastava bore no fruit, left Gandhi mission and Harijan association and joined Liberation Party.

Bono Nagesia, who had first-hand experience of inhumane suffering under the bonded slave system and who was most desperate to help Douloti and others also joined Prasad Mahato. All this happened while Douloti continued to pay the cost of these delayed actions and inactions, finally leaving her corporal cage."Filling the entire Indian peninsula from the oceans to the Himalayas, here lies bonded labour spreadeagled kamiya-whore Douloti Nagesia's tormented corpse, putrefied with venereal disease, having vomited up all the blood in its desiccated lungs."(94) 19

This was the end of Douloti and the narrative as well but it could not end everything. Since, "Like a flag, Douloti's thin body flutters as the vain glory of victory and questions the validity of freedom for women won through flag politics and independence-struggles in India."(Anwar 91)20 Douloti's silent death left haunting questions for people like Mohan Srivastava, whose "faith in Law, in the police remained unshaken." But after seeing Douloti's dead body across the carefully drawn map of India, he could for the first time sense the real pain, that no other words than those of the writer herself could better define-"….looking in front, he closed his eyes. His body jerked again, as if his arms were tied and a machine-gun was being emptied into him."(94) 21

This is shock, this pain, this breaking down of long held belief in 'all is well' is what Devi seeks to achieve as a writer and social worker. She poignantly "uses the image of bonded- sex-worker lying dead body on the map of India to denounce exploitation and to destroy the myth of free India for all" (Collu 55).22 Thus, the writer through this narrative expresses the pain, trauma and tribulations of the suffering humanity and shocks her readers in order to awake them from the slumber of satisfaction with the status quo. To sum up, the narrative truly justifies the following observation about the writer-"Mahasweta Devi, does not augment the silence or create a further peripheralization or misrepresentation of the Subalterns; instead the attempt has been to perpetuate a 'presence' in an eradicable absence of full presence"(Jamuna 138).

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Low Power Voltage Level Shifter Employing Power Gating for IOT Applications

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ABSTRACT

Power management is of increasing concern and challenge to SOC and product designer. Power Gating (PG) is now well understood as a technique for reducing static leakage power when circuits are idle In the IOT applications, Level shifters (LS) are used to transport digital signals from the near-threshold voltage level to the actual supply voltage level when interfacing the near-threshold domain and the nominal voltage domain. The LS should be quick enough to meet needs while keeping transition energy and static power as low as possible in order to reduce overhead. For this, we are proposing the double current limiter level shifter with Power Gating Technique which reduces the power consumption by preventing the supply directly connected to the circuit. At the power supply, two transistors were connected in parallel to obtain the design. Level Shifter that meets the requirements of contemporary IOT applications for power, delay, and voltage level shifting. The proposed Level Shifter was implemented in 45nm technology using Tanner EDA tool.

Keywords: Double Current Limiter, Level Shifter, Power Gating, IOT Applications, Power Consumption.

I. INTRODUCTION

In portable gadgets, power dissipation is quite significant. Until recently, energy consumption was not a serious concern because heat was dissipated by huge cooling fins, packaging, and fans are all examples of components. Systems with sub-threshold as well as near-threshold voltages consume minimal energy as well as power. Signal transmissions among sub-VTH as well as near-VTH systems are often difficult whenever standard LSs are used, since every circuit's voltage level is approximately to or less than the MOS device's vth, whereas the supply sources of the outer networks keep rising. When working with multi-voltage domains, level shifters are critical. Sub threshold leakage currents will become an increasingly major component of total power dissipation as future technologies scale and reduce power consumption. One of the really efficient leakage power mitigation solutions currently available is power gating. From the study of this work, we offer a power gating technique for Level shifters that allows for power gating during active mode.

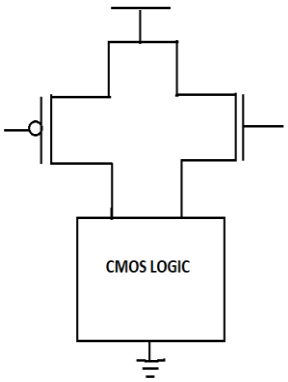

Figure 1: Block diagram of Power Gating

A level shifter cell is often used to adjust the voltage level from high to low or low to high. When numerous voltage domains are active on the chip, level shifters are used. A signal with a voltage spectrum that differentiates from the signal in another voltage domain. Because of the voltage range variation, the destination domain will operate in an unreliable manner. Buffers can be used to get LSs ranging from low to high. In general, MOS transistors' gate voltages have been pushed to the point of breaking down. Even though the breakdown point is often much higher than that of the main supply source, the MOS device's input can be worked at a voltage greater than the supply voltage. Level shifters are used to make sure that When different voltage blocks are combined in a SoC, they function appropriately. As signals migrate from one voltage level to another, level shifters must maintain the right driving strength and exact timing. At any stage of the synthesis or implementation process, level shifters can be incorporated.

Although level shifters are employed to resolve voltage mismatches between different parts of a system, they have a broad array of applications. Level shifters are commonly employed in legacy device interfacing, as well as in SD cards, SIM cards, and UARTs.

II. REARLIER WORK

The digital circuit used to change the voltage from one level to another is a Differential Cascade Voltage Switch Logic.

While installing the LSs across the different voltage domains, some particular placement requirements must be met.

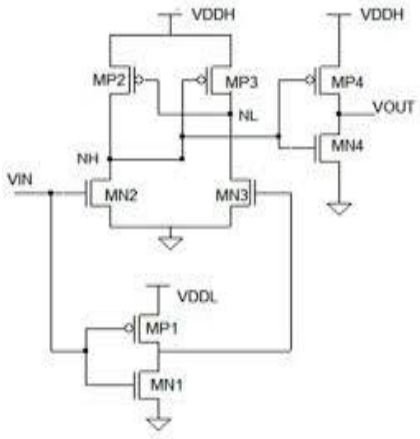

Fig2: Basic DCVS Level Shifter

The problem of adding LS is that it occupies up space while causing severe power loss. LS in its most basic version fosters rivalry between pull-up and pull-down networks.

Double Current limiter Level Shifter

Two current limiters are utilized in this Level Shifter to prevent the circuit from generating or transmitting excessive current as a result of a short circuit in the load.

Whenever supply voltages require the installation of internal current-limiters, In most cases, they are built with current sensors, control circuits, and pass transistors. Current sensors are frequently built with typical low resistance and MOS semiconductors. Furthermore, the voltage across is proportional to the current. This voltage could be used to regulate current flow in pass transistors.

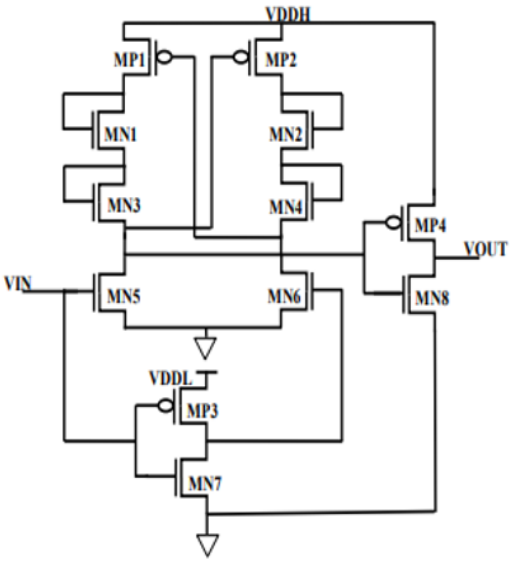

Fig3: Double Current Limiter Level Shifter

The transistor is worked as current limiter when the connection of the transistor is in such a way that the drain terminal is fed to the gate terminal. In the pull up network, current limiters are connected to lessen the current. When Vin is given Logic 0, device MN5 switches off and the device MN6 switches on. As the gate terminal of MN6 transistor is connected through the inverter, by this MN6 transistor gets the voltage of VDDL and gets turned on. From this the MP1 transistor turns on which simultaneously turns on the current limiter transistors of MN1 and MN3. This gives the Logic 1 as input to the MP4 and MN8, by this the transistor MN8 turns on and gives the output voltage of Logic 0.

When Vin is given Logic 1, transistor MN5 turns on and transistor MN6 turns off. As the terminal of MN6 transistor is connected through the inverter, by this MN6 transistor gets the voltage of zero and gets turned off. Due to the on condition of transistor MN5, the MP0 transistor turns on which simultaneously turns on the current limiter transistors of MN2 and MN4 while the transistors MN1 and MN3 are in off state. This gives the Logic 0 as input to the MP4 and MN8, by this the transistor MP4 turns on and gives the output voltage of Logic 1 which refers to VDDH.

The current limiters MN1-MN2 and MN3-MN4 moderate the voltage swing in the primary conversion stage by limiting the current, the better the power consumption and delay can be achieved. In this case, the existing complementary level shifter design aids in the formation of positive feedback while also ensuring the Level Shifter's stipulated functionality.
From the operation of Double Current Limiter Level Shifter, we observe that the output voltage gets the swing between VDDH and ground. Thus we obtain the full swing output voltage.

III. PROPOSED WORK

In the proposed work, power gating technique is applied since leakage power is the major concern in today's world. Power gating is an approach used in integrated circuit design to minimize power consumption by switching off current to non-utilized blocks.

In power gating technique, the additional transistors are to be placed in various ways such as one transistor as a header switch and other as a footer switch or both transistors are placed either as a header switches or as a footer switches. These additional transistors may be connected in series or parallel which depends on the application or need.

Introducing the sleep transistors isolates the chip's power network into two segments: a permanent power network that is connected to the power source and a virtual power network that runs the cells and may be switched off.

A significant fraction of the ICs in a realistic device/application are not used for a longer length of time. This can save a great deal of electricity whereas if energy to that section of the IC is turned down. This preserves not only static (leakage) but also dynamic (non-gated) power.

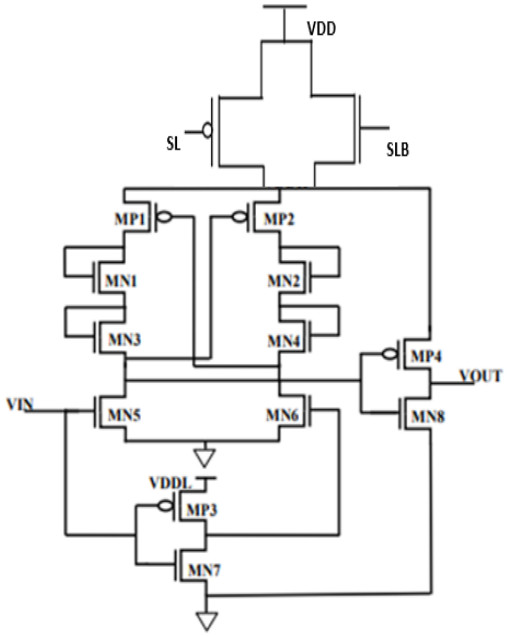

Fig4: Schematic of proposed Level Shifter

In this proposed method two additional transistors are added to level shifter to gate the supply from the circuit when both sl and slb are on, then only supply is passed to the circuit which is termed as active mode. In sleep mode both transistors MP0 and MP0 are turned off. In this scenario supply is not passed to circuit. Hence power is saved when the sleep transistors are off.

In this case, the transistors employed are Pmos (MP0) and Nmos (MN0). Figure 4 depicts the circuit diagram for the proposed level shifter.

These two modes are altered at the proper moment and in the appropriate manner to maximize power performance while trying to minimize performance degradation. Thus, the objective of power gating is to lessen leakage power by briefly shutting off power to circuits that are not essential in that mode.

In active mode of operation, When Vin is given Logic 0, transistor MN5 is turned off, and transistor MN6 is turned on. Because the gate terminal of the MN6 transistor is linked to the inverter, the MN6 transistor receives the voltage VDDL and turns on. The MP1 transistor is activated as a result, and the current limiter transistors MN1 and MN3 are activated as well. This provides Logic 1 as an input to the MP4 and MN8, which causes the transistor MN8 to turn on and provide Logic 0 as an output voltage.

When Vin is given Logic 1, transistor MN5 is activated and transistor MN6 is deactivated. Because the MN6 transistor's terminal is linked through the inverter, it receives a voltage of zero and is switched off. Because transistor MN5 is turned on, the MP0 transistor is activated, which activates the current limiter transistors MN2 and MN4, while transistors MN1 and MN3 are turned off. This provides Logic 0 as input to the MP4 and MN8, causing the transistor MP4 to flip on and provide the Logic 1 output voltage, which is VDDH.

IV. EXPERIMENTAL RESULTS

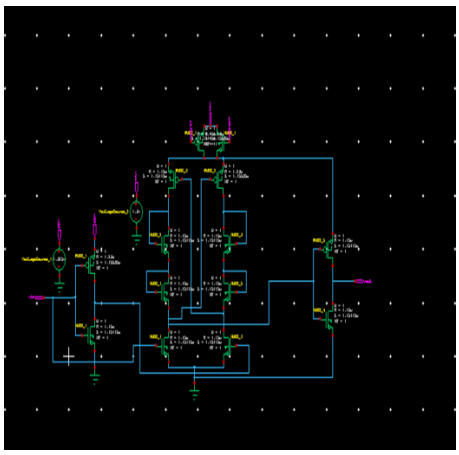

Fig5: Schematic of proposed LS

Figure 5 shows the schematic of proposed level shifter with power gating technique by adding two transistors in parallel as header switches in Tanner tool.

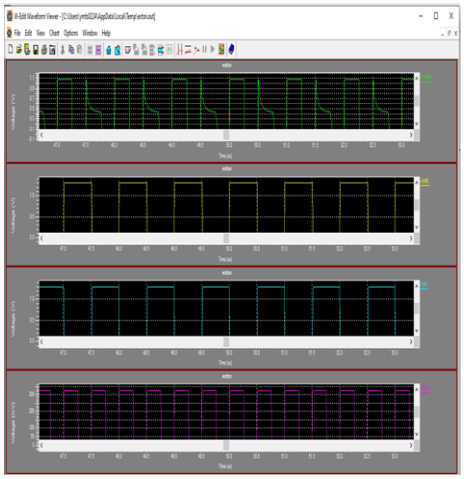

Fig 6: Simulation results for proposed LS

Figure 6 shows the simulation results for proposed level shifter. In this, we observe that when the sl and slb are in active state, we get the output voltages accurately with full swing. And also when the sl and slb are in sleep mode, we get the output voltages which seems to be the discharge of the voltage.

Evaluation table for Area, delay and power:

Parameter	Existing level shifter	Proposed Level shifter
Power (mw	6.1	1.95
Delay(ns)	3.6	3.2
Area	12	14

Table1: comparison between Existing and Proposed methods.

Table1 describes the comparison of performance parameters such as Area, Delay and Power between Level shifter (Existing) and Level shifter with power gating technique (Proposed). From these results, we conclude that the power dissipation is reduced in proposed method by using power gating technique.

The delay is also better in case of proposed level shifter. But, the area (which is nothing but the number of transistors) is less in existing level shifter compared to proposed level shifter because of additional transistors used in power gating technique.

The power results of level shifter with power gating technique. In the result, we are calculating the power from two voltage sources independently. To calculate average power, we have to evaluate the average of average power obtained by the two voltage sources. One is from voltage source_1 and the other is from voltage source_2.

The delay result of level shifter with power gating technique. Because the delay is estimated between the triggering value, which is only input, and the targeted value, which is only output. The computed delay value is 3.242ns in this case.

V. CONCLUSION

This article recommends a double current limiter level shifter with power gating approach. The recommended level shifter with power gating technique was created to shift voltage levels by utilizing 45nm technology. In the power gating approach, additional transistors are placed close to the supply or ground. When compared to the conventional double current limiter level shifter, the proposed circuit requires less energy and even has a lower delay, according to the measurements. The power source doesn't really interact with the power gating network whenever the extra devices seem to be in sleep state. This reduces the amount of energy consumed when sleeping. Ultimately, the postulated level shifter with power gating technique is applied to the IOT applications at interfacing devices.

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A Design of Synchronous Binary Counters Implemented Using Variable Clock for Real Time Applications

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ABSTRACT

In this work, a new fast structure for synchronous binary counting, which has a minimal counting period for practical counters. In many applications, a synchronous binary counter is necessary to be quick and handle a wide bit-width. However, most of the previous counters are associated with a limited counting rate due to large fan-outs and long carry chains, especially when the counter size is not small. In this paper, we first adopt a 1-bit Johnson counter to reduce the overall hardware complexity, and then duplicate the 1-bit Johnson counter to decrease the propagation delay caused by large fan-outs. Implementation results show that the proposed design can be realized with a small number of flip-flops, which is almost linear to the counter size thereby neglecting minimum delays and considering only the maximum delay path of the sub counters implemented in the proposed design. The effectiveness of the proposed method is synthesized and simulated using Xilinx ISE14.7.

Keywords : Backward Carry Propagation, Binary Counter, Constant-Time Counter, Pre-Scaled Counter.

I. INTRODUCTION

A counter is a basic component that can be found in a wide range of applications, including measuring systems, analog-to-digital converters, frequency divisions, phase-locked-loop frequency synthesizers, and so on. Due to recent advances in the applications, it is commonly required to implement a fast, wide counter supporting a constant counting rate doesn't depends upon the counter size. Moreover, the counting rate and the size conflict with each other, because the carry propagation from a low-order bit to a high-order bit becomes longer as the counter size gets larger.

The ripple carry chain in the traditional binary counter was replaced with a carry-look-ahead circuit in order to achieve a significant speedup. In addition, a hierarchical Manchester carry chain was used for carry propagation, and a state-look-ahead topology was used to break the carry chain by adding D F/F's, avoiding the rippling. In the carry chain was constructed with employing a tree structure. However, regarding a counter as a combination of an adder and a state register is not effective in achieving

a constant clock period, since the lower bound of the adder delay is not constant. There have been other efforts to speed up the counter by improving the F/F. For example, high-speed synchronous counters were developed by using the F/F based on the true single-phase clock.

If fast synchronous counting is only required instead of the binary sequence, a counter associated with a constant clock period can be achieved by employing a state generator. For instance, a pipelined carry propagation chain was presented by taking systolic structures, but it doubles the number of F/Fs required as well as the overall hardware complexity. To accomplish both constant delay and binary sequence, another carry propagation method called backward carry propagation was presented. It exploits the characteristics of a binary sequence that the more significant bits become high earlier than the less significant bits. This approach can be applied to achieve a constant-delay counter since the carry propagation is only determined by the least significant bit (LSB). However, the LSB has to drive all F/Fs of the counter, leading to a large fan-out problem. In other words, the number of input ports connected to the LSB exceeds the maximum value that can be derived by the LSB. In addition, another synchronous binary counter based on pre-scaling was presented.

A wide counter is partitioned into sub-blocks. The high-order block is enabled by a pre-scaled enable (PEN) signal generated from the low-order block, and the clock period of a pre-scaled counter is determined by the least significant block. However, there are still issues related to the large fan-out and the wide distribution of a PEN signal that is necessary to drive a large number of the write enable inputs of the F/Fs in the next block. The huge fan-out is in fact the critical issue to be solved in realizing a fast binary counter. As the counter size increases, the fan-out issue becomes more severe, leading to the longer propagation delay.

In this paper, we present a binary synchronous counter that operates with a constant delay for practical counter sizes ranging up to 128 bits. In the proposed counters, the large fan-out issue is mitigated by duplicating the one-bit Johnson counter and by applying the backward carry propagation method to get rid of the additional delay induced by the ripple carry propagation. The suggested counters achieves the highest counting rate, and the counting rate is determined only by the least-significant 1-bit counter regardless of the counter size. The following is a breakdown of the structure of this paper: Section 2 represents the process that has already been accomplished. Section 3 covers the proposed work. The simulation results for the proposed work is presented in Section 4. Section 5 deals with the conclusion.

II. EARLIER WORK

The n-MOD ripple counter can count 2n states, and then the counter resets to its initial value. Toggle mode is utilized with the flip flops. Just one flip flop receives the external clock signal. This flip flop's result is used as a clock signal for the succeeding flip flop. The flip flop through which the exterior clock pulse is transferred acts as the LSB in the counting series. Unlike an asynchronous counter, a synchronous counter uses a single global clock to drive every flip flop, resulting in concurrent output changes. But one benefit of a synchronous counter over an asynchronous counter is that it can function at a greater frequency since there is no cumulative delay so that each flip flop receives having similar clock. The block diagram of synchronous counter is as shown in fig.1

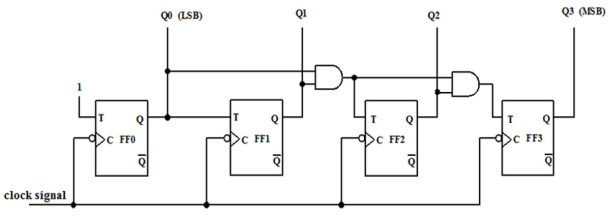

Fig.1: synchronous counter

Ring counters frequently use the Shift resister. The ring counter is virtually equivalent to the shift counter. The only difference is that the last flip-flop's

output is coupled to the first flip-flop's input in every ring counter, whereas it is utilized as an outlet in a shift resister. Except for that, everything else is the same. The number of states in the Ring counter equals the number of flip-flops utilized.

Switch-tail ring counter, wandering ring counter, and Johnson counter are all examples of twisted ring counters. It repeats a sequence of 1s, succeeded by 0s around the ring by connecting the counterpart of the final shift register's outcome to the first register's source. Figure 2 is a block diagram of the Johnson counter.

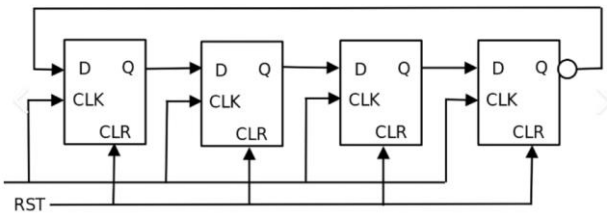

Fig.2: Johnson counter

Johnson counters are synchronous which sometimes referred as a creeping counter. To make an n-bit Johnson counter, the output of the last flip flop is connected to the input of the first flip flop. A popular type of shift register counter is this one. The feedback of the outcome to its own source gives it shape. A ring with a reversal is the Johnson counter. Johnson counters are sometimes referred to as creeping counters, twisted ring counters, walking counters, mobile counters, as well as switch tail counters. In an n-bit Johnson counter, the total number of used and unused states is: Number of used states=2n. Number of unused states=2n – 2*n

The Johnson counter has almost the same number of flip flops as that of the ring counter, but it would count double the number of states. This may be done with either D or JK flip flops. A Johnson ring counter is used to count input in a continuous loop. A self-decoding technology is the Johnson counter. Johnson's drawbacks are as follows: A binary series is not used by the Johnson counter. More states are unutilized than are used, according to the Johnson counter. Flip flops only require half of the total number of timing signals. Any timing sequence can be built into it.

The Johnson counter is a synchronous decade counter or divider. In hardware logic circuits, it is utilized to create powerful Finite State Machines. Examples include ASIC and FPGA design. A 1200 phase shift three-phase square wave generator is being generated using a three-stage Johnson counter. The frequency of the clock signal is separated by varying its feedback.

A synchronous binary counter can be used to produce a reliable binary output. The ripple carry counter is the probably the easiest synchronous counter, that connects the carry-out of a one-bit adder to the carry-in of the next step. The carry pulse is continuously rippled into the following stage, giving rise to the term ripple carry chain. The carry chain's long carry propagation is the primary major bottleneck in the performance of a synchronous counter. Several approaches for fast adders have been devised, and some of them have been adapted to fast counters. In order to acquire a large speed boost, the classic binary counter's ripple carry chain was replaced with a carry-look-ahead circuit. Furthermore, for carry propagation, a hierarchical Manchester carry chain was employed, as well as a state-look-ahead architecture is being used to disrupt the carry chain by inserting D F/ F's, eliminating ripples. Using a tree - like structure, the carry sequence was built. However, because the lower bound of the adder delay is not constant, considering a counter as a combination of an adder as well as a state register is ineffective in establishing a constant clock period. Other attempts to improve the F/F have been made to speed up the counter. High-speed synchronous counters, for example, have been constructed utilizing the F/F based on a real single-phase clock. A state generator can be used to create a counter with a constant clock period instead of a binary sequence if only quick synchronous counting is required. By using systolic structures, for example, a pipelined carry propagation chain was developed, although it

doubles the quantity of F/Fs needed and increases overall hardware overhead. A linear-feedback shift register (LFSR) would be another way to build a state generator, so that requires a lot of extra circuitry to translate the state order to binary or rather make the number of states a powers of 2. Others carry propagation approach termed backward carry propagation was offered to achieve both constant delay & binary sequence.

Combining backward carry propagation with carry look-ahead and standard carry propagation. Phases A, B, and C are used to divide the counter. To minimize the maximum logic depth, the outputs of the bits in Phase A are connected to the carry look-ahead circuit in Reference 1 as shown later. As a result, the toggle signal for high order bits is created by connecting these bits to the input of each AND gate. Backward carry propagation is used in section B, and it operates like this: When Wb2 is set to high, the following clock pulse will cause b3 to switch. We initially combine b2 and bl in an AND gate because they are high before b0. This is paired with b0 to produce the b3 flip signal. The time sensitive AND gate that generates the toggle output has a low fan-in here, indicating high-speed capabilities. A backward ripple chain for each bit is needed in Phase B equipment. Because this is expensive, we suggest a new Phase C with a typical low-cost ripple carry chain to the right of bit. The high-speed data from phases A and B, unfortunately, must be injected. There's really early and late data, just like there is earlier. Phase C's ripple chain forms initially, after which phase B's bits get high, and ultimately phase A's bits rise. We apply the backward carry propagating concept once more, combining the data from the ripple carry chain with the outputs of phase B's rightmost chain firstly. This is then coupled with the phase A bit values to form a toggle output for every bit in phase C. Phase C will use 2 cascaded AND gates to build a tiny backward carry propagation sequence for every bit. The data transmission duration in a simple counter's ripple carry sequence is restricted to Z..,. T, wherein T denotes the counter's clock duration. It exploits the characteristics of a binary sequence that the more significant bits become high earlier than the less significant bits. This approach can be applied to achieve a constant-delay counter since the carry propagation is only determined by the least significant bit (LSB). However, the LSB has to drive all F/Fs of the counter, leading to a large fan-out problem. In other words, the number of input ports connected to the LSB exceeds the maximum value that can be derived by the LSB. In addition, another synchronous binary counter based on pre-scaling was presented.

III. PROPOSED WORK

The proposed N-bit counter is illustrated in Fig.3 below. For the sake of simplicity, let we assume that n = $\lfloor \log 2\ N \rfloor$ and m = $\lceil (N - n)/L \rceil$, where L is the maximum fan-out to be determined by conducting simulations. An N-bit counter is partitioned into three different sub counters in order to take advantage of pre scaling, and m 1-bit Johnson counters are employed to generate m PEN signals to be used for the last sub counter. The Johnson counter is initialized to 0, and the PEN signal is generated to enable the counting of the next sub counter when the Johnson counter undergoes a state change from 0 to 1.

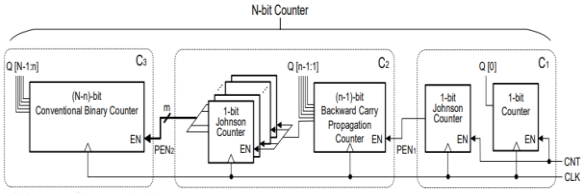

Fig.3: proposed N-bit counter

The backward carry propagation presented is an important concept in implementing a fast synchronous counter. What makes it work is the fact that a more significant bit of the counter becomes high earlier than the least significant bit due to the characteristics of the binary number system. Instead of a single chain used in the conventional binary counter, each counter bit has a separate AND chain

connected in the backward direction, as depicted in Fig. below. In a carry chain, the early arriving signals are evaluated in advance before the lately available signals arrive. The LSB's quickly changing pulse must be coupled to the carry chain's last AND gate, which means that the very last AND gate determines the critical path latency of backward carry propagation. As a result, the propagation delay is mostly dictated by the last AND gate's latency and a T F/F. As shown in Fig.4 below, however, the LSB, Q [0] in this figure, is connected to all the AND chains, having a large fan-out. In other words, the load of the LSB is too large to drive fast, making the critical path delay dependent on the fan-out.

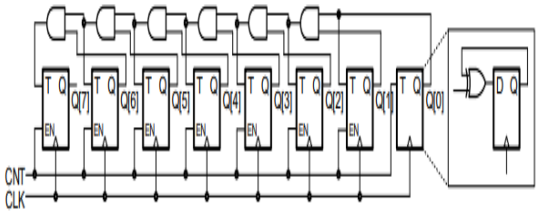

Fig.4: Conventional 8-bit synchronous binary counter with a ripple carry chain

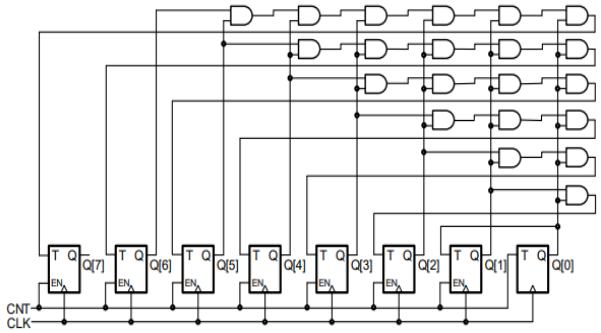

Fig.5: 8-bit synchronous binary counter designed with backward carry propagation.

A. Counter Block plays the role of a sequence generator that counts from 00...000 to 11…111. A counter is in general composed of a register part that stores the present state and a combinational incrementer that computes the next value. The counting rate is mainly limited by the computation time of the incrementer. The delay of the incrementer can be mitigated by pre-scaling. In the proposed counter architecture, an N-bit counter is realized by partitioning it into three sub counters, C1, C2, and C3, as shown in Fig.5 above.

Sub counter C1 is a 1-bit counter that toggles between 0 and 1 every clock. Sub counter C2 is an (n-1)-bit counter that works based on the backward carry propagation, and the last sub counter C3 is an (N-n)-bit conventional binary counter. The basic principle of the partitioned counter is to pre scale the high-order block by considering the low-order block. An N-bit counter is divided into 3 sub counters such that the propagation delay of the (N-n)-bit synchronous ripple carry binary counter C3, which consists of (N-n-1) AND gates, is smaller than the period of PEN2 generated in C2. As the period of PEN2 is 2 n clock cycles, the carry propagation in C3 can be stabilized before the next PEN2 arrives from C2. And sub counter C2 is an (n-1)-bit backward carry propagation counter, and enabled by the 1-bit counter C1. Observing that the delay of the long carry chain is reduced to only one AND gate by employing the backward carry propagation, we can guarantee that the carry propagation of C2 is shorter than the period of PEN1 generated in C1. As a result, we have only 3 sub counters, and the partitioning process is not recursively applied to the sub counters.

The carry propagation delay of C2 is just the summed delay of an AND gate and an XOR gate plus the loading delay of a D F/F. Note that the fan-out effect of the first bit is little enough to be negligible because the size (n-1) is quite small. If the minimum clock period is set by considering the setup time of a D F/F additionally, the carry propagation delay of C2 is always faster than the period of PEN1 generated in C1, which is 2 clock cycles. As a result, the clock period is indeed determined by the least significant sub counter C1.

B. Pre scaled Enable Signal Generation In the pre scaled counter, the PEN signal should be synchronous with the clock and its delay caused by the fan-out be negligible. The typical method to generate the PEN is to use a ring or twisted-tail counter. The ring counter

connects the output of the last F/F to the input of the first one, making a circular structure. When the n-bit ring counter reaches 2 n–1 value, the PEN signal becomes 1.

Similarly, the n-bit twisted-tail counter or the Johnson counter, in which the inverted output of the last F/F is connected to the input of the first one, activates the PEN signal when the count value becomes 2 n–1. They can operate at a high frequency, as there is no combinational circuit between adjacent F/Fs, allowing the PEN to be synchronous with the clock. However, the approach is not efficient, as it needs N F/Fs to traverse N states, increasing the hardware complexity. Moreover, the PEN signal needs to drive all the F/Fs in the next partition, leading to a high fan-out and increasing the propagation delay and thus decreasing the overall counting speed.

For example, a 64-bit counter can be made of a 1-bit sub counter C1, a 5-bit sub counter C2, a 58-bit sub counter C3, a 2-bit ring counter generating PEN1, and a 64-bit ring counter making PEN2. The fan-out of PEN1 is small enough to be ignored. However, as PEN2 drives 58 enable ports in C3, the delay caused by the high fan-out should be considered in the design. As will be found in the simulation and implementation results later, the propagation delay of PEN2 induces the critical path, preventing the counter from having a minimal clock period. To deal with the fan-out issue, a 2 n -bit ring counter is replaced with an 1-bit Johnson counter as illustrated in Fig.6 below, where a 5-bit backward carry propagation counter and a PEN generator are exemplified for N = 64, n = 6 and m = 4. The 1-bit Johnson counter changes its state when enabled after being initialized to 0 at the beginning. Our goal is to make PEN2 have a pulse every 2 n cycles, 64 cycles in this example.

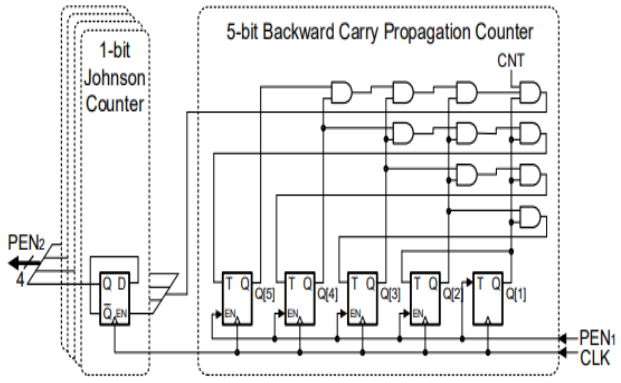

Fig.6: Pre scaled enable signal generation with redundant 1-bit Johnson counters

For the purpose, the enable signal should be high at the (2 n – 2)th and (2 n – 1)th cycles, the 62nd and 63rd cycles in the example, in order to make PEN2 being 1 at the (2 n – 1)th cycle, or 63rd cycle in the example. Such a signal can be generated by exploiting the backward carry propagation method depicted in Fig. 6. The AND operation of Q[5], Q[4], Q[3] and Q[2] can be realized by employing backward AND chains. The Q[5]&Q[4]&Q[3]&Q[2] signal becomes high when Q[2] undergoes a transition from low to high and lasts for four cycles.

The late arriving signal Q[1] is connected to the last AND gate to make the output of the AND chain high for two cycles. The enable signal is equivalent to the result of & Q[5:1], and the computation takes only one AND gate as &Q[5:2] is already computed in advance thanks to the backward carry propagation. The enable signal is high at the 62nd and 63rd cycles, and repeats periodically every 64 cycles. The PEN2 is inverted one clock cycle after the enable signal is asserted.

Consequently, PEN2 becomes high once every 64 cycles. In other words, PEN2 is equivalent to & Q[5:0] that is computed with the least 6 bits of the counter. The 1-bit Johnson counter can be redundantly duplicated to cope with large fan-out nodes. The number of redundant Johnson counters, m, is determined by evaluating m = $\lceil (N - n)/L \rceil$, where L is the number of input ports that can be driven by a F/F. For N ranging from 8 to 128 bits, m is usually less

than 8. As the redundant F/Fs are 8 at maximum, the additional complexity caused by the redundancy is a small portion of the whole counter.

The maximum fan-out of a Johnson counter is set to 16 by conducting intensive simulations in order not to degrade the counting rate. All the Johnson counters are driven by the same signal and thus generate m identical PEN2 signals. Each PEN2 is distributed evenly to drive up to L F/Fs of the next sub counter C3.

PROGRAMMABLE CLOCK DIVIDER

In all other existing methods analog circuitry is used as voltage-controlled oscillators for dividing input frequency. The major demands of dynamic range requirement and speed constraints in phase detection system adaptive line selection based fully reconfigurable all digital frequency divider is proposed. The input sample rate driven rate-controller asserts delay line consists of a combination of inverters and gate chain. Based on unit delay for each logic cell chains are interconnected in order to meet the clock skew design specification. Therefore, a fine delay control scheme is employed.

- PLL is used for synchronous clock generation system to drive counter at variable rate.
- By using this model single source clock can be used for multi rate clock domains.
- Reconfigurable clock divider can able to divide source clock into any integer multiples.

Reconfigurable clock divider

Here, the rate of delay buffer chain depth transition is moderated according to the incoming clock rate and each unit in proposed phase estimation system run at its own speed. Input samples with all types of sampling rate are accommodated and its efficiency through concurrent data propagation process is validated using appropriate clock down sampling and synchronizing events.

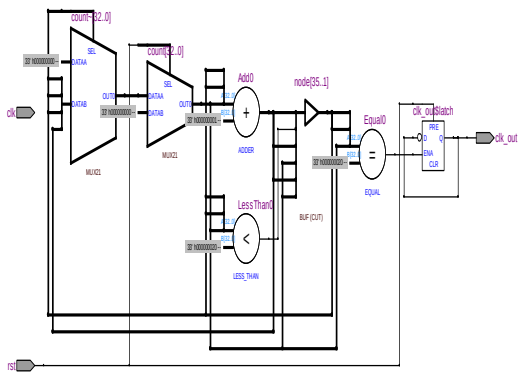

Fig.7 Clock divider unit path delay report

The optimal operating speed of buffer state transition can be determined based on incoming clock rate of the projected samples and adaptively optimization need to be configured using variable delay lines for the different clock-rate of input. As shown in fig.7 it can be observed that the synchronizer model leads to optimal critical path reduction during clock dividing and proved to be efficient in terms of throughput performance. In case of conventional PLL VCO for phase synchronization complex in nature but phase matching is proposed model is performed using reconfigurable delay lines and directly synthesized as buffers.

IV. EXPERIMENTAL RESULTS

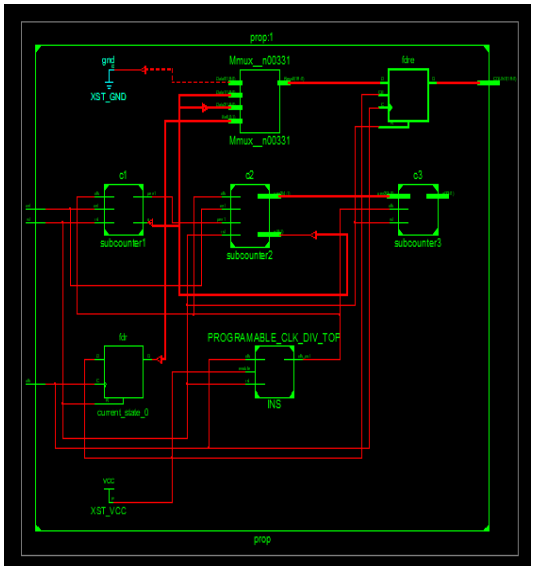

Fig.8: RTL schematic

Figure 8 shows RTL schematic of Proposed binary counter.

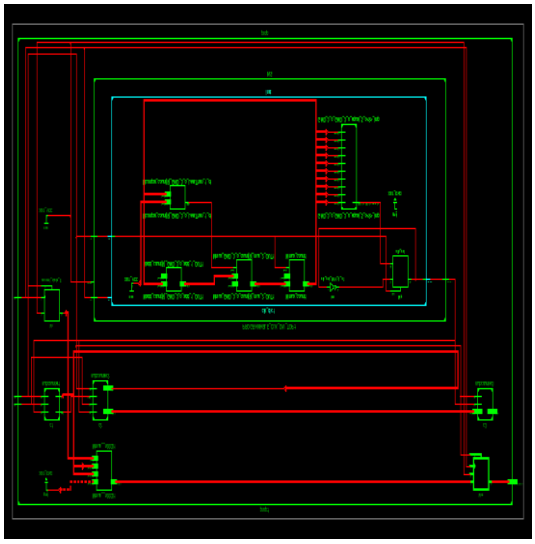

Fig.9: Technology schematic

Figure 9 shows Technology schematic of Proposed binary counter.

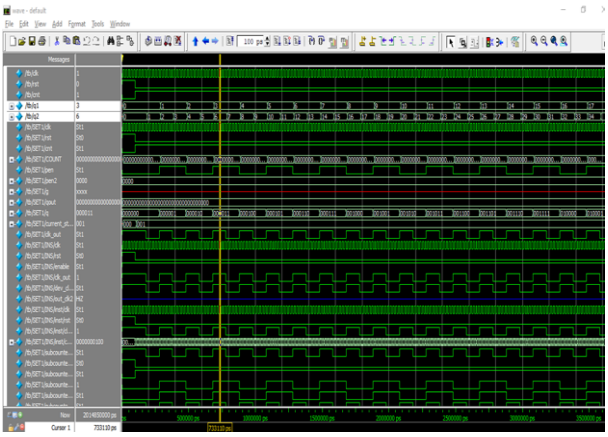

Fig.10: Simulation results

Figure 10 shows the simulation results for the proposed synchronous binary counter.

V. CONCLUSION

In this paper, we have proposed configurable synchronous binary counter architecture which can dynamically modified into any counter sizes. We implemented a variable rate constant synchronous binary counter using reconfigurable integer point clock divider. In this a variable clock frequency can be implemented, so that we can adjust the counting speed of the design. The proposed counter design also used variable rate clock divider which change the counter speed in accordance with different application requirements. The proposed counter are realized with a small number of flip-flops, which is a little higher than the counter size, which is almost independent of the counter size.

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Experimental Analysis and Circuit Modeling of Pulsed Current Injection in a pair of Wires

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ABSTRACT

A pulse current injection (PCI) setup involving a pulse generator with adjustable parameters is designed and modeled in SPICE. In order to allow causal and accurate time-domain simulation, the circuit model makes use of an augmented network to approximate the non-rational frequency response of the injection probe. The obtained SPICE model is preliminary validated by measurement for different sets of values of the pulse-generator parameters. Afterward, an explicative example of radiated test setup is considered. The stress waveform induced at the points of entry of the equipment under test by radiation (evaluated either by theoretical prediction or by measurement in a low-level radiation environment) is taken as reference to prove the effectiveness of the proposed PCI-setup model in identifying the values of the generator parameters required to reproduce the same disturbance by PCI.

Keywords: Pulse Current Injection, Pulse Generator, SPICE, Stress Waveform, Parameters, and Radiation Environment.

I. INTRODUCTION

Pulsed current injection (PCI) allows testing the immunity of electric/electronics devices against fast and intense transient electromagnetic disturbances. The technique resorts to inductive couplers to inject intense transient electromagnetic (EM) disturbances directly into the cable harnesses entering the device under test (DUT). The noise entering the DUT input ports may exhibit significant differences due to the frequency response of the injection device. To investigate these influence factors, a PCI test setup involving a wire-pair is setup and modelled in the SPICE environment. Measurements and simulations are exploited to put in evidence the effects that the presence of other wires in the bundle play on the voltage waveform induced at the terminations of a specific wire.

A formulation for obliquely incident electromagnetic wave has been presented [1] for an analysis of high-power electromagnetic pulse penetration into multilayered dispersive media. Based on generalized models of measured dielectric constants and propagation channels reflecting the Earth's general features, the propagation phenomenon of the

obliquely incident early-time (E1) high altitude electromagnetic pulse (HEMP) is analyzed. In addition, the polarization and critical angle are also considered. It is found that the total reflection occurs at an incident angle of about 38 degrees at the soil-rock interface, and that the parallel-polarized E1 HEMP penetrates better than the perpendicular-polarized one. The peak level of the penetrating electric field is found to be 5.6 kV/m at normal incidence, regardless of the type of polarization, and E1 HEMP is greatly reduced near the critical angle. Moreover, the penetrating E1 HEMP is analyzed as a variation of moisture content and depth of materials, resulting E1 HEMP could be useful in determining the levels of shielding required for buried facilities.

II. PULSE CURRENT INJECTION

Pulse Current Injection (PCI) acceptance testing is used to demonstrate that electrical Point of Entry (POE) protective devices perform in accordance with the transient suppression / attenuation requirements. The PCI tests require high energy generators for delivering current pulses either directly or through coupling devices in the cables. The short pulse test is covered with two generators, PPG-E1-1200 for current pulses up to 1.2 kA and EMP300K-5-500 for 1.5 kA up to 5 kA pulses. Additionally, montena proposes a lower-level pulse generator (EMP10K-5-500) for tests on electronic components. The intermediate pulse test requires a generator delivering up to 260 A.RF antenna line POE must be tested up to 400 A. Montena proposes two “charge line” generators for testing the susceptibility of those antenna ports. A set of charge line plugs of different lengths are supplied in order to generate frequencies in the specified range. Each generator is fully configurable, with current adjustable output, manual or remote control.

Montena has developed a full range of pulse generators according to MIL-STD -188-125-1 & 2. This standard describes the pulsed current injection (PCI) tests, simulating the currents induced in cables exposed to NEMP pulses. The systems provided cover the short pulse (E1) and the intermediate pulse (E2) tests. A charge line pulser is also available for antenna line testing. Accessories such as current injection and measuring probes, coupling and decoupling networks, fiber optic links, etc. are delivered with the equipment. A PC software application drives all the instruments for a simple and effective operation.

The advantages of the PCI are mentioned below:

- Unique fully compliant test solution to cover the entire standard requirements.
- Transportable for on-site verification tests.
- Control and pulse management software package to simplify the test procedure.

A typical test setup comprises following elements as shown in the following fig. 1.

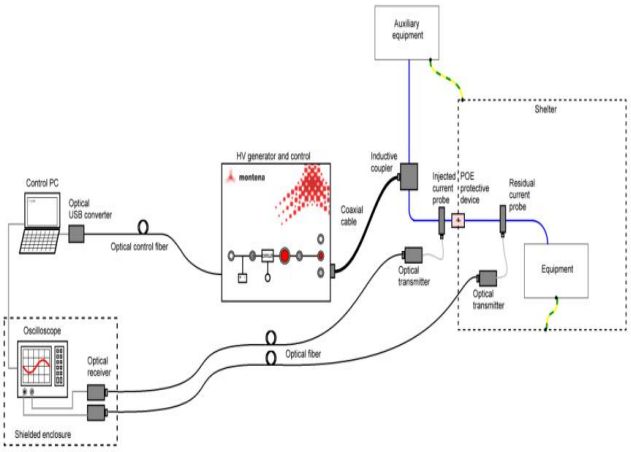

Figure 1: Schematic of a typical PCI test setup installation

The high voltage pulse generator delivers the specified high current pulses either directly or through coupling devices into the wire attached to the protective device under test. The major part of the injected energy shall be shortcut to the grounded shielding. Only a small residual part of the pulse may enter the facility through the point of entry protective

device. An oscilloscope measures the injected and residual pulse with current probes for display and eventually storage in the control PC. In order to ensure correct measurement, the current probes are connected using fiber optic links and the measurement equipment shall be installed in a shielded enclosure. Montena Pulse Lab software application takes care of the configuration of the measurement oscilloscope. It directly provides the injected and residual current pulse shapes and parameters, what reduces to almost zero the risk of measurement errors.

Montena's PCI test system is able to perform pulsed current injection tests according to MIL-STD 188-125-1 & -2, short pulse (E1), intermediate pulse (E2) and charge line pulse tests. This is shown in the below table I.

TABLE I

PULSE SHAPES

	E1 - Short pulse	E2 - Intermediate pulse	Charge line pulse
Max. short circuit current (Isc)	≥ 5'000 Amp	≥ 250 Amp	≥ 400 Amp
Adjustable range of Isc	≤ 100 to ≥ 5'000 Amp	≤ 25 to ≥ 250 Amp	≤ 10 to ≥400 Amp
Waveform	Double exponential	Double exponential	Variable pulse width
Rise time (10%~90%)	≤ 20 ns	≤ 1.5 µs	≤ 5 ns
FWHM (50%~50%)	500 .. 550 ns	3 .. 5 ms	variable
Source impedance	≥ 60 Ω	≥ 10 Ω	≥ 50 Ω

The PCI test setup can be established in three different manners based on the pulse. They are:

- Portable Low Level Short Pulse Test Setup
- High Level Short Pulse Test Setup
- Intermediate Pulse Test Setup

Portable Low Level Short Pulse Test Setup

This test setup shown in fig. 2 shall be used for the injection of the short pulse (E1) with a peak current intensity of up to 1200 A. It has been designed to ease the onsite tests, especially for the periodic reverification campaigns

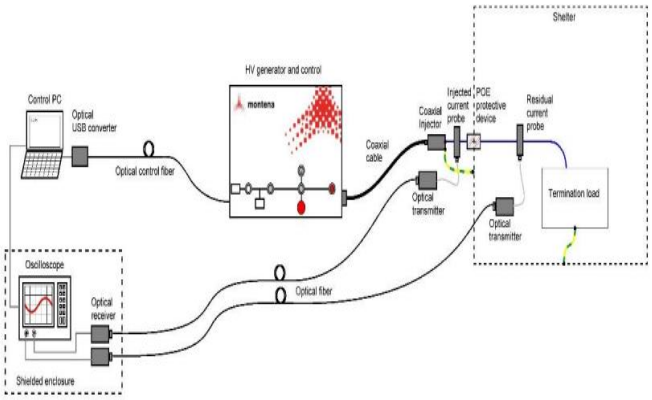

Figure 2: Typical acceptance test setup with the PG-E1-1200 generator

1200 AMP SHORT PULSE GENERATOR

The portable generator PPG-E1-1200 generates output current pulse according to MIL STD 188-125, E1. It has an internal impedance of >60 ohm and its charging between may be set between may be set between 5-80 kv It delivers short circuit current pulses in the range of 50-1200 A.

The generator is compact, battery powered for easy deployment at customer site, where power is not always available. The power autonomy is up to one day and it can be charged from a 110V – 240V power plug directly.

The generator is remote controlled from a web-based software application through an USB optic link. The operator is thus totally electrically insulated from the high voltage elements. The generator is delivered with ruggedized transportation box on wheels for easy deployment on site.

TABLE II

1200 APM SHORT PULSE GENERATOR SPECIFICATIONS

SPECIFICATIONS	
Type	**PPG-E1-1200**
Standard	MIL-STD-188-125-1 and -2 / short pulse (E1)
Peak short circuit current	≤ 50 A to 1.2 kA
Peak voltage (open circuit)	≤ 5 kV to 80 kV
Output waveform	double exponential
Source impedance	≥ 60 ohms
Pulse rise-time (short circuit)	< 20 ns
Pulse length (FWHM, short circuit)	500 - 550 ns
Output interface	8 meters HV coaxial cable with a special coaxial termination
Insulation	oil
Interfaces	USB / optic fiber
Power rating	85 – 132 / 187 – 264 Vac, 47 - 63 Hz
Autonomy (on internal battery)	about 8 hours
Generator dimensions	55 x 50 x 25 cm (L x W x H)
Weight	31 kg (with external HV cable), 50 kg (total with transportation box)

SPECIFICATIONS	
Type	**EMP300K-5-500**
Standard	MIL-STD-188-125-1 and -2 / short pulse (E1)
Peak current (short circuit)	≤ 1.5 kA to 5 kA
Peak voltage (open circuit)	100 kV to 350 kV
Output waveform	double exponential
Source impedance	≥ 60 ohms
Pulse rise-time (short circuit)	< 20 ns
Pulse length (FWHM, short circuit)	500 - 550 ns
Output interface	Bar with screws
Insulation	SF6
Interfaces	USB / optic fiber
Power rating	210 – 250 Vac, 50 - 60 Hz, 600 VA
Generator dimensions	188 x 60 x 42 cm (L x W x H)
Weight	about 175 kg

High Level Short Pulse Test Setup

This test setup shall be used for the injection of the short pulse (E1) with a peak intensity between 1500 A and 5000 A.

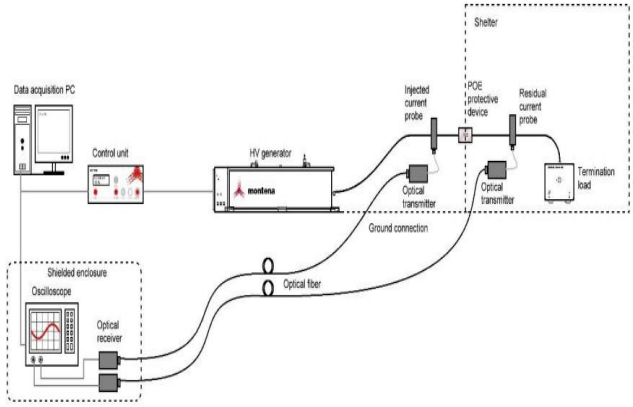

Figure 3: Typical acceptance test setup with the EMP300K-5-500 generator

5000 AMP SHORT PULSE GENERATOR

To fulfil the MIL-STD test specifications up to more than 5000 A peak current with a 60 Ohm internal impedance, this short pulse generator must be charged at more than 300 kV. The generator is based on a Marx technology. The generator is remote controlled from a control unit with USB and RS232 control interfaces. A dedicated control software application is also available to automate the test setup.

TABLE III

5000 AMP SHORT PULSE GENERATOR SPECIFICATIONS

Intermediate Pulse Test Setup

This test setup shall be used for the injection of the intermediate pulse (E2) with a peak intensity up to 260 A.

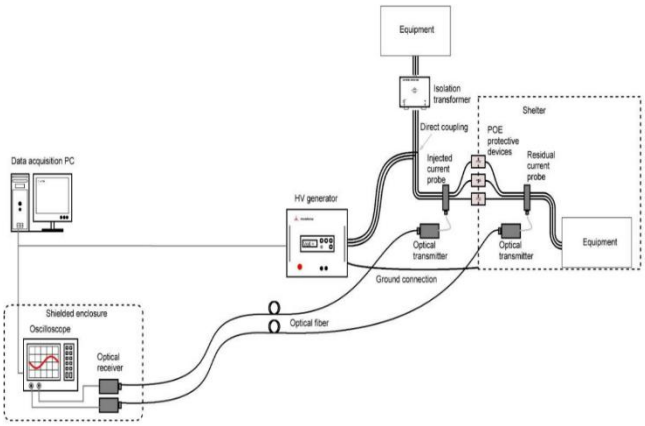

Figure 4: Typical verification test setup with the IPP3K-4MS generator

INTERMEDIATE PULSE GENERATOR

This generator is built using a direct discharge of high voltage capacitors.

TABLE IV

INTERMEDIATE PULSE GENERATOR SPECIFICATIONS

SPECIFICATIONS	
Type	**IPP3K-4MS**
Standard	MIL-STD-188-125-1 and -2 / intermediate pulse (E2)
Technology	direct discharge
Peak short circuit current	25 A to 260 A
Peak voltage (open circuit)	3 kV max, positive only
Output waveform	double exponential
Source impedance	≥ 10 ohms (typ.11 ohms)
Pulse rise-time (short circuit)	0.6 µs
Pulse length (FWHM, short circuit)	3.4 ms
Output interface	4 outputs, safety connectors
Interfaces	RS 232 / USB
Power rating	200 – 264 Vac, 50 - 60 Hz, 1.6 kVA peak
Generator dimensions	55 x 51 x 40 cm (L x W x H)
Weight	42 kg

III. PCI TEST SET UP AND CIRCUIT MODELLING IN SPICE

Overview of the used Test Set up

PCI is a non-interfering and cost-effective technique, to test the robustness of electric/electronic devices to high-altitude electromagnetic pulses (HEMPs).The technique resorts to inductive couplers to inject intense transient electromagnetic (EM) disturbances directly into the cable harnesses entering the device under test (DUT).For bulk current injection (BCI), the PCI test the input of the equipment under test a transient disturbance with expected characteristics (i.e., amplitude, rise time, and pulse width).

When the probe is then mounted on the real cable harness, significant differences between the waveform actually injected in the DUT and the theoretical waveform set through calibration can be expected. Measurement on controlled test setup and circuit (SPICE) simulation are used with the objective to accurately predict and compare the stress waveforms theoretically injected across the 50-fi terminations of a single-wire cable. With respect to other testing techniques, PCI does not require large and expensive test facilities. Moreover, since the disturbance can be injected into a cable or even into a single wire at a time. Pulsed current injection (PCI) is widely used for immunity testing of electronic equipment to intense transient electromagnetic disturbance, caused by lightning, switching operations in substations, high-altitude nuclear explosion, etc. Pulse current injection (PCI) is a convenient and effective technique to test the vulnerability of electric/electronic equipment to high-altitude electromagnetic pulses (HEMPs).

Circuit Modelling

In this Section, circuit modelling of the key components in the PCI test setup in Fig. 5 (i.e., the pulse generator and D-coupler, the wiring fixture and coupling device) is addressed, with the objective to implement and simulate the PCI test setup.

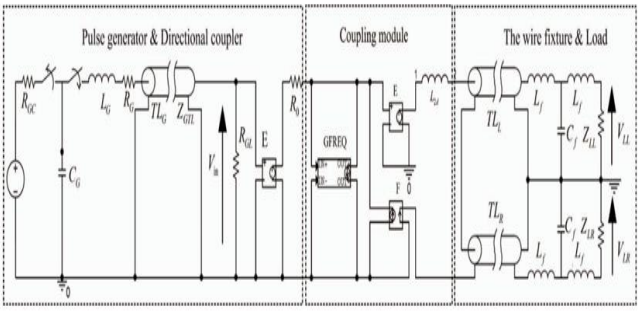

Figure 5: Depiction of Circuit Modelling

The test consists in injecting an electromagnetic (EM) threat-retable transient onto the cables of the equipment under test (EUT) by an injecting probe, and monitoring EUT robustness against such a stress waveform. Compared with radiated tests, where the system is completely immersed in the EM environment, PCI allows more accurate screening and detection of critical cables (and points of entry), by resorting both to common mode and single wire-to-ground noise injection [1]. Moreover, since the test is run on the tabletop, PCI is attractive in terms of required time and costs. The standards in provide several regulations for the injected current waveform, in terms of amplitude, rise time, and pulse width. However, most of them focus just on the calibration setup.Hence, though interference at the EUT input represents the key-quantity to qualify EUT vulnerability, it is hard to control and set the actual standards in provide a number of regulations for the injected current waveform, in terms of amplitude, rise time, and pulse width. However, most of them focus just on the calibration setup. Hence, though

interference at the EUT input represents the key-quantity to qualify EUT vulnerability, it is hard to control and set the actual waveform induced at the EUT input pins. On the other hand, though several recent works investigated the correlation between field-to-wire coupling and bulk current injection (BCI) under continuous-wave (CW) conditions little has been done so far concerning the injection of transient EM disturbances. In this framework indeed, stressing the EUT with a pulsed waveform with the same characteristics of the current induced at the EUT input in a radiation environment would be highly desirable. In this letter, a PCI test setup assuring accurate reproduction at the EUT input of a stress waveform with assigned characteristics is presented. The setup comprises a BCI probe clamped on a single-ended wiring interconnection and fed by a pulse generator with adjustable parameters.

Figure 6: Test setups deployed to experimentally investigate PCI on the case of single- wire harness

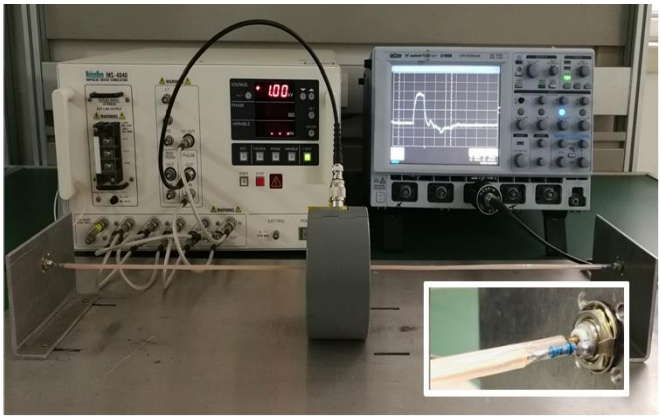

Figure 7: Test setups deployed to experimentally investigate PCI on the case of a straight wire-pair cable

Test setups exploited for experimental investigation of PCI

It is shown that accurate modeling of the test setup in SPICE can be profitably exploited to set the adjustable parameters of the pulse generator so that a specified stress waveform, preliminarily evaluated either by calculations or by measurements in a low-level radiated test, can be subsequently injected in the input pins of the EUT. The obtained PCI setup model (exploiting an augmented RLC model of the BCI probe to avoid convergence issues in the time domain) is first assessed versus measurement data. Then, by a specific example of radiated immunity test setup, it is exploited to identify the pulse-generator parameters required to reproduce the stress waveform injected in the EUT.The actual stress waveform injected at the DUT input often exhibits significant differences with respect to the theoretical one. If on the one hand this weakens test significance, on the other hand it makes hard the correlation with the stress waveform, that would be induced by direct illumination of the system in a radiation environment.

IV. RESULTS AND DISCUSSION

Assessment investigation of acceptance and validation assessment data of PCI is needed for sorting out every instrumentation and probe entity reply attributes. These assessment investigations are also needed for transforming measured outcomes into measurables in terms of engineering units. Another outcome desirable was to support in devising a conclusive hardness of subsystem and system statement. These assessments are possible only from the support imparted from a few sponsoring agencies. The assessments could generally include the following:

- CW immersion-oriented threat replies.

- Test data of PCI.
- Illumination of threat-level.
- Investigations of Validation assessment necessity.
- Conclusions drawing based on hardness.
- Suggestions for remedial course of actions.

With the final objective to assure equivalence between radiated and conducted immunity testing to intense electromagnetic pulses, in this work a circuit model of a typical. Pulsed current injection (PCI) test setup is derived, implemented in SPICE, and validated by measurement. By virtue of such a model, the parameters of the discharge circuit of the pulse generator can be adjusted to compensate the waveform distortion introduced by the injection probe. Results of preliminary PCI tests are presented with the twofold objective to validate the models proposed in the previous sections, and to show the effects of different values of the PCI setup parameters.

A. *Probe Circuit analysis*

In this sub-section, we will analyse the probe circuit with its schematic in the below fig. 8. We will make this comprehensive analysis by making use of Microcap in order to indicate the various attributes.

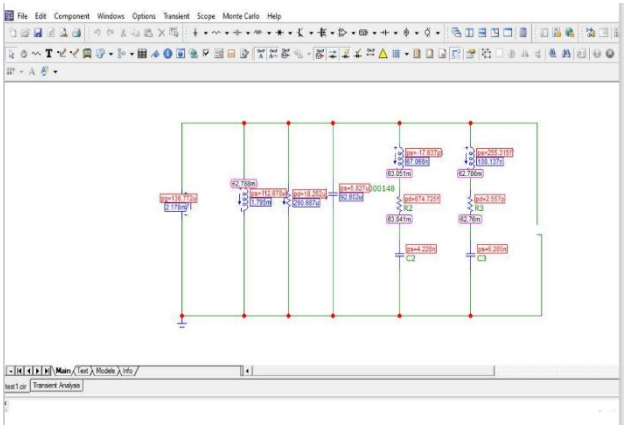

Figure 8: Probe Circuit analysis in Microcap

Now that, we have known the attributes, we will see the result of AC Analysis and Frequency of it in the following fig. 9 and fig. 10, respectively.

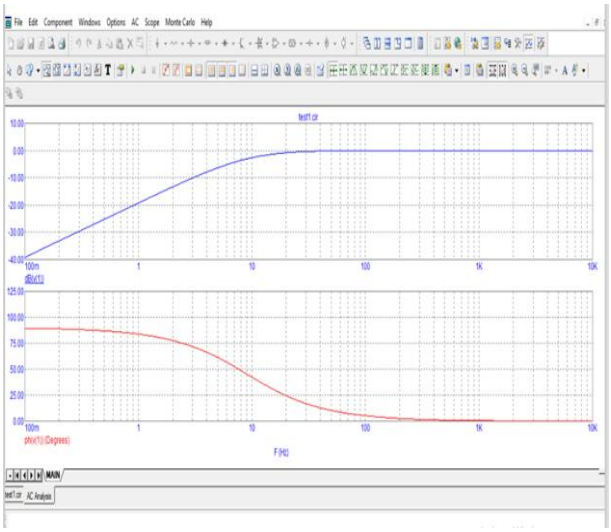

Figure 9: AC analysis result

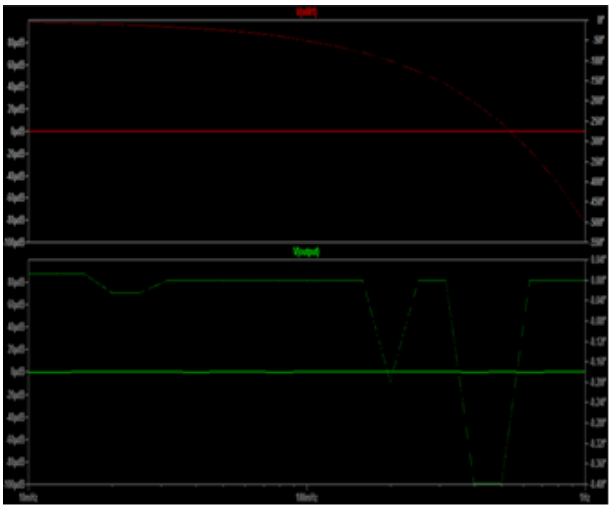

Figure 10: Frequency response

Pulse generator

In this sub-section, we will look into the simulation aspect of the pulse generator with its schematic in the below fig. 11.

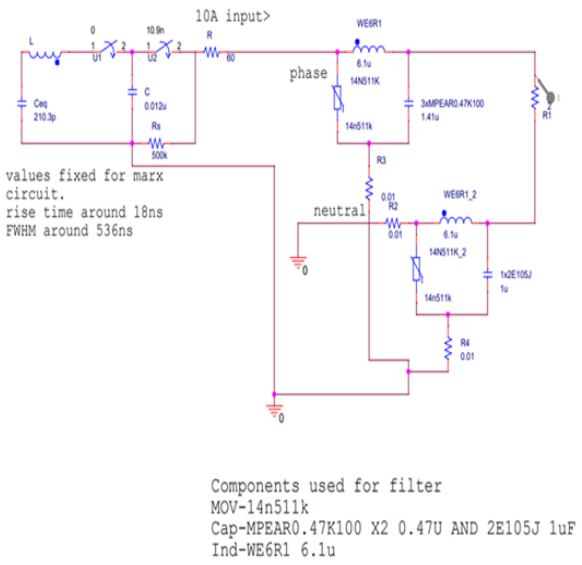

Figure 11: Simulation-based schematic for Pulse Generator

This schematic will be having several information including but not limited to: Values utilized for circuitry, components utilized for filter, etc. Then, the output from this generated will next be analyzed. In the below fig. 12, the time output has been shown and in the next fig. 13, - I output has been shown in appropriate manner.

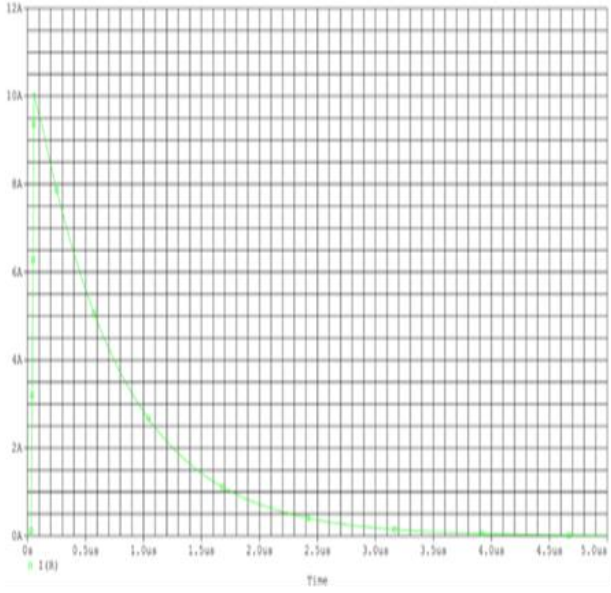

Figure 12: Time output from Pulse Generator

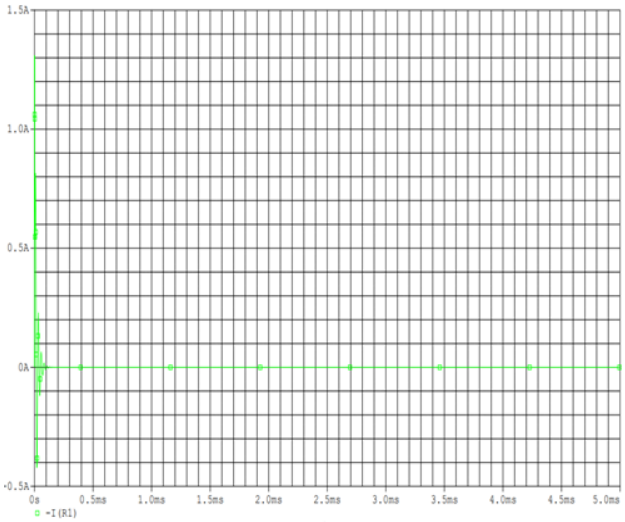

Figure 13: - I output from Pulse Generator

Circuit on microcap

Having already analysed about the probe circuitry, we will now analyse about the main circuit in this sub-section. In the following fig. 14, the analysis of our circuitry on Microcap has been depicted.

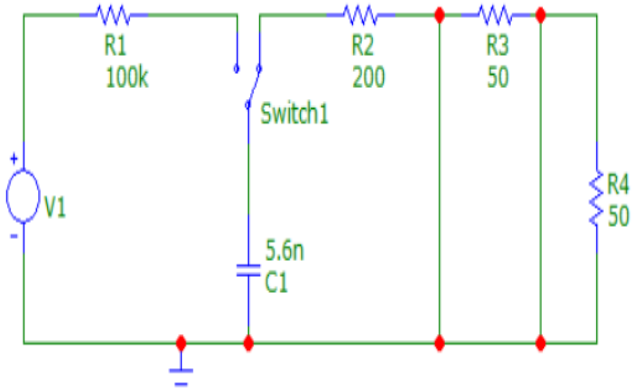

Figure 14: Circuit Analysis on Microcap

Switch 1 on left side

In this sub-section, we will first discuss the case of considering the switch 1 in the left side with its corresponding schematic in the following fig. 15 and then its outcomes:

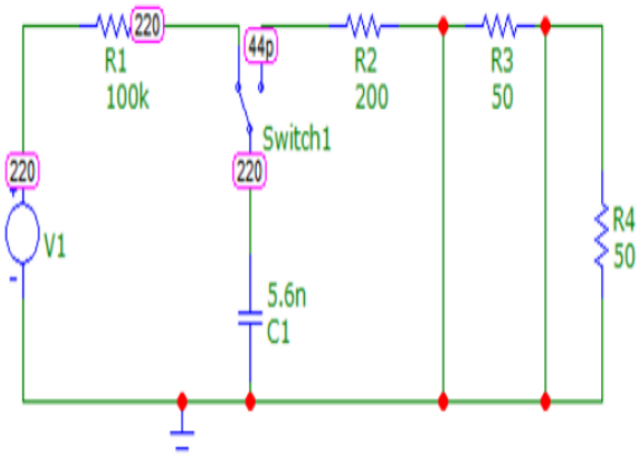

Figure 15: Depiction of Switch 1 on Left Side

Now, we depict the observed transient result in the below fig. 16. Followed by it, the observed AC result has been given in the next fig. 17. In the same way, the DC results were observed and depicted in the next fig. 18. Finally, fig. 19 is depicted to show the Observations from the Dynamic DC Result.

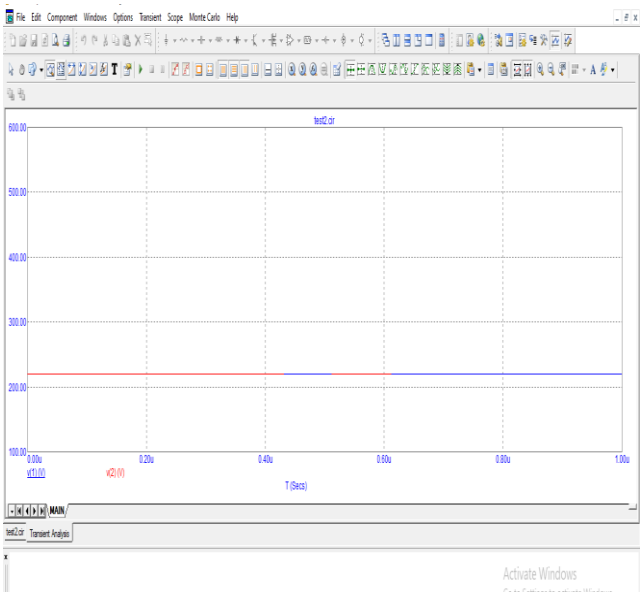

Figure 16: Transient Result Observations

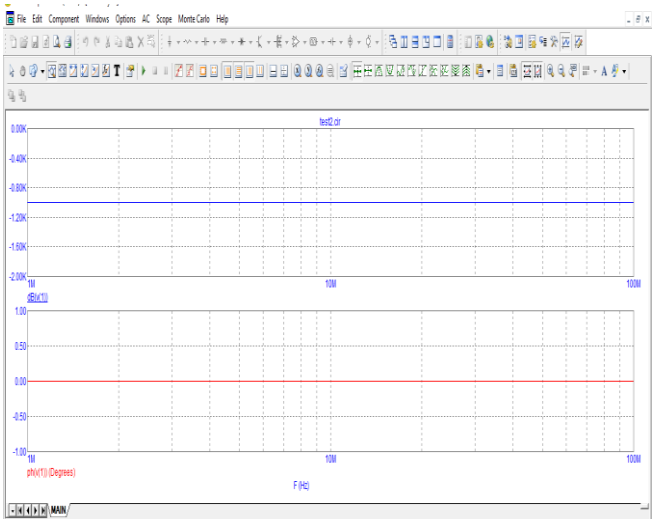

Figure 17: AC Result Observations

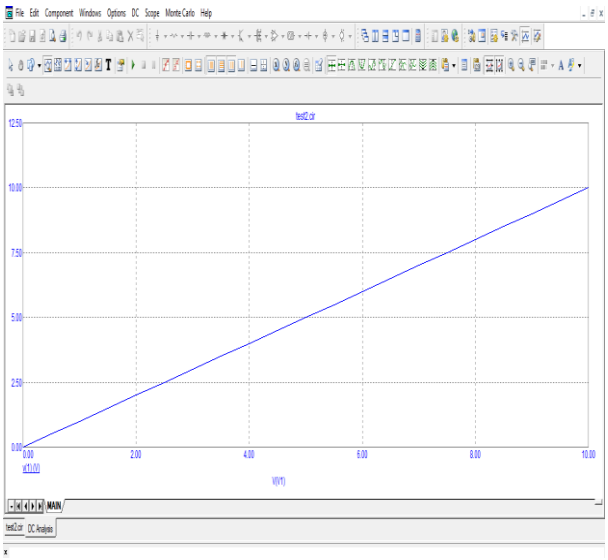

Figure 18: DC Result Observations

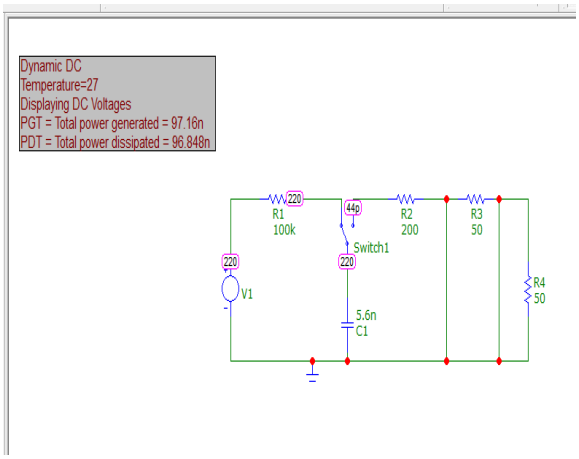

Figure 19: Dynamic DC Result Observations

Switch 1 on right side

In this sub-section, we will first discuss the case of considering the switch 1 in the right side with its corresponding schematic in the following fig. 20 and then its outcomes:

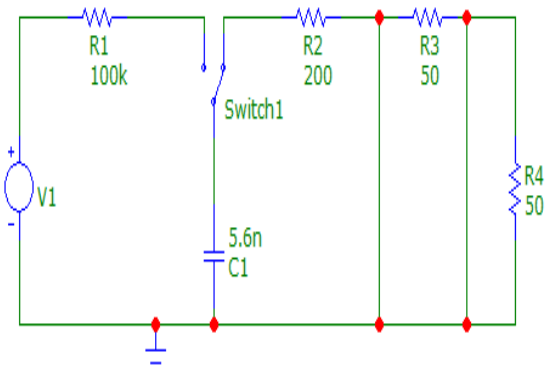

Figure 20: Depiction of Switch 1 on Right Side

Now, we exhibit the observed transient result in the below fig. 21. Next to it, the observed AC result has been shown in the succeeding fig. 22. Likewise, the DC results are depicted in the next fig. 23 and finally by fig. 24, which has been indicated to show the Observations from the Dynamic DC Result.

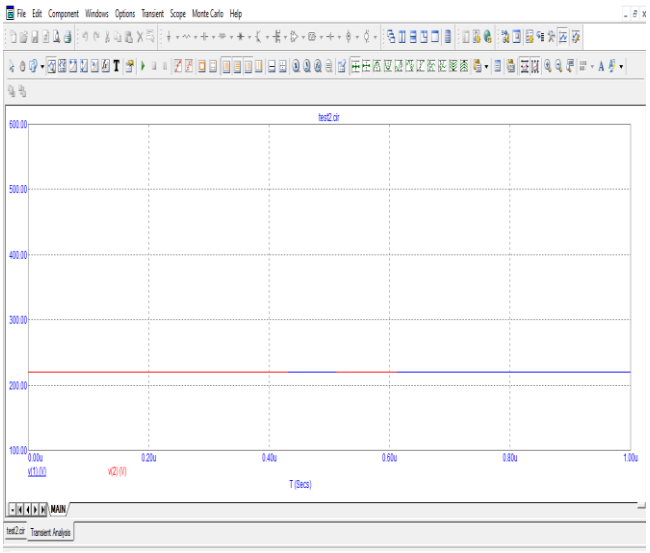

Figure 21: Transient Result Observations

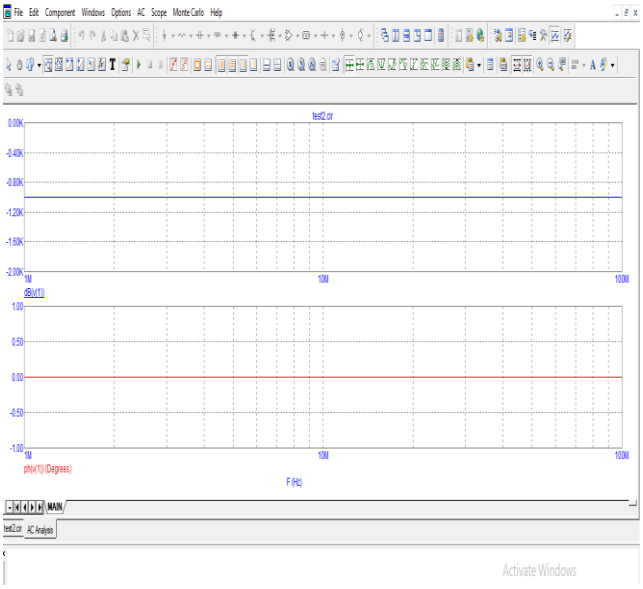

Figure 22: AC Result Observations

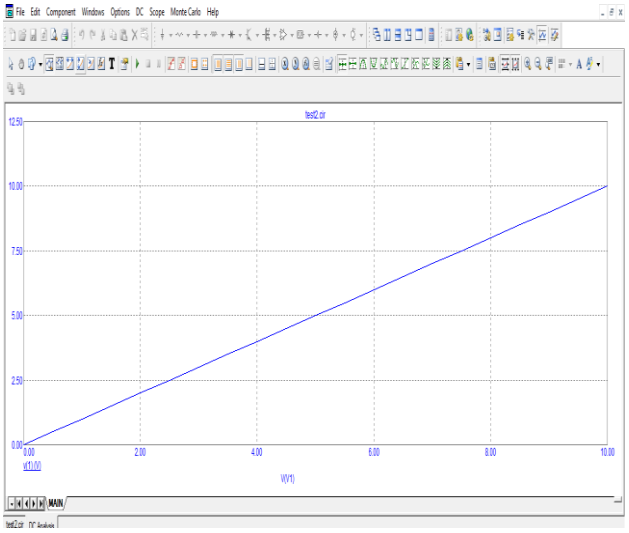

Figure 23: DC Result Observations

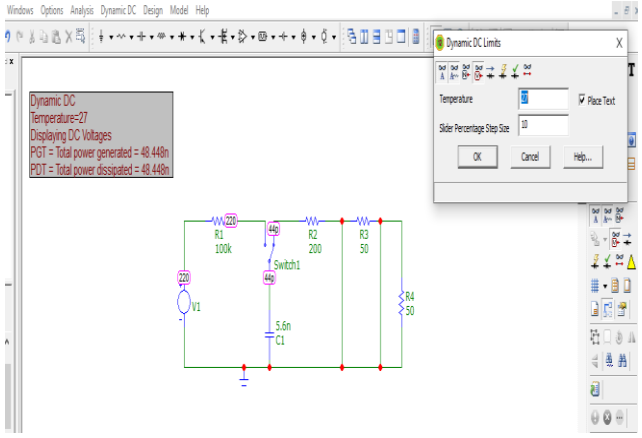

Figure 24: Dynamic DC Result Observations

V. CONCLUSION

This finding suggests to further investigate the role that different loads connected at the terminations of the wiring harness plays on the amplitude and shape of the induced voltage waveform. Test setup for PCI injection has been realized and modelled in the SPICE environment. Measurements and simulations have been used to investigate the influence of the presence of additional wires in the bundle, as well as their terminations, on the stress waveforms induced at the input pins of the device under test.

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A Psychological Strategy for Improving Parenting Abilities

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ABSTRACT

In order to lessen the prevalence of behavioral and emotional issues in preadolescent children, this research describes the theoretical underpinnings of a novel multilayer parenting and family support technique. A tiered system of family intervention, the Triple P-Positive Parenting Program offers five progressively more intense levels of intervention. In addition to two levels of quick primary care consultations aimed at treating moderate behavioral issues, these interventions also include two more comprehensive parent education and family intervention programs for kids who are at higher risk of developing more serious behavioral issues. The goal of the program is to identify the minimally necessary parenting action needed to divert a child's course away from more serious issues. A core principle in the approach is parental skill self-regulation. The program adapts the intervention's strength to each family's needs by using flexible delivery modalities (such as individual face-to-face, group, telephone-assisted, and self-directed programs). The program has a broad reach due to its multidisciplinary, preventative, and community-wide orientation, which enables it to target destigmatized access points through primary care services for families who are hesitant to take part in parenting skills programs.

Keywords : Parents, Positive Parenting, Intervention, Behavioural Issues

I. INTRODUCTION

The well-being of children is fundamentally dependent on the quality of family life. The parent-child relationship in particular, as well as family interactions in general, have a significant impact on children's psychological, physical, social, and economic well-being. Family dysfunction and the deterioration of family ties are associated with a number of serious social, economic, and mental health issues (Chamberlain & Patterson, 1995).

According to epidemiological research, family risk factors like neglectful parenting, family strife, and marriage dissolution have a significant impact on children's development. Particularly, a lack of warm, positive interaction with parents, insecure attachment, aggressive, inflexible, restrictive, or inconsistent discipline methods, insufficient supervision of and involvement with children, marital conflict and

breakdown, and parental psychopathology (particularly maternal depression), increase the risk that kids will experience serious behavioral and emotional issues, such as substance abuse, antisocial behavior, and juvenile crime.

In order to better prepare parents for their duty as caregivers, this paper provides the theoretical and empirical underpinnings of a comprehensive multilevel model of parenting and family support. The program's special features are examined, and potential study avenues are emphasized.

WHAT IS A TRIPLE P- POSITIVE PARENTING PROGRAM?

Triple P is a multilayer method of parenting intervention that was created at the University of Queensland in Australia with the goal of raising the standard of parenting assistance provided to parents. (Sanders, 1999; Sanders, Markie-Dadds, & Turner, 2003). As a home-based, individually administered training program for parents of pre-schoolers to teenagers, the program had its start on a limited scale. (Sanders & Glynn, 1981). Parents are taught specific tactics as part of the intervention that is designed to increase the protective factors and decrease the risk variables mentioned above.

The Triple P model includes a five-tiered system of increasing strength interventions, starting with media and information-based strategies, moving on to primary care consultations that last only briefly, and finally ending with more intensive parent education and improved behavioral family interventions. Along with other family adversity variables like marital conflict, depression, and high levels of parenting stress, the increased intervention concentrates on parenting skills. The universality of Triple P, the use of various levels of intervention to help match intensity to need, the multidisciplinary nature, the use of adaptable delivery modalities, the encouragement of a self-regulatory approach to help with maintenance and generalization, and the targeting of destigmatizing access points are some of its distinctive features. All parents are intended to benefit from Triple P, which uses the media to reach them all with a saturated message and with simple access to the program.

Principles of Positive Parenting

The program's foundational five positive parenting tenets were chosen to address particular risk and protective factors that are known to forecast favorable developmental and mental health outcomes in children.

1. A secure and interesting environment

Children of all ages require a protected atmosphere that is safe, supervised, and allows them to play, explore, and experiment. This idea is crucial for encouraging healthy development and avoiding accidents and injuries at home.

2. An environment that fosters learning

The program specifically teaches parents to respond positively and constructively to child-initiated interactions (such as requests for help, information, advice, and attention) through incidental teaching and other techniques that help children learn to solve problems for themselves. Although this principle involves educating parents in their role as their child's first teacher.

3. Advocacy in Discipline

Alternatives to forceful and ineffective forms of discipline that are taught to parents through Triple P include particular child management and behavior modification techniques (such as shouting, threatening, or using physical punishment). These techniques include establishing ground rules for certain circumstances, talking about rules with kids, issuing clear, calm requests and directions that are age-appropriate, laying out logical consequences, using the quiet time (non-exclusionary time-out), time-out, and intentional ignoring.

4. Achievable Expectations

This principle entails discussing goals that are both developmentally appropriate for the kid and practical for the parent, as well as parents' expectations,

assumptions, and ideas regarding the reasons behind children's behavior. Parents who put their kids at danger of abuse are more likely to have exaggerated views of what they can do.

5. Parental Self-Care

Numerous aspects that have an impact on a parent's sense of wellbeing and self-worth are related to parenting. By urging parents to see parenting as a part of a larger framework of personal self-care, resourcefulness, and well-being and by imparting useful parenting techniques that both parents can use, the Triple P programme expressly addresses this issue at all levels.

Table 1. The Triple P Model of Parenting and Family Support

Level of intervention	Target population	Intervention methods	Practitioners
Level 1 Media-based parent information campaign Universal Triple P	All parents interested in information about parenting and promoting their child's development.	A coordinated media and health promotion effort aimed at promoting parenting programmes and bringing attention to parent-related issues. maybe utilising print and electronic media (e.g., community service announcements, talk-back radio, newspaper and magazine editorials).	Typically coordinated by area media liaison officers or mental health or welfare staff.
Level 2 Health promotion strategy/brief selective intervention Selected Triple P Selected Teen Triple P	Parents with an interest in parenting education or specific worries about their child's conduct or development.	Information on health promotion or tailored guidance for a particular developmental concern or minor difficulty with a child's behaviour. may entail a brief (20 minute) telephone or in-person therapist contact or a group seminar session.	Parent support during routine well-child health care (e.g., child and community health, education, allied health, and child care staff).
Level 3 Narrow-focus parent training Primary Care Triple P Primary Care Teen Triple P	Parents who need counselling or active skill training because of the aforementioned problems.	A quick programme (approximately 80 minutes spread over 4 sessions) that teaches parents how to control a specific issue behaviour in a child. May involve telephone or faceto-face clinician contact or group sessions.	Same as for Level 2.
Level 4 Broad-focus parent training Standard Triple P Group Triple P, Group Teen Triple P Self-Directed Triple	Parents who desire comprehensive instruction in effective parenting techniques. Parents with kids who exhibit aggressive or	Parent-child contact and the application of parenting skills to a wide range of target behaviours are the main topics of this programme with a broad focus (approximately 10 hours across 8–10 sessions). includes	Intensive parenting interventions (e.g., mental health and welfare staff,

P Self-Directed Teen Triple P	rebellious conduct, for example, are typically.	techniques for improving generalisation. may involve group sessions, telephone or in-person contact with a clinician, or self-directed activities.	and other allied health and education professionals who regularly consult with parents about child behavior).
Stepping Stones Triple P	families with preschool-aged disabled children who already have or are at risk of having emotional or behavioural problems.	A 10-session, parallel curriculum that focuses on disability and is individually designed. Sessions usually last 60 to 90 minutes (with the exception of 3 practise sessions, which last 40 min).	Same as above.
Level 5 Intensive family intervention modules Enhanced Triple P	Conflict between partners or parents of kids with behaviour issues and associated family dysfunction (such parental melancholy or stress).	A comprehensive, personally planned programme with modules (sessions run 60–90 minutes) that include practise sessions to improve parenting abilities, stress and mood management skills, and partner support skills.	Intensive family intervention work (e.g., mental health and welfare staff).
Pathways Triple P	Parents who might abuse their children. Program focuses on issues with controlling anger and other aspects of abuse.	Modules cover anger control and attribution retraining.	Same as above

Source: Sanders, M. R. (2008). Triple P-Positive Parenting Program as a public health approach to strengthening parenting. Journal of family psychology, 22(4), 506.

Implementation of Positive Parenting

In order for the public health approach to be successful, it is necessary to complete a number of crucial tasks before a multilevel program can be transformed into a system of treatments offered on a large scale. There are seven specific principles:

(i) Having data on the fundamental prevalence rates of specific juvenile issues;

(ii) a record of the baseline prevalence rates of risk and mitigating factors;

(iii) having proof that addressing these risk and protective variables decreases specific child issues;

(iv) demonstrating the availability of efficient and culturally acceptable interventions for dissemination;

(v) having a successful training and distribution system;

(vi) making the interventions widely available; and

(vii) A plan for handling the inevitable socio-political milieu that surrounds population-level actions is an extra requirement.

Establish Base Rates for Modifiable Parental Risk and Protective Factors

A child's exposure to a strict, inconsistent parenting style, low parental self-efficacy in handling the

responsibilities of raising children, mental health issues in parents (such as depression and anxiety), high marital or partner conflict, and a lack of parenting support are all potentially modifiable parenting factors that put a child at risk of developing behavioral and emotional problems. Parental exposure to evidence-based parenting programs, availability of professional assistance for children's emotional and behavioral issues, and high levels of social and emotional support from important others are some potentially modifiable protective factors that lower children's risk of developing problems. Epidemiological studies reveal that many children are exposed to unfavorable parental behaviors.

For example, Sanders et al. (2007) found in a survey of 4,018 parents of 2- to 12-year-olds that 70% of parents reported they were likely or very likely to shout and become angry with their children and that 43% reported hitting their children. The risk and protective factors that are most likely to change as a result of the intervention can be assessed prior to an intervention being implemented and can be reassessed over time.

Culturally Appropriate Programs Are Available

Parents with parenting-related problems may seek assistance from people with quite different cultural, linguistic, and religious backgrounds. In order to be successful, a programme must also be acceptable to parents on a cultural level. Every parent learns how to raise a child within a specific cultural environment, which may differ in terms of family size and structure, the presence of extended family, gender roles, and exposure to particular customs and values. Parenting-related cultural knowledge can be picked up through interactions with other members of the culture, discussions with more seasoned parents, modelling, and family-of-origin experiences.

The experience of parenting has elements that are universal throughout cultures. Every parent wants the best for their child, regardless of culture. There are gender variances in parental obligations as well as common developmental and behavioral issues that stress out parents across cultures. Additionally, parenting customs differ both inside and between cultures. It explains what parenting is, what sorts of obligations are required, which behaviors are issues that call for discipline, and how to apply that discipline. There is mounting evidence that, despite cultural differences, the core ideas of effective parenting are universally applicable.

II. CONCLUSION

The Triple P demonstrates the positive effect on society. The Favorable Parenting Program has a positive impact on a variety of parenting abilities, including parents' parental competencies and their confidence in their parenting techniques. There are some encouraging trends in stress reduction for parents as well as favorable benefits on kids' levels of behavioral issues, how kids interact with classmates, and disagreements and bad communication at home. Parenting classes for parents of children between the ages of 3 and 16. The Teen Triple P program, however, is an exception; it is well-known and presently utilized by many. More evidence-based programs are desperately needed in the delivery of pediatric healthcare. The study's latest findings show how the Teen Triple P program affects kids' social and emotional behaviors, which enhances parent-related outcomes, family relationships, and family functioning. The current effect study provides solid scientific justification for this preventive approach. Communities may be used to advertise the program It can be utilized responsibly in the delivery of pediatric healthcare to assist parents in raising their kids.

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Predicting Steel Consumption for India using Multi-Variate Regression Analysis of Data from Similar Countries

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ABSTRACT

An attempt is made to create a statistical model for predicting finished steel consumption for India in the medium term by studying historical data from similar sized steel economies. Economies were selected based on their size and steel consumption profile. These were further narrowed down to those economies where reliable economic data was available for a per capita GDP range where India has been in the recent past and would be in the medium term. Finally the data for China and South Korea were found suitable. The data was split in periods where said economies were in the per capita GDP range of $500-2000 and $2000-10,000 (constant 2021 US$). India is currently at a per capita GDP of $2000. Thereafter, utilising regression analysis, starting with a single variable regression and advancing into regularised multi-variate regression, an attempt was made to narrow down the economic predictors for steel consumption. Finally, a model was derived after multiple rounds of data fitting that could predict the per capita steel consumption for India. To arrive at a steel consumption number for a particular year, the economic variables responsible for steel consumption were forecasted for the year and a range was arrived at. **The resultant range for steel consumption for India in 2030 is 157-188 mn MT.**

Keywords: Steel Economies, PCASTECONS, GDP, PCAPGDP

Economic importance of steel

An economy grows by boosting demand and supply simultaneously. Both these need capital investments. Each step of economic growth and resultant activity consumes steel because of its ubiquity. Therefore more than any other single product, steel demand is the greatest indicator of a growing economy. Steel contributed 3.8 % of the world's GDP and supported 96 million jobs in 2017. The entire supply chain of steel and its consuming sectors contributed 10.7% of the world's GDP and supported 259 million jobs in 2017.

When economies are poor (per capita GDP < $2000), the per capita steel consumption may not be as high since the individual is spending on sustenance items

such as food and clothing. Individual savings are low and capital expenditure (consumer durables) at a family level is scarce. Therefore per capita steel consumption is very low.

When economies are emerging out of poverty and can be generally classified as emerging economies ($2000<per capita GDP<$10,000), there are multiple drivers for steel consumption. Families having satisfied their basic needs are steadily investing into capital goods such as appliances, automobiles and homes. Public expenditure shifts from subsidies to infrastructure creation and private expenditure is high into manufacturing and capacity creation. There is an acceleration in overall steel consumption and the per capita steel consumption exponentially increases.
As economies mature (per capita GDP>$10,000) and people become wealthy, public infrastructure investments are limited to repairs, private capital consumption is limited to replacements and drop in manufacturing competitiveness due to high labour costs/currency appreciation inhibits investment in capacity creation.

Therefore, we may see three different trajectories for steel consumption during the three different phases of an economy. However at each stage steel consumption is an important indicator.

India

As a steel consumer, India is the second largest in the world at 106 million tons of finished steel in 2021 but overshadowed by China by a factor of 10. India's per capita consumption at 76 kgs is still well below China's 667 kgs. Steel manufacturing contributes 2% to India's GDP and provides 29 million jobs. Given the current path of the economy, there are potentially going to be significant changes to this figure.

Hypothesis

Per capita steel consumption [PCASTECONS] is primarily driven by per capita GDP [PCAPGDP]. There might be additional drivers that represent consumer durables, investment and trade. PCASTECONS would have a different trajectory at different PERCAPGDP levels as indicated by a poor, emerging or developed economy.

India's PCASTECONS in the future can be predicted using a similar economy's path mapping the primary driver PERCAPGDP and additional drivers as listed above.

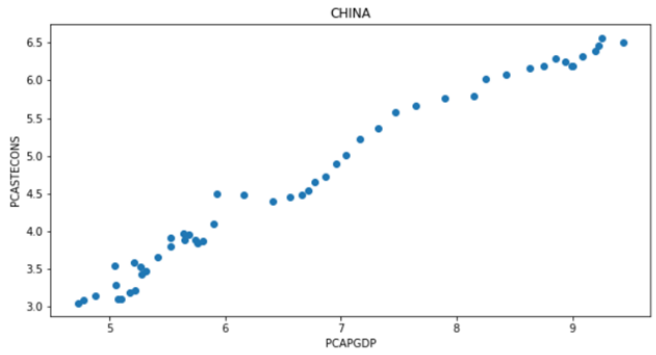
Approach

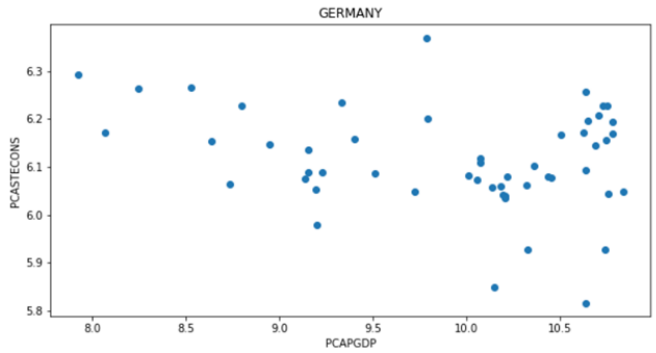
Using correlation and regression analysis, starting with a univariate and continuing onto multi-variate analysis, a function for India's medium term steel consumption to be derived. Use this function combined with the reader's prediction of the variables at different timelines to predict India's steel consumption at the same timelines. For the purposes of this paper we shall predict the steel consumption for the year 2030.

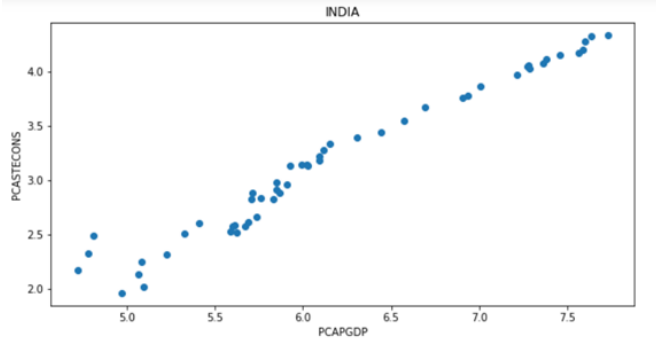
Finding the right comparable economies

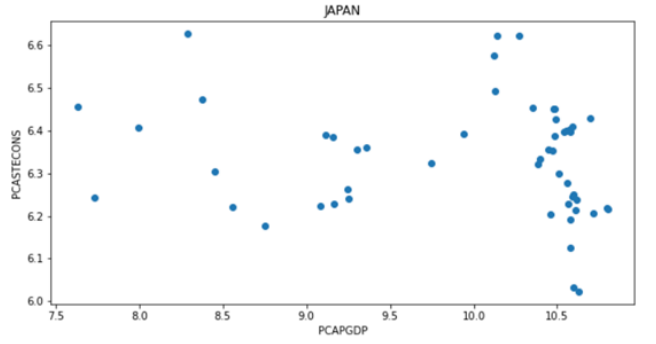
We chose the following economies:
USA/Japan/Germany/China/South Korea/Russia/India
All the above are large economies as also large producers of steel. They are at different stages of development and belong to different geographies. Russia was subsequently discarded as the data was corrupted due to the dissolution of the Soviet Union as also critical gaps in the 70s thereby rendering the data series not credible.

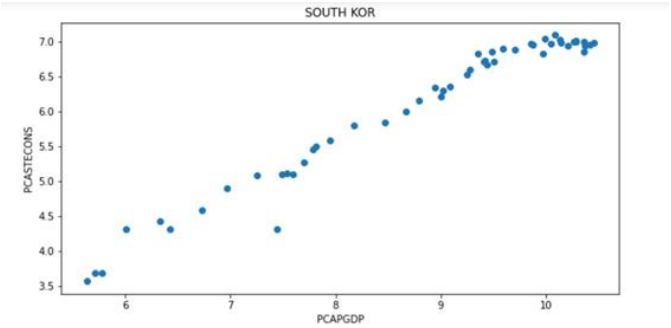
A simple correlation analysis was conducted between PCASTECONS and PERCAPGDP for the six economies and the results are provided on a log scale for better readability:

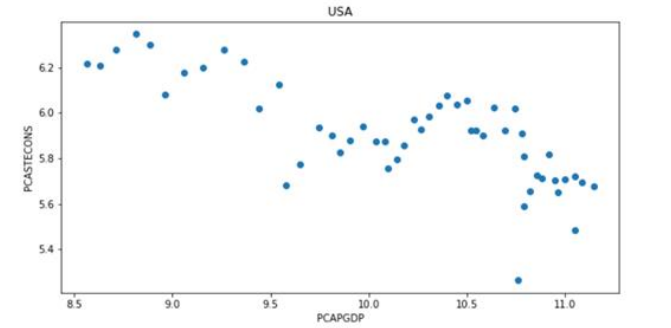












[All six graphs can be used or all six eliminated. Size should be small if used]

The Plots show a clear correlation for countries China, India and South Korea and poor correlation for USA, Germany and Japan. This clearly supports the hypothesis that the correlation shall not be consistent at various stages of development of an economy and it will get poor as the economy matures. Doing the correlation for the three mature economies at pre-developed stage was not possible due to inavailability of a robust data series as also the fact that the data would be so dated (pre-80s) that technological evolution would affect the outcomes.

Therefore the latter 3 data sets are also eliminated and we are left with 3 data sets only. This is sub-optimal but there are no other large economies where we have robust data from sub $2000 levels upto $10,000 levels.

Decoding the relationship between PCASTECONS and PCAPGDP

We proceeded to fit a Linear regression model using individual country's data. This approach involves fitting a log-log linear model between PCASTECONS and PERCAPGDP. Separate models are fit for each country and for the GDP ranges of 500-2000 and 2000-10,000. 30% of data within each slab is randomly taken for testing the model performance.

	Per Capita GDP $500-2000			Per Capita GDP $2000-10,000	
Coeff	**India**	**China**	**South Korea**	**China**	**South Korea**
PCAPGDP	0.6406	1.2241	0.5694	0.4557	0.7184
INTERCEPT	-0.6238	-3.5888	0.8459	2.1874	-0.1485
Mean % error	2.22	3.30	32.12	4.57	8.44

It is evident from the above examples that PCAPGDP is a consistent driver of the PCASTECONS. However, for each country the slopes and intercepts change and for the same country the regression output changes at different PCAPGDP slabs. This supports part of the hypothesis but does not give a verifiable predictor of PCASTECONS in the future. There is a higher than acceptable error for South Korea for PCAPGDP at 500-2000 and the reasons for this are not explained at this time.

Attempt to improve the regression by adding another variable

It is well know that Gross Fixed Capital Formation has a multiplier effect on economic growth representing investments into infrastructure, manufacturing, construction. These are sectors with highest impact on steel consumption from a visible standpoint. GFCF has been normalised to per capita GCFC (PCAGFCF) and a multi-variable regression between PCASTECONS and PCAPGDP+ PCAGCFC is attempted. A log-log linear model between PCA Steel Consumption and PCAPGDP+PCAGFCF is fitted. Separate models are fit for each country and for the PCAPGDP ranges of 500-2000 and 2000-10,000. 30% of data within each slab is randomly taken for testing the model quality.

Further, since it is well understood that GDP and GFCF are not independent variables, rather highly correlated variables, the output of multi-variate regression using co-dependent variables creates the problem of multi-collinearity. This makes the results statistically non-dependable. Therefore, this task is conducted using regularised regression.

Regularized regression is a type of regression where the coefficient estimates are shrunk towards zero. The magnitude (size) of coefficients are penalized. Complex models are discouraged, primarily to avoid overfitting.

	Per Capita GDP $500-2000			Per Capita GDP $2000-10,000	
Coeff	**India**	**China**	**South Korea**	**China**	**South Korea**
PCAPGDP	0.9052	0.1815	0.0589	0.2388	0.6288
PCAGFCF	0.0761	0.8210	0.7739	0.7455	0.3887
Mean % error	2.05	3.17	37.87	3.38	7.89

As is evident from the above table, adding GFCF to the analysis does not deteriorate the quality of the output if we are tackling multi-collinearity effectively. There has been a slight, albeit statistically insignificant, improvement in the analysis by adding the variable. Adding a variable is not important singularly from the point of view of reducing error margins, the exercise helps us understand the impact of multiple drivers on the demand of commodity especially one as ubiquitous as steel that has myriad applications and in turn drivers. The ultimate quality of prediction can improve manifold if we can use multiple drivers that may remain symmetric or become divergent in the future. E.g. an economy may show consistent headline growth but may turn its

focus from exports to domestic consumption. Something like automobile production may see downward shifts if the policy starts taxing automobile sales harshly to fund public mobility.

Steel Intensity

Our objective at this stage is to find the right variables for predicting steel consumption in general and those that may be significant for India. It is clearly understood that steel consumption would be driven by Headline growth (GDP). However it is boosted significantly by Investment (GFCF). Therefore these are two fundamental variables that cannot be ignored. Further, indicators such as Manufacturing as a % of GDP, Construction as a % of GDF, Auto production, merchandise exports are all drivers of steel demand. There may be less significant indicators but reliable, long term, multi-lateral data is not available on them.

It is important to take a break here and talk about steel intensity. Steel intensity is the concept that explains the difference in steel demand for similarly sized, similarly populated economies. This is an observed phenomena that debunks GDP being a unilateral indicator of steel consumption. An emerging nation saving hard, investing aggressively, focussed on manufacturing and exporting ruthlessly can have significantly higher per capita steel consumption than an economy largely agrarian, leading in services, ignoring public capital expenditure and not focussed on exports. These are not hypothetical examples. At around $2000 per capita GDP the per capita steel consumption of the selected economies were as follows:

Country	Year	Per Capita GDP	Per Capita Steel Cons	Steel intensity Kgs/$1000 GDP
South Korea	1983	2199	195	89
China	2006	2099	288	137
India	2019	2072	75	36

It is well known that India was saving less, investing less, manufacturing less and exporting less on a per capita basis than the Asian Tiger Korea and the Chinese Dragon. Therefore, at the same income level, its steel consumption was 40-75% less than these players.

Therefore deriving any formula by ignoring indicators representing investment, consumer durable spend and trade can be debunked straight away without checking their statistical integrity. The future prediction of steel consumption shall require an estimation of steel intensity.

Finding the right suite of variables

We ran multiple regressions using base variables PCAPGDP+PCAGFCF and additional variables from the following list:

Manufacturing as a % of GDP/Industrial as a % of GDP/Auto production/Merchant Exports/Urban population %

Additional variables could have been thought of but they were either included in the above (e.g. Construction which is included in Industrial) or may be insignificant in the overall picture (no. of air conditioners purchased) or may be highly correlated (auto components to auto production) or simply unavailable.

Basis, the overall exercise the best regression fits were obtained by using the following variables:

Per Capita GDP (PCAPGDP)

Per Capita GFCF (PCAGFCF)

Per Capita Automobile production per capita (PCAAUTOPROD)

Per Capita Merchandise Exports per capita (PCAMEREX)

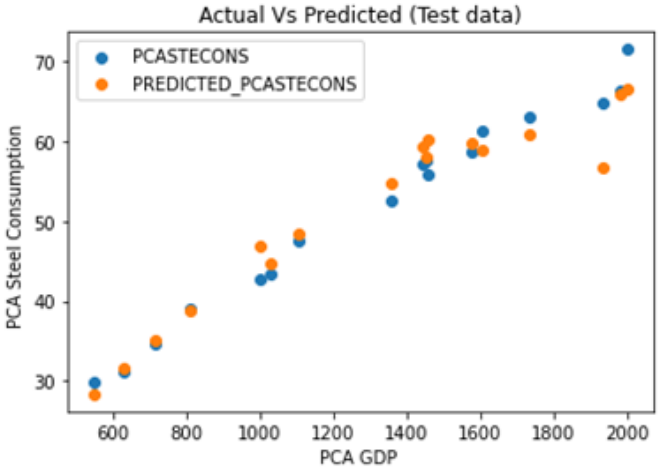
We continued to use regularized regression in order to deal with the multi-collinearity between the variables. Separate models were fit for each country and for the GDP ranges of $500-2000 and $2000-10,000. 30% of data within each slab is randomly taken for testing the model quality.

	Per Capita GDP $500-2000			Per Capita GDP $2000-10,000	
Coeff	**India**	**China**	**South Korea**	**China**	**South Korea**
PCAPGDP	0.7263	0.1967	0.2565	0.2761	0.3680
PCAGFCF	0.1095	0.2519	0.3973	0.6852	0.4153
PCAAUTOPROD	0.1489	0.2781	-0.0685	0.1508	-0.0345
PCAMEREX	0.0078	0.2647	0.1739	-0.1212	0.2583
Mean % error	1.65	2.23	35.58	5.22	7.54

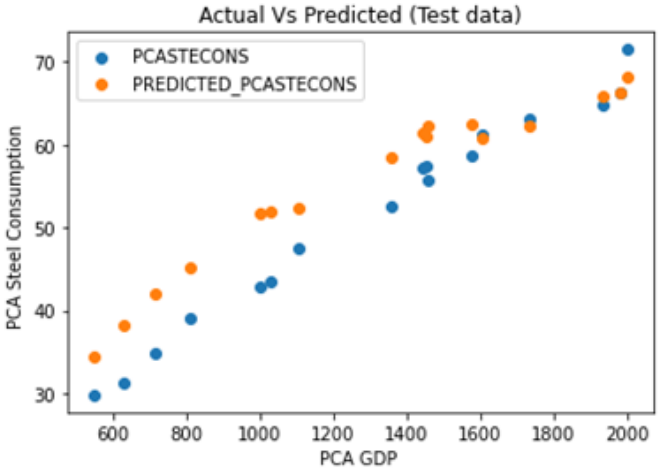
Cross Prediction

Our previous tests have been to test a data series against itself, i.e. short/medium term predictions for the same economy where expectedly there would not be a sudden change in economic profile, e.g. a manufacturing intensive economy would not overnight become agrarian or a net exporter is not suddenly going to have a major trade deficit. Therefore quality of fits would be and have been good. The litmus test is to take the variables for one country and fit it to another country at a similar stage in its economic lifecycle. We took the output of China and Korea for the PCAPGDP slab $500-2000 individually and applied them to India's data from the same economic period and fit the predicted steel consumption to the actual figure. The results were as follows:

Prediction for India using China's data

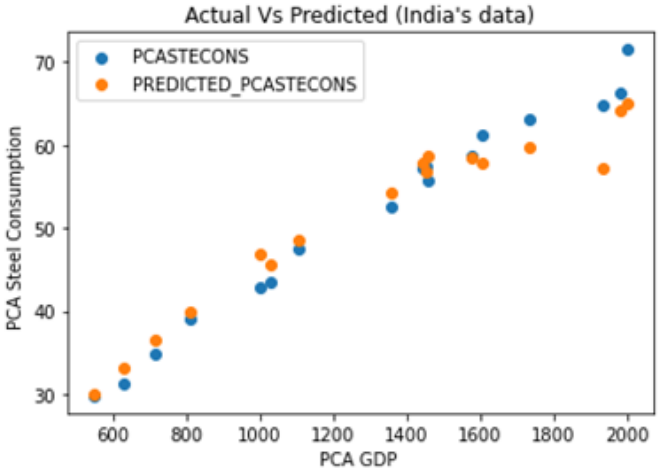


Prediction for India using South Korea's data



Mean % error= 8.79

The results are encouraging as the error levels are quite low. The results allow a correction for difference in steel intensities of similarly income level economies by incorporating the variables responsible for differences in steel intensity. The error for Korea-India fit is higher than China-India fit because Korea data in the 500-2000 slab had a comparable higher error across analyses. This may be related to reliability of data that pertains from the period 1974-1983 when South Korea grew at an unprecedented pace.



Mean Error % = 4.65

As is evident the error of 4.65% is no worse than 4.20% and 8.79% from the previous step, it does provide a unifying equation for prediction of steel demand for India.

Pooling of Data-diversification of data risk

We then attempted pooling of data between China and South Korea using a regularized Ridge Regression to fit the model. As the outputs from individual regressions in the above step were varying from one another despite providing fairly good predictions, an attempt was made to come up with a unifying equation. This exercise, if successful, would provide the reader a logical and concise output.

The model takes the following form:

$$\ln\left(\frac{y}{\tilde{y}}\right) = \beta_{gdp}\ln\left(\frac{X_{pgdp}}{\tilde{X}_{pgdp}}\right) + \beta_{pauto}\ln\left(\frac{X_{pauto}}{\tilde{X}_{pauto}}\right) + \beta_{pgfcf}\ln\left(\frac{X_{gfcf}}{\tilde{X}_{gfcf}}\right) + \beta_{pmerex}\ln\left(\frac{X_{pmerex}}{\tilde{X}_{pmerex}}\right)$$

y: Steel Consumption

x̃: Geometric mean of the respective feature and country

We used China's and South Korea's data for PCAPGDP between 500 and 2000 to fit a regression line, and test the performance against India's data for the same slab.

Coeff	Value
PCAPGDP	0.2324
PCAAUTOPROD	0.1954
PCAGFCF	0.2702
PCAMEREX	0.1904

Final Step

Using the regularized Ridge Regression from the previous step but this time for a PCAPGDP slab of $2000-10,000, we arrive at the following equation that hopefully should provide a reliable predictor for steel demand/consumption for India in the next 20 years or till it reaches a per capita GDP of $10,000.

Coeff	Value
PCAPGDP	0.2960
PCAAUTOPROD	0.0826
PCAGFCF	0.4346
PCAMEREX	0.1525

Forecasting India's Steel Consumption in 2030

Population forecast for 2030

According to the latest edition of the United Nations' World Population Prospects, India is expected to overtake China as the most populous country in this decade and grow from 1.4 billion currently to 1.515 billion by 2030.

GDP Forecast for 2030

GDP is expected to grow between 6 and 8% in real terms per annum for the next decade as per Goldman Sachs provided it does or does not do certain things to

boost it's economy. This is the range that has been reiterated by multiple economists and agencies around the world.

There is a lot of pent up energy in the economy on the back of two lost years of the pandemic as well as major structural reforms implemented in the years preceding Covid that are expected to play out going forward. However Quantitative Tightening and associated phenomena around the world seems to be pushing the global economy into a short term recession and this may play a spoilsport for the Indian economy as well. Therefore, GDP is projected to grow from 3.17 tn in 2021 to between 5.4 tn and 6.3 tn by 2030 in constant 2021 US$.

Gross Fixed Capital Formation forecast for 2030

GFCF as a % of GDP in India between 2000-2010 grew from 25% to 40%. This was on the back of a credit fuelled commodity-manufacturing boom. However, starting 2010 private companies with highly leveraged balance sheets and the public exchequer with its burgeoning deficit were forced to cut down on investments. From a high of 40% in 2010, GFCF fell to 30% by 2016. This has been a painful period of consolidation for the Indian economy. China on the other hand has maintained a GFCF of 40%+ since 2000 in an unprecedented investment boom, the likes of which the world has never seen in its history.

Going forward, the tailwinds for GFCF are a pickup in private sector investments as capacity utilizations are running high and private corporate debt is immensely manageable. The Government has indicated a $1.3 tn infrastructure plan (National Investment Pipeline) for the years 2020-25 and seems serious in implementing the same. Notwithstanding the expected reduction in global capital flows, the level of investment in the coming decade shall be higher than the preceding decade and GFCF should be 35% of the GDP for this decade. For 2030, a bad case scenario is 32% of GDP and a good case scenario is 38% of GDP has been estimated.

Merchandise Export Forecast for 2030

This is the most difficult forecast as it just does not map India's manufacturing competitiveness as also the potential of the world economy to absorb more goods. This is further affected by policy variables such as trade barriers and trade agreements. From a qualitative standpoint, India is figuring out the key levers to being more competitive in merchandise exports. There are a slew of trade agreements, either inked or in the pipeline, a domestic push towards manufacturing in terms of the PLI scheme and structural reforms such as GST that are expected to boost exports significantly in the coming decade. On the other hand, an impending global slowdown and the increasing nationalistic tendency to onshore production by developed countries may play spoilsport to India's export ambitions. Last, the challenges faced in the recent past by importers from the world's factory China due to geopolitical issues and China's zero covid policy has birthed a paradigm popularly known as China+1. Many companies are moving production from China to countries such as India and Vietnam. This phenomena can make these countries the new Asian tigers in terms of exports.

India is currently exporting just short $40 bn per month in 2022 demonstrating a growth of nearly 15% over last year. An expectation of real growth for India in merchandise exports for the next decade would range from a pessimistic 7% due to a slowdown in global trade to a wildly optimistic 12% that could only be realised if India manages to attract record FDI in manufacturing and gets its act right. Basis the above, the range of merchandise export in 2030 (constant 2021 US$) could be $725 bn to $1100 bn.

Automobile Production Forecast for 2030

India produced 4.4 million vehicles (excluding 2/3 wheelers) in 2021. India is growing both as a vehicle market as well as an export hub, especially for small cars. Further the trend of moving upward from 2/3 wheelers to 4 wheelers as per capita income increases, is a major tailwind for this sector. It is expected that Indian auto production shall grow between 10-12%

for the next decade. Therefore, the range of auto production in 2030 could be 10.4 to 12.2 million vehicles.

Final Projections for 2030

Parameter	Unit	Low Case	High Case
Population	million	1515	1515
GDP	$ Billion	5361	6342
GFCF	$ Billion	1715	2410
Merchandise Exports	$ Billion	725	1100
Auto Production	million	10.40	12.20
Per Capita GDP	$	3540	4185
Per Capita GFCF	$	1130	1590
Per Capita Merchandise Export	$	480	725
Per Capita Auto Production	Nos.	0.007	0.008
Per Capita Steel consumption	Kgs	103	124
Gross Steel consumption	Mn MT	157	188

The steel consumption for India by 2030 is expected to range between 157 and 188 million MT per annum.

Notes:

$ denotes 2021 constant US$

Mn is million

MT is Metric Tonnes

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Methods for Water and Waste Water Treatment and Management

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ABSTRACT
Waste water is water whose physical, chemical or biological properties have been changed as a result of the introduction of certain substances which render if unsafe for some purposes such as drinking. The day to day activities of man is mainly water dependent and therefore, discharge waste into water. This article highlights methods of waste water treatment system and management for toxic wastes.
Keywords- Waste Water, Treatment, Toxic Wastes, Management.

I. INTRODUCTION

Satisfactory disposal of wastewater is dependent on its treatment prior to disposal equate treatment is necessary to prevent contamination of receiving waters to a degree which might interfere with their best or intended use, whether it be for water supply, recreation, any other required purpose.

Wastewater treatment consists of applying known technology to improve or upgrade the quality of a wastewater. Usually wastewater treatment will involve collecting the wastewater in central, segregated location (the Wastewater Treatment Plant) and subjecting the wastewater various treatment processes.

Its objective is to produce an environmentally-safe fluid waste stream (or treated effluent) and a solid waste for treated sludge) suitable for disposal or reuse (usually as farm fertilizer). Using advanced technology it is now possible to re-use sewage effluent for drinking water.

In the Indian context, conventional sewage treatment plants fall into systemic disrepair die to (1) high operating costs, (2) equipment corrosion (due to formation of methane and hydrogen sulphide, (3) non-reusability of treated water due to high COD and high fecal coliform counts, (4) lack of skilled operating personnel and, (5) equipment replacement issues. Examples of such systemic failures include the massive cleanup effort by the Indian government in 1936 by setting up sewage treatment plants under the Ganga Action Plan

Wastewater treatment, however, can also be organized or categorized by the nature of the treatment process operation being used, for example, physical, chemical or biological.

Water and Waste Water Treatment System

1- Physical Method

Sedimentation (Clarification), Screening, Aeration. Filtration, Flotation and Skimming Degasification, and Equalization are physical methods.

Physical methods include processes where no gross chemical or biological changes are carried out and strictly physical phenomena are used to improve or treat the waste water. Examples would be 'coarse screening' to remove larger objects and sedimentation (or clarification). In the process of sedimentation, physical phenomena relating to the settling of solids by gravity are allowed to operate. Usually this consists of simply holding a wastewater for a short period of time in a tank under dormant conditions, allowing the heavier solids to settle, and removing the clarified effluent. Another physical treatment process consists of that is physically adding air, usually to provide oxygen to the wastewater. Still other physical phenomena used in treatment consist of filtration. Here, wastewater is passed through a filter medium to separate solids. An example would be the use of sand filters to further remove entrained solids from a treated wastewater Permitting greases or oils, for example, to float to the surface and skimming or physically removing them from the wastewaters is often carried out as part of the treatment process.

In certain industrial wastewater treatment processes strong or undesirable wastes are sometimes produced over short periods of time. Since such "slugs" or periodic inputs of such wastes would damage a biological treatment process, these wastes are sometimes held, mixed with other wastewaters, and gradually released, thus eliminating "shocks" to the treatment plant. This is called equalization. Another type of "equalization" can be used to even out wide variations in flow rates. For example, the wet well of a pump station can receive widely varying amounts of wastewater and, in turn, pump the wastes onward at more uniform rates.

2- Chemical Method

Chlorination, Ozonation, Neutralization, Coagulation, Adsorption, and Ion Exchange are examples of chemical methods Chemical treatment consists of using some chemical reaction or reactions to improve the water quality. The most commonly used chemical process is chlorination. Chlorine, a strong oxidizing chemical, is used to kill bacteria and to slow down the rate of decomposition of the wastewater. Another strong oxidizing agent that has also been used as an oxidizing disinfectant is ozone.

A chemical process commonly used in many industrial wastewater treatment operations is neutralization. Neutralization consists of the addition of acid or base to adjust pH levels back to neutrality. Since lime is a base it is sometimes used in the neutralization of acid wastes.

Coagulation consists of the addition of a chemical that, through a chemical reaction, fumes an insoluble end product that serves to remove substances from the wastewater. Polyvalent metals are commonly used as coagulating chemicals in wastewater treatment and typical coagulants would include lime (that can also be used in neutralization) certain iron containing compounds (such as ferric chloride or ferric sulphate) and alum.

3- Biological Method

Biological treatment methods use microorganisms, mostly bacteria, in the biochemical decomposition of wastewaters to stable end products. More microorganisms, or sludge are formed and a portion of the waste is converted to carbon dioxide, water and other end products. Generally, biological treatment methods can be divided into aerobic and anaerobic methods. Based on availability of dissolved oxygen.

Aerobic methods include Activated Sludge Treatment Methods, Trickling, Foltres, Oxidation Ponds, Lagoons etc. Here oxidation of the organic matter takes place.

Anaerobic methods include Anaerobic Digestion, Septic Tanks, and Lagoons where, mostly reduction of carbon in organic compounds into hydrocarbons takes place.

The solids which are removed are primarily organic but may also include inorganic solids. Treatment must also be provided for the solids and liquids which are removed as sludge. Finally, treatment to control odours, to retard biological activity or to destroy pathogenic organisms may also be needed.

Wastewater may contain high levels of the nitrous nitrogen and phosphorus Excessive release to the environment can lead to a build up of nutrients, called eutrophication, which can in turn encourage the overgrowth of weeds algae, and cyanobacteria (blue-green algae). This may cause an algal bloom, a rapid growth in the population of algae. The algae numbers are unsustainable and eventually most of them die. The decomposition of the algae by bacteria uses up so much of oxygen in the water that most or all the animals die, which creates more organic matter for the bacteria to decompose. In addition to causing a deoxygenating condition, some algal species produce toxins that contaminate drinking water supplies. Different treatment processes are required to remove nitrogen and phosphorus.

Methods of Management for Hazardous and Toxic Wastes

A hazardous waste is any discarded material, liquid or solid, that contains substances known to be:

1. Fatal to humans or lab animals in low doses,
2. Toxic, carcinogenic, mutagenic or teratogenic (an agent that interrupts or alters the normal development of a foetus with results that are evident at birth, e.g., a chemical, virus, or ionizing radiation) to humans or other life-forms;
3. Ignitable with a flash point (The flash point of a volatile liquid is the lowest temperature at which it can vaporize to form an ignitable mixture in air) less than 60°C. Ignitable wastes can create fires, and are spontaneously combustible. Examples include waste oils and used solvents.
4. Corrosive. Corrosive wastes are acids or bases (pH less than or equal to 2 or greater than or equal to 12.5) that are capable of corroding metal containers such as storage tanks, drums, and barrels. Battery acid is an example.
5. Explosive or highly reactive. Reactive wastes are unstable under "normal" conditions. They can cause explosions, toxic fumes, gases, or vapors when heated, compressed, or mixed with water. Examples include lithium-sulphur batteries and other explosives.

A hazardous waste is a waste that poser substantial or potential threats to public health or the environment.

These wastes may be found in different physical states such as gaseous, liquids, or solids. Furthermore, a hazardous waste is a special type of waste became it cannot be disposed off by common meats to other by-products of our everyday lives.

Many types of business generate hazardous waste. For example, dry cleaners, automobile repair shops, hospitals (approximately 0.5% of all hazardous wastes produced are of biomedical origin) and photo processing centers generate hazardous waste. The producers of hazardous wastes are companies such as chemical manufacturers, electroplating companies, and oil refineries.

Hazardous waste also include sludge leftover from electroplating processes, certain waste from iron and steel manufacturing, wastes from cleaning and/or degreasing processes, solvents, wastes from industries such as petroleum refining or pesticide manufacturing. Some of the most common hazardous wastes include fluorescent light bulbs, some old batteries (lithium or lead containing batteries), cathode ray tubes, and mercury-containing devices, discarded paint, pesticides, cleaners and a number of other household products.

Earlier, hazardous wastes were being disposed in regular landfills resulting in unfavorable amounts of hazardous materials seeping into the ground. These chemicals eventually made their way to the water systems, and contaminated the soil that are used by animals and crops, as well as the soil that people employed to build their communities. Currently, in order to enter a landfill, hazardous wastes must be

stabilized and solidified, rendering them less harmful than they were in their original forms.

- Hazardous and toxic wastes, when released into the environment, cause many health problems including cancer and birth defects.
- Disposal practices for hazardous wastes have often been unsatisfactory Government legislation and alternative disposal practices are creating safer and more effective ways of dealing with this increasingly serious problem.

Hazardous Waste Disposal

Treatments can be classified as physical chemical biological or thermal Physical treatments are used to separate solids from liquids through the use of physical forces and mechanical devices. Chemical treatments are used to neutralize (e.g., by mixing acids and bases), precipitate, oxidize or reduce chemical components, or to cause a chemical alteration of a liquid phase to produce a solid, vapor or altered liquid phase. Biological treatments are used to biodegrade diluted organic wastes, while thermal treatments are used to cause the vaporization, oxidation or other destruction of liquid or solid phase components. The important techniques of hazardous waste management are:

- ***Avoid production of Hazardous waste:*** The safest and least expensive wayto avoid hazardous waste problems is to avoid creating the wastes in the first place.
- ***Reusing and Recycling to nonhazardous forms:*** Most hazardous waste is recycled, converted to nonhazardous forms, stored, or disposed off so that it doesn't become a public problem. However, the hazardous waste that does enter the environment is one of our most serious environmental problems.
- ***Converting to non hazardous forms:*** Several processes is also available to make hazardous substances less toxic. Chemical processing can transform materials to nontoxic forms. A simple example is Neutralization. A corrosive acid that is neutralized with a basic substance so that it is no longer corrosive.
- ***Incineration destruction and waste-to-energy:*** A hazardous waste may be "destroyed" for example by incinerating it at a high temperature. Flammable wastes can sometimes be burned as energy sources; incineration treatments not only reduce the amount of hazardous waste, but also they also generate energy. Controlling the amount of oxygen allowed is significant to reduce the amount of harmful by-products formed.
- ***Pyrolysis:*** Some hazardous waste types may be eliminated using pyrolysis in an ultra high temperature electrical arc, in inert conditions to avoid combustion. Examples are the destruction of concentrated organic wastes like pesticides and other persistent organic pollutants.

The best way is to avoid many problems by reducing our output of hazardous waste in the first place; reduction of all hazardous wastes could be achieved by the use of more efficient manufacturing processes, use of alternative compounds and the re-use as is or the reprocessing.

Another concerns about hazardous waste is the danger of accident or leakage during transportation, storage of large quantities awaiting disposal; and where to locate the hazardous waste treatment facility, a facility that no municipality or township wants.

Conclusion

Waste water is and will always be with us. because we cannot survive without water, when water supplied is used for the numerous human activities, it become contaminated its or characteristic is changed and therefore become waste water. In most developing countries. low cost, low technology methods such as waste Stabilization bonds have been successful.

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Helix Directional Antenna for Low Power Wireless Communication

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ABSTRACT

In wireless communication, there`s useless Communication executed in a route that doesn`t factor to the recipient. Omni-directional antennas ship the identical quantity of strength similarly in all directions perpendicular to an axis i.e., Azimuthal directions. This waste of strength reduces the lifespan of the battery devices inflicting extra traffic collisions than necessary. One manner to lessen this wasted strength and traffic collisions is to apply the opposite form of antenna called "Smart antenna". These antennas can use selectable radiation styles relying at the state of affairs and for this reason drastically lessen useless strength waste. Smart antennas offer the capacity to apprehend the route of the incoming indicators that the bodily format is conducive to mapping together with orientation.

Keywords: MIMO, Azimuthal direction, Phase array antenna, Radiation Pattern.

I. INTRODUCTION

Communication is a vital aspect of life that humans are unmatched in. Evolution has provided us with the tools and the knowledge to improve our lives. Through technology, we can now see the world from a different perspective. Due to the increasing popularity of wireless communication, many new technologies have been introduced to allow people to reach the rest of the world. One of these is the use of antenna technology. An antenna that allows communication in a specific direction is known as a directional antenna.

This feature allows the antenna to receive and transmit signals in a given direction, which is very useful for long-term and energy-efficient communication. There are also more advanced variants of directional antennas, such as smart antennas. These are capable of changing the direction of communication without the need for any physical change.

Although directional antennas have been around for a long time, their practical and theoretical ideas are still undiscovered. This is because they are not subjected to experiments. The most widely used techniques for testing the effectiveness of directional antennas are simulations.

This report presents an experimental study of the behaviour of a smart antenna design. The experiment

was carried out to study the behaviour of a smart antenna and it is built using a software called "MATLAB".

Hence The results of the study were compared to those of a paper presented at a conference held at Meraka Institute Council for Scientific and Industrial Research Pretoria, South Africa.

II. PROPOSED WORK

The overall performance of wireless networks and the variety of programs are often limited by self-interference, variety, reliability, and cost. New application technologies that provide a high level of intelligence and hence advanced functionality known as a smart world are often highly dependent on these factors. Self-jamming occurs at more than one node. They are transmitted simultaneously and interfere with each other. It sends a signal and often cause retransmission. this often leads to significant reductions in throughput (i.e., slow uploads and downloads), increased latency (most damaging for latency-sensitive multimedia telecommunications), and increased power consumption. The communication range is effectively determined by the ability of a signal-to-noise ratio of and captures the minimum signal strength, what the receiver needs, that is, transmitter power, gain antenna, receiver sensitivity and back noise.

The overall stability of the network and thus intelligent application functionality is highly dependent on the technology. Each node handles the errors of other nodes in the network. Several advanced solutions have been introduced recently, such as MIMO (Multiple Input Multiple Output) technology. The speed of MIMO and the power of Weightless can be achieved by using low-cost, low-power parasitic array antennas.

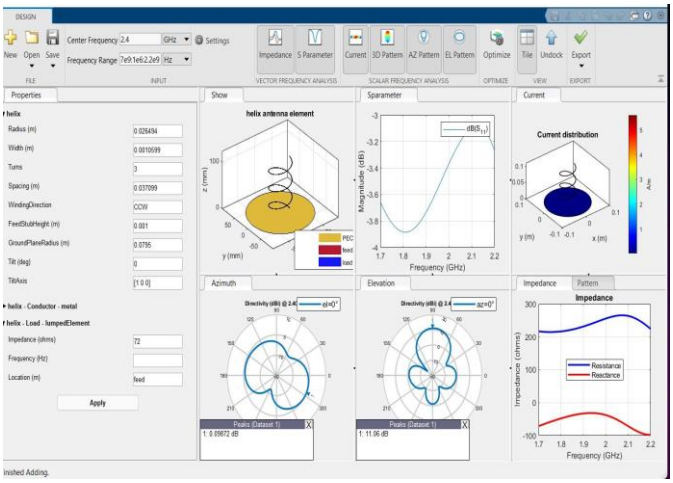

Figure 1: MATLAB Stimulation

In compare to a previous model proposed in paper at Meraka Institute Council for Scientific and Industrial Research Pretoria, South Africa by Albert A. Lysko and Mofolo Mofolo in which the author expressed an experimental method for getting more efficient output from the antenna and less noise by using parasitic array.

An Antenna with better throughput speeds up and reduction in the latency. An antenna to be designed to provide robust high-performance communications in a wireless mesh network operating at 2.4 GHz frequency. we proposed a system by using a software called MATLAB. We have stimulated various programs of smart antenna on under different Situation to get the desired output like-

A program is designed to simulate the smart antenna system on a BTS receiver (Uplink).

Receiving wire array of four elements operating on 2.4 Ghz with a separation distance 0.075 meters narrowband (uncorrelated or partially correlated) signals are assumed.

Another program is designed to stimulate Directional antenna system, this antenna operates on 2.4 Ghz The impedance of directional antenna is 72ohms.

III. SIMULATION AND RESULT

In this work we performed experimental evaluation for antenna. A directional antenna is stimulated for a frequency range of 2.4 Ghz.

Maximum gain values in directional antenna is of 11.1 dBi and its minimum value is of -22.8 dBi and also for the narrow band beam we have seen the difference in the maximum gain = 11.1 dBi and maximum gain span of 3 seconds.

Various graphs and patterns related to stimulation of desired antennas are shown below:

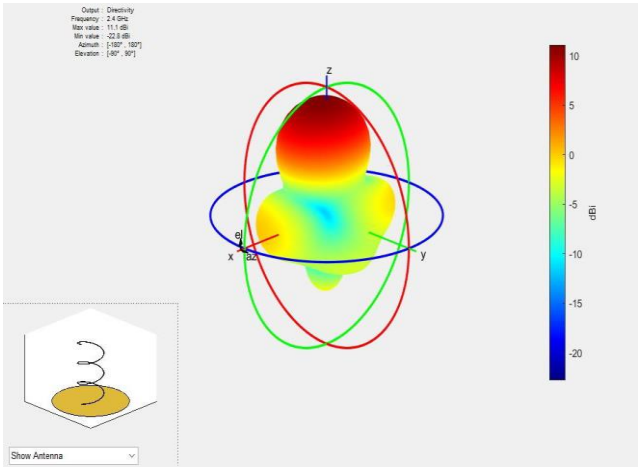

Figure 2: Directional antenna

This radiation pattern of the directional antenna shows directivity of antenna, the antenna has maximum and minimum gain of 11.1 dBi and -22.8 dBi respectively. Over a frequency of 2.4 Ghz having azimuthal [-180degree, 180 degrees] And elevation [-90-degree, 90 degrees] respectively.

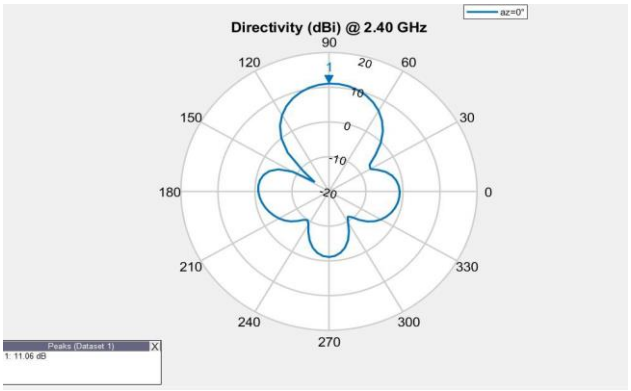

Figure 3: EL Pattern

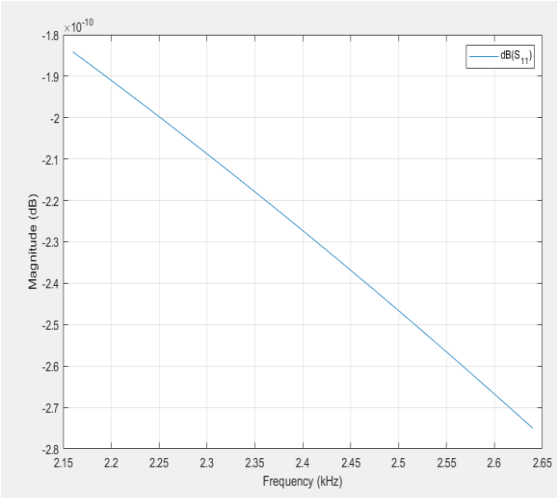

Figure 4: S-Parameter

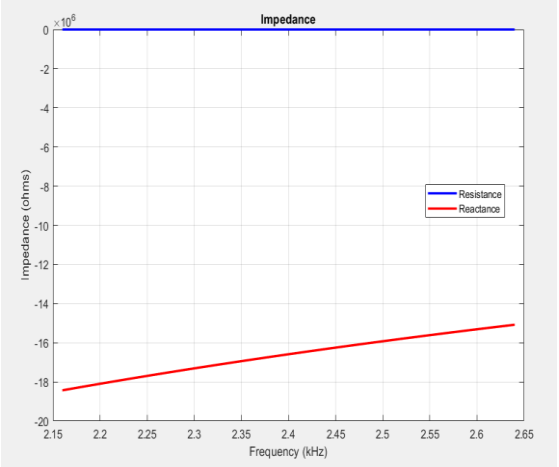

Figure 5: Impedance Graph

Graphs for various radiation beam forming pattern and transition period are listed below:

- The Radiation represent the emission or reception of wave front at the antenna, specifying its strength. In any illustration, sketch

drawn to represent the radiation of an antenna is its radiation pattern.

- Graphically, radiation can be plotted as a function of angular position and radial distance from the antenna.
- This is a mathematical function of radiation properties of the antenna represented as a function of spherical co-ordinates, E (θ, Ø) and H (θ, Ø).

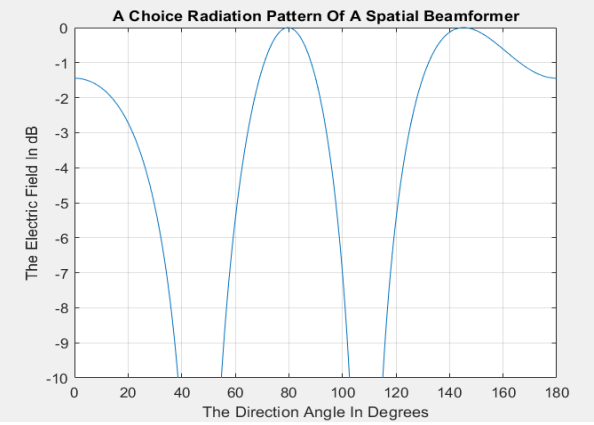

Figure 6: Radiation Pattern (a)

The above shown graph is plotted for Electric Field and Angular Position which gives radiation pattern for the antenna. Similarly, another graph for radiation pattern with different parameters is shown below.

This is also plotted against the electric field and angular position that gives the radiation pattern for the antenna. The graphs showing different peaks for electric field at different angular positions.

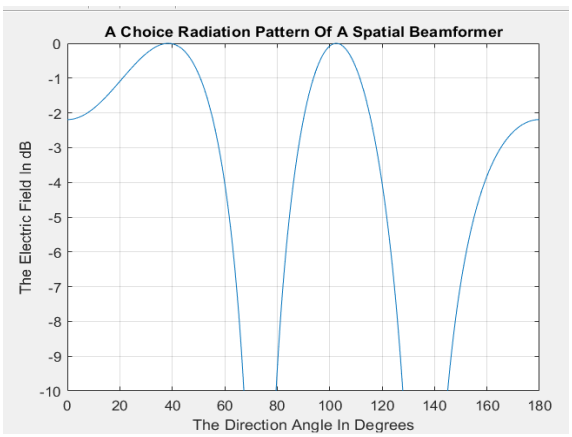

Figure 7 : Radiation Pattern (b)

IV. CONCLUSION

In this work, we studied different methods for wireless antenna communication. We successfully performed antenna building for a low-power wireless communication, which reduces the power consumption of the battery i.e., increases the life cycle of the battery. Moreover, this stimulation work is performed for an antenna of the frequency range of 2.4Ghz. The impedance and bandwidth of our antenna are much better in comparison to the antenna of the reference Paper (Base Paper) which we used as a guide for our Project. We successfully get better results for Maximum and minimum gain in narrow band and wide band.

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Scope of Green Chemistry

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ABSTRACT

Green Chemisty is new and rapid emerging branch of Chemistry. The beginning of Green Chemistry is considered as a response to the need to reduce the damage of the environment by man-made materials and the processes used to produce them. Green Chemistry could include anything from reducing wastes to even disposing of waste in the correct manner. All chemical waste should be disposed off of in the best possible manner without causing any damage to the environment and living beings. The Green Chemistry revolution is providing an enormous number of challenges to those who practice Chemistry in industry. This article focuses sustainable development, solvent less reaction, oxidation reagent and catalyst.

Keywords :- Trends of Green Chemisty; multifunctional reagent, sustainable development.

I. INTRODUCTION

Chemistry, like any other branch of Science in making progress, discovering new reagents, new synthesis and new compounds. In a similar way, green chemistry has the same future as chemistry. The additional advantage of green chemistry is that all its discoveries/ synthesis are environmentally benign. There are, however, certain areas of investigations that are scientifically challenging to chemists. However, these areas have potential for large benefits as green chemistry alternatives. Some of the new areas are discussed below.

Oxidation reagent and Catalysts

Though there is notable advancement in oxidation chemistry, but it is still one of the most polluting chemical technology. Oxidative transformations, as we know are the basis of necessary functionalization of fundamental molecules. It is the oxidation procedures that allows petroleum based feedstocks to become chemical products, which are the starting materials of numerous chemical industries.

Over the years, in the past, many of the oxidation reagents and catalysts comprise of toxic substances like heavy metal (e.g., chromium). These substances have been used in large amounts for the manufacture of billions of kilograms of petrochemicals. All these processes have lead to the release of huge quantities of these metals into the environment. Further these toxic substances affect the human health.

The objective of green oxidations chemistry will, of course be to use and generation of non-hazardous substances, with maximum efficiency of atom incorporation.

Combitional Green Chemisty

Combinatorial chemistry is a practice of being able to make a large number of chemical compounds rapidly on a small scale through reaction matrices. This practice is used on a large scale in the pharmaceutical sector. In case, a pharmaceutical company identifies a compound (lead compound), which has considerable promise (as far as its biological activity is concerned) then the company would proceed in making a large number of derivatives of the lead compound and test their efficacy. In this way, the potential of a compound will be optimized. The combinatorial chemistry has enabled large number of substances to be made and screened for their activities without having any adverse effect on the environment.

In the context of green chemistry, combinatorial approach is very useful to assess the biodegradability of the products. For example, if a company has struck on a biodegradable pesticide, then combinatorial approach will be helpful to make large number of other compounds, which will have the required pesticidal activity along with biodegradability.

Proliferaton of solventless reactions.

A large number of reactions occur in solid phase without the use of solvents are not harmful to the environment. In fact, a number of solventless reactions occur more efficiently with more selectivity compared to reactions carried out using solvents. Such reactions are simple to handle, reduce pollution and are comparatively cheaper to operate. The reaction can be conducted either by heating the reactant. Alternatively, a solution of the reactants in suitable solvent (like water, alcohol, methylene chloride etc.) is stirred thoroughly with a suitable adsorbent or solid support like silica, gel, alumina, phyllosilicate. After stirring the solvent is removed in vacuo and the dried support on which the reactants have been adsorbed are used to carry out the reaction under microwave irradiation

Green Chemistry in Sustainable Development

Sustainable development means development, which meets the needs of the present without compromising the ability of the future generations to meet their own needs. The Earth Summit was held on June 3-14, 1992 at Rio de Janeiro. This was attended by delegates including 150 Heads of States. The International Community adopted Agenda 21. This was a landmark achievement, which incorporated economic and social concerns. It contained a wide variety of recommendations on the following issues:

(i) Reducing wasteful use of natural resources.

(ii) Fighting poverty.

(iii) Protecting the atmosphere, oceans, plant and animal life.

(iv) Promoting sustainable agricultural practices for feeding the ever increasing population of the world.

Sustainable development, is, in fact, related to sustainability of our natural resources. The most obvious concern for the extensive utilization of limited or depleting resources is the fact, that by definition, they can run out or become exhausted. Such resources are not regarded as sustainable either from environment or from economic point of view. An appropriate definition of sustainability is the ability to maintain the development of the quality of life while not compromising the ability of our future generations to do the same. Thus, if the present generation consumes petroleum resources to the extent that they become no longer viable and usuable for future generations, this would violate the goals of sustainability. However, in case of feedstocks, it is possible to have a sustainable supply, not only for the present generation but also for future generations.

Green chemistry can play a vital role in sustainable development. Green chemistry, as we know is environmentally benign synthesis. Chemical manufacturing is the source of many useful and enjoyable products, which has not only improved the quality of life of the people but also increased their life expectancy. Some of these products include antibiotics and other medicines, plastics, gasoline and

other fuels, agricultural chemicals like fertilizers and pesticides, and a variety of synthetic fabrics including nylon, rayon and polyester. All these products are made by chemical industrial processes, which are mainly responsible for pollution of the environment. It was only in 1990, the U.S. Environmental Law was promulgated, according to which the first choice for preventing pollution is to design industrial processes that do not lead to waste production. This, in fact, is the approach of green chemistry.

Green chemistry works towards sustainability by:

(i) Making chemical products that do not harm either the environment or our health.

(ii) Using industrial processes that reduce or eliminate hazardous chemicals.

(iii) Designing more efficient processes that minimize the production of waste materials.

(iv) Preventing pollution before it happens rather than cleaning up! the mess later.

(v) Using minimum amount of energy for any chemical process. with a view to reduce the cost of production.

(vi) Using the most appropriate starting materials, reagents and catalysts.

(vii) New products designed should be biodegradable.

II. CONCLUSION

Green Chemistry is new philosophical approach that through application and extension of principle of Green Chemistry and contribute to sustainable development. Great effort are still undertaken to design an ideal process that start from non-polluting materials. Most importantly we need the relevant specific scientific engineering so, we can say that this approach in chemistry is helpful in protection human health and environment.

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Evaluation of Leet Speak on Password Strength and Security

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ABSTRACT

Making secure passwords is one of the biggest challenges in everyday life. There are numerous rules and requirements making passwords complex and hard to remember, and keeping track of which password is for which account is a major hassle. According to an article from HelpNetSecurity, statistics show that an alarming "78% of respondents required a password reset in their personal life within the last 90 days" ("78% of people"). In recent years, leet speak has become increasingly popular as a way to create memorable passwords. Leet speak is a convenient method for users to create passwords that meet password requirements in many services. But there has been increasing debate on whether this approach is a secure and safe method or not. This paper aims to solve this debate by effectively evaluating the strength of ordinary passwords and leet passwords using various means. With the help of password cracking or recovery tools and password strength classifiers, this paper will compare the cracking time and strength scores of ordinary passwords and leet converted passwords. The paper will begin with a background information section explaining important concepts discussed in the paper, followed by the methodology of the experiment, a presentation of the data along with the evaluation of the results, and a conclusion at the end.

Keywords: Cyber Security, Password, Password Strength, Leet, Leet Speak

I. INTRODUCTION

Passwords are a form of providing authentication, a way of proving that one is who that claim to be. The use of secret words or phrases for the purpose of authentication has existed since ancient times ("Password"). In ancient Rome, guards would require people to say a watchword to prove their identity (ibid).

Passwords have long prevailed as the most common choice for user authentication. This is because they are simple to implement, without the need for special hardware; have to be entered precisely and correctly, as even a minor error results in an entirely incorrect password; are convenient for the user, as they don't require a user to carry an additional item with them;

protect user privacy, a password can be easily swapped and replaced if compromised (ibid).
These are some of the things that other forms of authentication, such as biometrics and physical security keys, fail to address.
However, this does not mean that passwords are perfect; they too have their flaws.

Primarily, making secure passwords. On the one hand, they have to be long and complex to be safe, but on the other hand, they must be simple enough to be memorable. The balance between secure passwords exists at the point where they are not easy to guess but not hard to remember, and this point is quite hard to arrive at.

Having long and complex passwords increases the likelihood of a user repeating the same password for multiple accounts or storing the password in a clear text written form electronically or physically, increasing the chances of them being discovered. It also often results in a user forgetting their password and being compelled to change it to something more simple yet unsafe.

There exist many techniques to combat this widespread issue, such as the Correct Horse Battery Staple Method, Revised Passphrase Method, Bruce Schneier Method, etc. (Schneier).

One such method in the debate is leet speak. Some sources claim that it is a viable and safe method of producing passwords, whereas others claim that it has little to no effect on password strength.

Leet Speak

Leet speak (a.k.a. "l337 speak"), derived from the word "elite" (used to refer to hackers), was first seen in the 1980s on bulletin board systems (BBS) (TechTarget Contributor). BBSs are servers that allow for the public communication and exchange of files and messages between users through the use of a terminal application, similar to modern forums such as Reddit or Quora ("Bulletin board"). Originating with hackers and techies, leet speak found its way to the mainstream culture with the rise of "Doom and Doom II", a fairly influential game in the video game industry (TechTarget Contributor). Leet speak is the process of creatively replacing certain letters in a word or phrase with numbers or symbols that resemble the original letter (ibid).
Common examples of this are leet → 1337, noob → n00b, hacker → hax0r (ibid).

With the rise of restrictions on passwords, many have resorted to leet speak to meet all the requirements of uppercase letters, lowercase letters, numbers, and symbols. Users find leet speak as a convenient way of meeting password requirements while making them easy to

remember. Meeting these requirements gives users a sense of assurance that their password is strong and safe, but this sense of security may not always be true (). Password requirements and strength meters don't take many things into account such as common unsafe password habits: using names, birthdates, favorite items, or common passwords ("123456", "password123", "qwerty"). Thus it is not enough to say that a password containing leet is secure just because a strength meter said so.

Password Security

Password security is important to protect online accounts and prevent unauthorized access. There is a lot of thought and effort that goes into managing and maintaining the security of passwords.

One of the methods used is password hashing. To protect passwords from being compromised in the event of a data breach, they are stored as password

hashes (Jung). These are scrambled texts that are returned by passing a password through an incredibly complex function called a hash function (ibid). Password hash functions have several criteria that they have to meet before they can be considered safe enough: they must be non-reversible, they must be deterministic, and even a small change in the input must result in an entirely new output (ibid).

Non-reversible hashes mean that there is no inverse function that will output the decrypted password when given a hash as an input (ibid). This is impossible in practicality so hash developers aim to make hash functions as complex as possible and make it impractical and infeasible to find the original password from just the hash (ibid).

Deterministic hash functions are functions that for the same input, the function will output the same exact hash every time (ibid). Collisions are passwords that result in the same exact hash, and although there will always be collisions, hash developers aim to make it as difficult as possible to find them (ibid).

During the password creation stage, a user creates a cleartext password which is stored as a hash in a database (ibid). Then when the user wants to log in to their account, they present the password in cleartext which is hashed using the same algorithm used during the creation stage, and if the two hashes match perfectly, the passwords are the same and the user is granted access to the account (ibid). However, this approach alone is vulnerable to brute force attacks (ibid).

A brute force attack is an attack where a malicious actor tries to gain access to a system by trying every possible combination of passwords, keys, or other authentication factors ("Brute Force"). This type of attack is usually conducted by automated software that can try thousands or even millions of different combinations very quickly.

Brute force attacks can be very difficult to defend against because they can be conducted very quickly and with little effort (ibid). The best defense against a brute force attack is to use strong authentication factors that are difficult to guess, such as long passwords or passphrases, and to limit the number of attempts that can be made to gain access to a system (ibid).

Another method used to combat brute force attacks is password salts (Jung). This method is more effective against offline brute force attacks than online ones (ibid). Offline brute attacks work by somehow obtaining the password hash, and trying every possible combination to match the hash (ibid). Offline attacks are generally more effective than online ones because many services have a lock-out mechanism, where after a certain number of incorrect attempts, the service either locks the account or notifies the user (ibid). With offline attacks, this risk is mitigated.

To combat offline attacks, security professionals use random salts that are appended to the password at the time of creation (ibid). When the password is hashed, it is hashed with a random salt, which is also stored separately elsewhere (ibid). When the user attempts to log in, the stored salt is re-appended to the provided cleartext password and if the hash of the user-provided password plus salt matches the stored hash, then the user is granted access (ibid). This nearly mitigates the offline attack risk because it is nearly impossible to verify the password without knowing the associated salt (ibid).

These methods and techniques help mitigate many issues and significantly reduce the likelihood of leaking a password, but they are not foolproof. The best way to maintain security is to start at the source, making strong passwords. There are many ways to evaluate the strength of a password: online services

often use password strength meters, there exist machine
learning-based password strength classifiers, and password entropy can be used to calculate the complexity of a password.

Many users also opt to use password generators that use algorithms to develop long, complex, and incredibly safe passwords, however, these are often nearly impossible to remember, so users choose to use a password manager alongside the generator ("Is it Safe"). Many password managers now feature a password generator that can automatically save the password to the manager for different accounts (ibid). Password managers are generally considered to be incredibly safe, however, it is important to use popular ones as they tend to be more secure (ibid). Some examples of popular managers include NordPass, DashLane, 1Password, etc. (ibid).

There is also a tool that allows people to deep scan the web for mentions over their password or credentials (Hunt). Created by Microsoft Regional Director, Troy Hunt, the "Have I Been Pwned" site allows users to enter any credential and scan online password lists, credential leaks, and more for the entered credentials (ibid). Although the site sounds suspicious and insecure, it has been researched and evaluated by many researchers and security professionals (ibid). It is used by governments, organizations, individual users, etc. (ibid). The website's code is also open-source through the .NET Foundation (ibid).

Methodology Zxcvbn

To test and compare the strength of regular passwords and leet combined passwords, I used a tool called "zxcvbn" (zxcvbn). This tool allows one to estimate the strength of a password using an algorithm that returns valuable information: a strength score (0 - 4), estimates of how long it would take to crack, and feedback for improving the password.

Before using the zxcvbn tool, I first downloaded a list of passwords from Daniel Miessler (Miessler). I then used the following command "sed -ne '/[^0-9]/p' passwords.txt > passwords_sifted.txt" to sift through the passwords and remove any password containing only numbers, storing the remaining passwords into a passwords_sifted.txt file. This was because number passwords cannot be converted to leet. The resultant file had 834792 passwords.

I then wrote a script to convert these sifted passwords into leet format. To create the script, I formulated a character map, mapping each alphabet to a set of leet symbols and characters obtained from GameHouse (Craenen). The character map is as follows:

```
char_map = {
    "a" : ["a", "4", "@"],
    "b" : ["b", "13", "8", "I3", "l3"],
    "c" : ["c", "(", ""],
    "d" : ["d", "|)", "[)", "cl", "c1"],
    "e" : ["e", "3"],
    "f" : ["f", "ph"],
    "g" : ["g", "9"],
    "h" : ["h", "#", "/-/"],
    "i" : ["i", "1", "!"],
    "j" : ["j"],
    "k" : ["k", "|<"],
    "l" : ["l", "1", "|", "|_"],
    "m" : ["m", "/\/\", "/V\", "|V|"],
    "n" : ["n", "/\/", "/V"],
    "o" : ["o", "0", "()", "ø"],
    "p" : ["p"],
    "q" : ["q"],
    "r" : ["r"],
    "s" : ["s", "$", "5"],
    "t" : ["t", "+", "7"],
    "u" : ["u"],
    "v" : ["v", "\/"],
    "w" : ["w", "\/\/", "VV", "vv"],
    "x" : ["x", "><"],
    "y" : ["y", "`/"],
    "z" : ["z", "2", "7_"]
}
```

I then used the leet_converter.py script (attached in the appendix) to convert the letters in each password

to a randomly chosen leet alternative, however not all letters were converted to increase the realisticness of the generated passwords. The script created a passwords_leet.txt file which contains the leet-converted passwords.

The passwords_leet.txt file and the passwords_sifted.txt file were then fed into a strength testing script, password_strength.py (attached in the appendix). The password_strength.py script uses the zxcvbn library to assess and evaluate each password in the two files provided and outputs the data into two new files, called password_normal_strength.txt (for non-leet passwords) and password_leet_strength.txt (for leet passwords) (insert citation). The results found that almost all leet passwords had lower strength scores than their non-leet counterparts.

There were a few exceptions where the leet password had been heavily modified to the point where it no longer easily resembled the original. I found that, in the original word list, approximately 52.3% of the passwords had been given a score of 3 or above, and about 82.4% of these passwords had been given a score of 2 or below when converted to leet.

Hashcat

To test the strength of the two types of passwords using Hashcat, I chose to conduct a brute force attack against every password (Hashcat). However, before I could use Hashcat to crack the passwords, I needed to convert them into hashes. So I composed a script to convert each password into a hash using the SHA-1 hashing algorithm, called hash_converter.py (attached in the appendix). After which I ran a brute force program to crack the passwords. The program lasted 3673.324 seconds and was able to crack 12.98% of the leet converted passwords, and it lasted 3774.213 seconds and was able to crack 13.01% of the original passwords.

Entropy Values

Entropy measures the complexity of a password by assessing the number of passwords that can be generated given a character pool, and it is calculated by multiplying the password length by the log base 2 of the character pools (E = L * log2(R)) (Szczepanek). A character pool is the type of characters such as lowercase letters, uppercase letters, numbers, special characters, etc. Each character pool corresponds to the number of characters in that pool. The table shown below demonstrates this:

Lowercase Letters [a-z]	26
Uppercase Letters [A-Z]	26
Numbers [0-9]	10
Special Characters [“!”, “”””, “‘”, “#”, “$”, “%”,“&”, “’”, “(“, “)”, “*”, “+”, “,”, “-”, “.”, “/”,“:”, “;”, “<”, “=”, “>”, “?”, “@”, “[“, “\”, “]”, “^”,“_”, “`”, “{“, “|”, “}”,” “~”, “ ”]	35

The value of R in the formula is the sum of the numbers corresponding to the character pools that are present in the password. For example, the password “password123” would have an R value of 36 whereas “Password123” would have an R value of 62. Using this formula, I programmed a python script to multiply the length of each password by the log base of the R value of the password and stored the results in the following files, password_normal_entropy.txt, and password_leet_entropy.txt. I found that approximately 82.9% of the leet passwords had a higher entropy value than their original counterparts, and 5.7% of the normal passwords had a higher entropy value than their leet-converted counterparts.

II. RESULTS AND DISCUSSION

	zxcvbn (Given a score of	Hashcat (Percent cracked)	Entropy (Greater value than

	3 and above)		the counterpart)
Normal	52.3%	13.01%	5.7%
Leet	22.4%	12.98%	82.9%

As the table above demonstrates, zxcvbn demonstrates that leet speak has an adverse effect on password strength, and password entropy demonstrates that it significantly benefits the password complexity. However, I think Hashcat's results hold the greatest weightage and most accurately portray the conclusion among the three methods as this method best demonstrates the process of hackers. Hashcat's results demonstrate that it was able to crack more normal passwords but by a minuscule margin. I believe that that margin can be attributed to the margin of error, because, given another dataset, the percentage cracked could be reversed. The conclusion that can be drawn from the results overall is that leet speak has a minimal effect on the security of passwords as hackers are aware of these techniques and have developed programs that allow for them to circumvent these tricks and techniques. Leet speak may be able fool password strength meters in many websites but it is not a viable method to increase the security or strength of passwords.

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Appendix

leet_converter.py:

```
# Import necessary modules
import random

# Creating the character map with letters corresponding to leet speak characters
# Because not all letters are always converted to leet, each letter also corresponds
to the same letter twice to create a weighted probability of a letter being converted.
char_map = {
    "a" : ["a", "a", "4", "@"],
    "b" : ["b", "b", "13", "8", "I3", "13"],
    "c" : ["c", "c", "(", ""],
    "d" : ["d", "d", "|)", "|)", "cl", "cl"],
    "e" : ["e", "e", "3"],
    "f" : ["f", "f", "ph"],
    "g" : ["g", "g", "9"],
    "h" : ["h", "h", "#", "/-/"],
    "i" : ["i", "i", "1", "!"],
    "j" : ["j", "j"],
    "k" : ["k", "k", "|<"],
    "l" : ["l", "l", "1", "|", "|_"],
    "m" : ["m", "m", "/\\/\\", "/V\\", "|V|"],
    "n" : ["n", "n", "/\\/", "/V"],
    "o" : ["o", "o", "0", "()", "m"],
    "p" : ["p", "p"],
    "q" : ["q", "q"],
    "r" : ["r", "r"],
    "s" : ["s", "s", "5", "$"],
    "t" : ["t", "t", "+", "7"],
    "u" : ["u", "u"],
    "v" : ["v", "v", "\\/"],
    "w" : ["w", "w", "\\/\\/", "VV", "vv"],
    "x" : ["x", "x", "><"],
    "y" : ["y", "y", "`/"],
    "z" : ["z", "z", "2", "7_"]
}

# Opening the sifted passwords file and reading it into the text_original variable
text_original = open("./passwords_sifted.txt", 'r').read()
text_leet = ""
# Looping through ever character in the original text to convert to leet
```

```
# Import necessary
modulesimport random
```

```
# Creating the character map with letters corresponding to leet speak characters
# Because not all letters are always converted to leet, each letter also
corresponds to the same letter twice to create a weighted probability of a letter
being converted.char_map = {
    "a" : ["a", "a", "4", "@"],
    "b" : ["b", "b", "13", "8", "I3", "l3"],
    "c" : ["c", "c", "(", ""],
    "d" : ["d", "d", "|)", "[)", "cl",
    "cl"],"e" : ["e", "e", "3"],
    "f" : ["f", "f", "ph"],
    "g" : ["g", "g", "9"],
    "h" : ["h", "h", "#", "/-/"],
    "i" : ["i", "i", "1",
    "!"],"j" : ["j", "j"],
    "k" : ["k", "k", "|<"],
    "l" : ["l", "l", "1", "|", "|_"],
    "m" : ["m", "m", "/\\/\\", "/v\\", "|v|"],
    "n" : ["n", "n", "/\\/", "/v"],
    "o" : ["o", "o", "0", "()",
    "ø"],"p" : ["p", "p"],
    "q" : ["q", "q"],
    "r" : ["r", "r"],
    "s" : ["s", "s", "$", "5"],
    "t" : ["t", "t", "+",
    "7"],"u" : ["u", "u"],
    "v" : ["v", "v", "\\/"],
    "w" : ["w", "w", "\\/\\/", "vv",
    "vv"],"x" : ["x", "x", "><"],
    "y" : ["y", "y", "`/"],
    "z" : ["z", "z", "2", "7_"]
}


# Opening the sifted passwords file and reading it into the text_original
variabletext_original = open("./passwords_sifted.txt", 'r').read()
text_leet = ""
# Looping through ever character in the original text to convert to leet
```

```
for char in text_original.lower():
   # If the character is a letter and exists in the char map, then choose a random
leet character
   if char in char_map:
       leet_chars = char_map[char]
       leet_char = random.choice(leet_chars)
   # If the character is not a letter (numbers or symbols), then keep it the same
   else:
       leet_char = char
   # Append the leet characters to the transformed leet text
   text_leet += leet_char


# Opening the passwords_leet.txt file and writing the newly converted passwords to
this file
text_leet_file = open("./passwords_leet.txt", 'w')
text_leet_file.write(text_leet)
```

password_strength.py:

```
from zxcvbn import zxcvbn


password_normal_str = open("./passwords_sifted.txt", 'r').read()
password_leet_str = open("./passwords_leet.txt", 'r').read()
password_normal = password_normal_str.split("\n")
password_leet = password_leet_str.split("\n")


password_normal_strength = open("./password_normal_strength.txt", 'a')
password_leet_strength = open("./password_leet_strength.txt", 'a')


try:
   for passwd in password_normal:
       password_normal_strength.write(str(zxcvbn(passwd)));
       password_normal_strength.write("\n")
except:
   pass


try:
   for passwd in password_leet:
       password_leet_strength.write(str(zxcvbn(passwd)));
```

hash_converter.py:

```
import hashlib


# Open files containing the normal and leet passwords
password_normal_str = open("./passwords_sifted.txt", 'r').read()
password_leet_str = open("./passwords_leet.txt", 'r').read()

# Split the passwords by "\n" into an array of passwords
password_normal = password_normal_str.split("\n")
password_leet = password_leet_str.split("\n")

# Create two files that will contain the hashes
password_normal_hash = open("./password_normal_hash.txt", 'a')
password_leet_hash = open("./password_leet_hash.txt", 'a')

# For each password in the normal password list, hash it using sha1 and write it to
the normal password hash file
for passwd in password_normal:
   hash_object = hashlib.sha1(bytes(passwd, 'utf-8'))
   hex_dig = hash_object.hexdigest()
   password_normal_hash.write(hex_dig + "\n")

# For each password in the leet password list, hash it using sha1 and write it to the
leet password hash file
for passwd in password_leet:
```

hashcat_cracker.py:

```
import os


password_normal_hash_str = open("./password_normal_hash.txt", 'r').read()
password_leet_hash_str = open("./password_leet_hash.txt", 'r').read()

password_normal_hash = password_normal_hash_str.split("\n")
password_leet_hash = password_leet_hash_str.split("\n")
```

```
character_set = "?a"


os.system("echo \"\" > passwd_normal_hashcat.txt")
os.system("echo \"\" > passwd_leet_hashcat.txt")

for passwd in password_normal_hash:
   os.system("echo \"" + passwd + "\" > passwd.txt")
   os.system("hashcat -m 100 -a 3 passwd.txt " + ("?a" * passwd.len()) + " >>
passwd_normal_hashcat.txt")
   os.system("echo \n" + passwd + "\n >> passwd_normal_hashcat.txt")


for passwd in password_leet_hash:
   os.system("echo \"" + passwd + "\" > passwd.txt")
   os.system("hashcat -m 100 -a 3 passwd.txt " + ("?a" * passwd.len()) + " >>
```

entropy_calculator.py:

```
from asyncio.proactor_events import _ProactorBaseWritePipeTransport
import math
from operator import truediv
from sre_parse import SPECIAL_CHARS
from tokenize import Special
import math


password_normal_str = open("./passwords_sifted.txt", 'r').read()
password_leet_str = open("./passwords_leet.txt", 'r').read()
password_normal = password_normal_str.split("\n")
password_leet = password_leet_str.split("\n")


password_normal_entropy = open("./password_normal_entropy.txt", 'a')
password_leet_entropy = open("./password_leet_entropy.txt", 'a')


for passwd in password_normal:
   has_uppercase = False
   has_lowercase = False
   has_numbers = False
   has_symbols = False
   pool_size = 0
```

```
        if
            character.isuppe
            r():
            has_uppercase =
            Truepool_size +=
            26 break


    for character in passwd:
        if
            character.islowe
            r():
            has_lowercase =
            Truepool_size +=
            26 break


    for character in passwd:
        if
            character.isdigi
            t():has_numbers
            = True pool_size
            += 10 break


    SPECIAL_CHARS = "!”\"#$%&’'()*+,-./:;<=>?@[\]^_`{|}~ "


    if any(character in SPECIAL_CHARS for character in
        passwd):has_symbols = True
        pool_size += 35


    entropy = len(passwd) * math.log(pool_size, 2)


    print(passwd + ": " + str(entropy))
    password_normal_entropy.write(str(entropy) +
    "\n")


for passwd in
    password_leet:
    has_uppercase = False
    has_lowercase = False
    has_numbers = False
    has_symbols = False
    pool_size = 0
```

```
for character in passwd:
    if
        character.isuppe
        r():
        has_uppercase =
        Truepool_size +=
        26 break


for character in passwd:
    if character.islower():
        has_lowercase =
        Truepool_size += 26
        break

for character in passwd:
    if
        character.isdigit
        ():has_numbers =
        True pool_size +=

SPECIAL_CHARS = "!”\"#$%&''()*+,-

if any(character in SPECIAL_CHARS for character in
    passwd):has_symbols = True
    pool_size += 35

entropy = len(passwd) * math.log(pool_size,

print(passwd + ": " + str(entropy))
password_leet_entropy.write(str(entropy) +
```

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Approximate Multiplier Design Using Novel 4 : 2 Compressor Design With Improved Accuracy

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ABSTRACT

Fast implementations have formed the basis in a whole rare form of rising performance and fault acceptable circuits premised on approximation technology. High performance comes at the expense of accuracy in many applications. Additionally, such methods minimise system architectural complexity, latency, and power consumption. When compared to existing designs, this study investigates and proposes the design and analysis of an approximation compressor with reduced size, latency, and power and equivalent accuracy. The stated approximation 4: 2 compressor now has relatively small footprint, lower power losses, and reduced latency in comparison with precise 4: 2 compressor. With the optimized compressors, 8 bit and 16 bit Dadda multipliers can be designed efficiently. In comparison to current approximation multipliers, these multipliers offer equivalent accuracy.

Keywords : Approximate 4:2 compressors, approximate multipliers, error resilient applications, image processing.

I. INTRODUCTION

Approximate[3] computing is a new trend in digital architecture that allows for significant performance gains in terms of power, speed, and space while avoiding the need for exact computation. For embedded and mobile systems with strict energy and speed limits, this method is becoming increasingly crucial. Several error-resilient applications can benefit from approximate computing. This technology involves image processors, data gathering and identification, and deep learning, to mention a very few. Multipliers [2] are crucial aspects in microchips, digital signal, and embedded devices, that are used for a multitude of activities from filtration to convolutional layers. Due to its complicated logical framework, multipliers, from the other extreme, are among the most energy-intensive digital blocks. As a consequence, approximation multiplier development became a prominent area in recent studies. Partially generated products, partially reduced products, and carry-propagate addition are the building elements of a multiplier. In any of these blocks, approximations can be used. For instance, partial product truncation is a well-established approximation approach in which some partial products are not generated and the truncation error is minimised using appropriate correction functions.

In the design of computing systems, energy efficiency has risen to the forefront. Simultaneously, as computer systems become more integrated and mobile, computational activities

have expanded to encompass image processing It is difficult to tell the difference between a decent search result and the top result in data mining. Imprecision tolerance is a feature of these applications.

Measurement error tolerated feature can be triggered by a variety of conditions, which include the: (1) human visual constraints: these are regulated by the power of the human cortex to substitute up missing key info and block out high-frequency sequences; (2) data redundancy for input: this redundancy imply that such a lossy system can indeed be viable and acceptable due to inherent tolerance; and (3) messy input data which are unwanted/ noisy info. This presentation's core objective is to evaluate new and significant improvements and advances in estimation technology which can also be referred as approx. computation (AC). The word encompasses a broad range of research efforts, from programming languages to the transistor level. The hunt for solutions that allow computing systems to exchange energy for the quality of the calculated output is a common thread running across these divergent projects.

Given that traditional Dennard s scaling yields declining returns as technology advances, taking use of the new source of energy-efficiency afforded by approximation computing is becoming increasingly vital.

Because of the huge volumes of data and intricate computations necessary in these applications, a new issue has emerged as big data processing and artificial intelligence become more important. To accelerate the development of these new technologies, energy-efficient and high-performance general-purpose compute engines, as well as application-specific integrated circuits, are in great demand. Exact or high-precision computing, on the other hand, isn't always required. Small mistakes, on the other hand, can compensate for each other or have no substantial impact on the computed results. As a result, approximation computing (AC) has evolved as a novel method to energy-efficient design as well as enhancing the performance of a computing system with little accuracy loss.

Approximate computing has developed as a new paradigm for circuit and system design that is both high-performance and energy efficient. With so many approximate arithmetic circuits suggested, it's become vital to comprehend a design or approximation approach for a given application in order to maximise performance and energy economy while minimising accuracy loss. The goal of this paper is to offer a complete overview and comparative evaluation of newly developed approximation arithmetic circuits under various design restrictions. Approximation integrators/summators, multipliers, and divisions are synthesized and evaluated in the perspective of efficiency optimizations and size reductions. The fault and circuitry attributes are then globalized all over a set of design classifications.

The circuits with lower error rates or error biases perform better in simple computations, such as the sum of products, whereas more complex accumulative computations that involve multiple matrix multiplications and convolutions are vulnerable to single-sided errors that result in a large error bias in the computed result. Because addition[1] mistakes are more sensitive than multiplication errors in such complicated calculations, multipliers can tolerate a larger approximation than adders. In addition to the gains in performance and power consumption for these applications, the adoption of approximation arithmetic circuits[4] can improve image processing and deep learning quality.

Approximation can be used to reduce the overhead on calculation units of a processor, resulting in improved performance and efficiency. The speed of operation, which is inversely related to the system delay, necessitates massive parallel processes, which consume a lot of hardware and energy. By lowering the accuracy and dependability of the system, energy and space efficient solutions may be realised. Approximation concept has recognized as a highly recommended technique for reconciling a balance between latency, space occupancy, and energy consumption. Faster systems with lower design complexity and power consumption result from approximated arithmetic processes.

I. EARLIER WORK

In AI and DSP [6] techniques, multiplication is and will always be doubt an efficiency influencing operation. Such tasks involve considerable high performance parallel operations having minimal error, so it necessitates rising

performance multiplier topologies. With the use of estimation in multipliers, quick and efficient analyses can be obtained with even less computational effort, time, and with better power efficiency yet ensuring optimum reliability. But since adder structures've got delay time, partial product addition is the worst delay effecting process in multiplication. Compressors[9] are now used to decline the propagation delay time. The summing value and carry generated are evaluated by compressors at every step. The resulting carry is then combined with a bit with a greater significant sum value in the subsequent steps. This technique is done repeatedly until the final outcome is achieved. Through use of estimation in multiplication procedure leading to fast computation which can occupy minimum hardware architecture requirement, computational latency, and power consumption while preserving tolerable accuracy. Partial product summation is the worst step where the delay for computation is high in overall multiplication due to the propagation latency of adder networks. Compressors are used to shorten the propagation delay. Compressors at each level compute the sum and carry. In the following stage, the resulting carry is combined with a bit with a higher meaningful amount. This process is repeated until the desired outcome is achieved.

CONVENTIONAL 4:2 COMPRESSOR:

Figure 1 depicts the overall topology of an exact 4: 2 compressor that is having five input with three outputs, and that is formed by two complete adders that are cascaded. The precise 4:2 compressor's inputs are A1, A2, A3, A4, and CIN, while the outputs are COUT, CARRY, and SUM.

$$C_{OUT} = A_3(A_1 \oplus A_2) + A_1(\overline{A_1 \oplus A_2}) \quad (1)$$

$$CARRY = C_{IN}(A_1 \oplus A_2 \oplus A_3 \oplus A_4) + A_4(\overline{A_1 \oplus A_2 \oplus A_3 \oplus A_4}) \quad (2)$$

$$SUM = C_{IN} \oplus A_1 \oplus A_2 \oplus A_3 \oplus A_4 \quad (3)$$

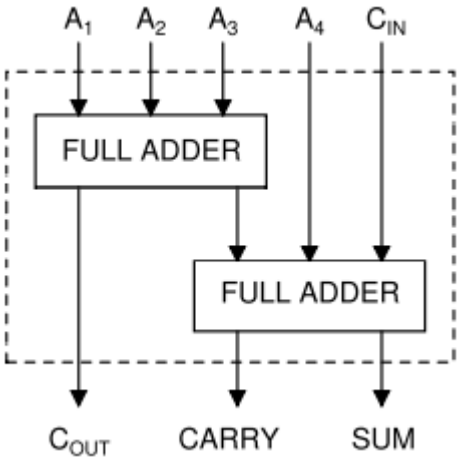

Fig.1: conventional 4 bit compressor design

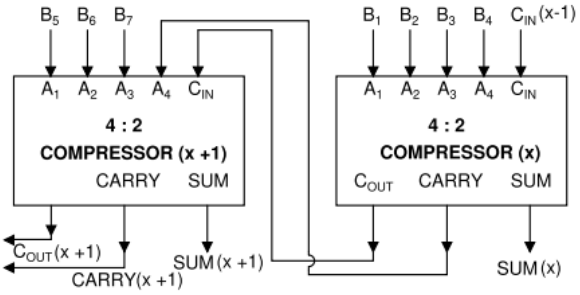

Fig.2: cascading of two compressors

Figure 2 depicts a compressor chain. The input carry from the previous 4: 2 compressor that handled the lower significant bits is represented by CIN.

Two estimated compressors are suggested in this work. Figure 3 depicts the planned 4: 2 approximation high-speed area-efficient compressor. v1, v2, v3, and v4 are the compressor inputs; ca and su are the outputs, where su indicates sum of the compressor and ca indicates carry of the compressor design.

To design su, experts used a mux design approach. The return of the ex-or Logic circuit is sent into the MUX s control signal. (v3v4) is picked when the selecting line is high, and (v3 + v4) when it becomes lower. Here is a collection of the logical formulas for realising su and ca.

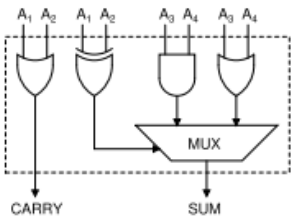

Fig.3: area-efficient 4:2 compressor

su = (v1 v2)v3v4 + (v1 v2)(v3 + v4) (1)

ca = v1+v2 (2)

Where A1, A2, A3, A4 in this are v1, v2, v3, v4 and sum is su and carry is ca. The error has been added for the input numbers 0011, 0100, 1000, and 1111, To ensure that equal positive and negative deviation is created with ED = 1, The truth table (Table 1) of the planned 4: 2 compressor must be employed (minimum).

Table.1: Truth table of area efficient 4:2 compressor

A_1	A_2	A_3	A_4	$CARRY$	SUM	ED
0	0	0	0	0	0	0
0	0	0	1	0	1	0
0	0	1	0	0	1	0
0	0	1	1	**0**	**1**	-1
0	1	0	0	**1**	**0**	+1
0	1	0	1	1	0	0
0	1	1	0	1	0	0
0	1	1	1	1	1	0
1	0	0	0	**1**	**0**	+1
1	0	0	1	1	0	0
1	0	1	0	1	0	0
1	0	1	1	1	1	0
1	1	0	0	1	0	0
1	1	0	1	1	1	0
1	1	1	0	1	1	0
1	1	1	1	**1**	**1**	-1

This study proposes an alternate architecture for multipliers with more than three stages of cascaded compressors as a method of improving the hardware utilisation of the proposed design. The high performance with area-efficient compressor topology requires a XOR, AND, and 2 OR logical gates along with a MUX. OR and AND gates each utilize six CMOS based transistors. This research suggests and implements a design that affects the number of transistors reduction by leveraging NAND and NOR gates, as seen in Figure 4. Although the SUM and CARRY obtained by the modified design are not identical to those provided by the suggested 4: 2 compressor architecture, the mistake is eliminated by cascading the compressor in multiples of 2.

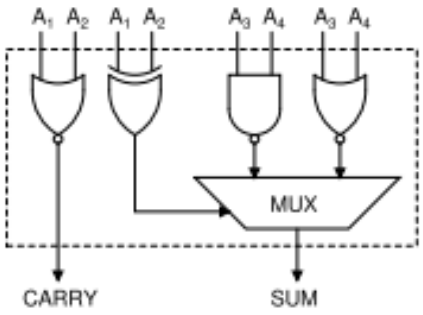

Fig.4 The suggested improved Dual-stage 4: 2 compressors basic building block.

By approximating the 4: 2 compressor, the output count can be reduced to two. To approximate the outcome, COUT is removed. When the input combination is 1111, an error occurs. The CARRY and SUM are both set to 11 when the input bits are 1111, resulting in a one-bit error.

II. PROPOSED WORK

High-speed multipliers are becoming increasingly used in a variety of computing applications, including computer graphics, scientific calculations, and image processing, and so on. The multipliers speed determines how fast the processors run, and designers are currently concentrating on achieving high speed while utilising minimal electricity. The multiplication architectural style including of three main layers such as: partial product outputs production or calculation, partial product minimization/reduction process, and final adding the obtained two rows of results with general adder like RCA, PPA etc. The PPR is responsible for a significant portion of the multiplier time, energy, and area overhead. Compressors are frequently built to produce partial products in order to reduce delay and improve performance.

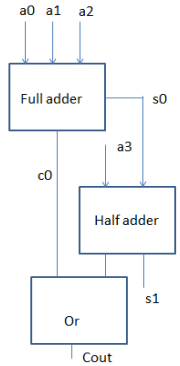

Fig: 5 new design for approximate compressor.

To analyse compressor, we are now building an 8 bit dadda and 16 bit dadda multiplier. Below is an illustration of an 8-bit dadda multiplier. The suggested multiplier offers a faster speed and better accuracy than the present multiplier.

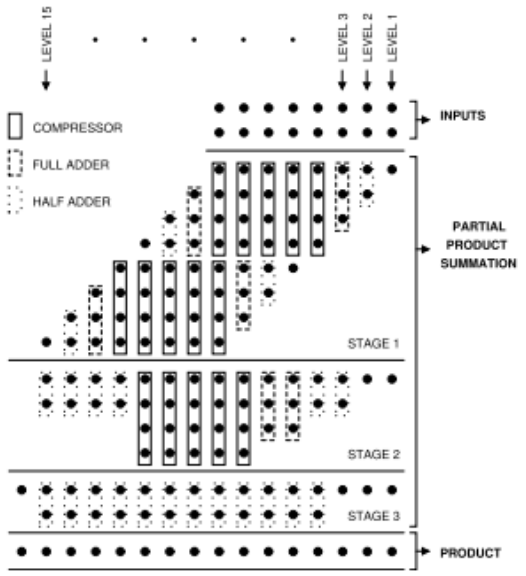

Fig.6: approx. multiplier for 8 x 8 bit

The 16-bit dadda multiplier is created by combining proposed compressors with an identical compressor that already exists. Due to proposed design, exactness is somewhat increased compared to the current multiplier, and the multiplier s performance is enhanced compared to the existing multiplier because of the suggested compressor architecture. Below is a diagram of the multiplier design utilising the suggested 4:2 compressor.

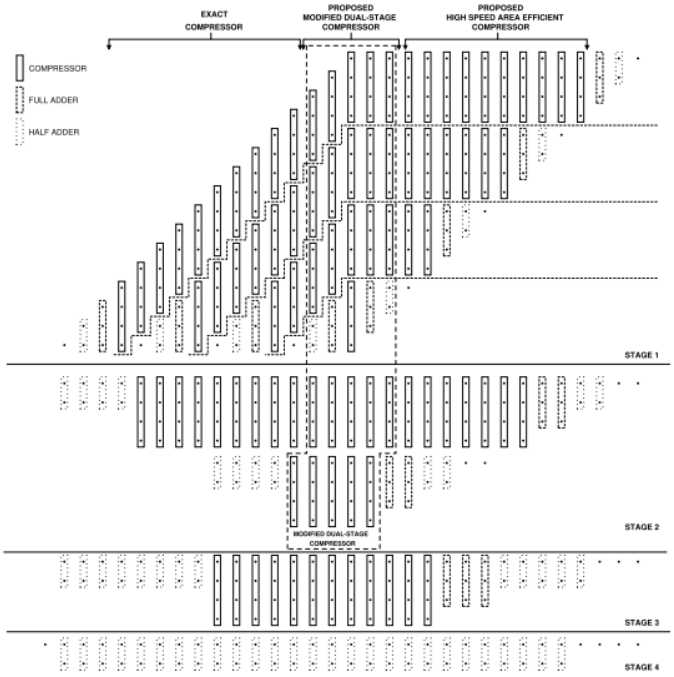

Fig: 7 proposed 4: 2 compressors used in 16 × 16 multiplier.

III. EXPERIMENTAL RESULTS

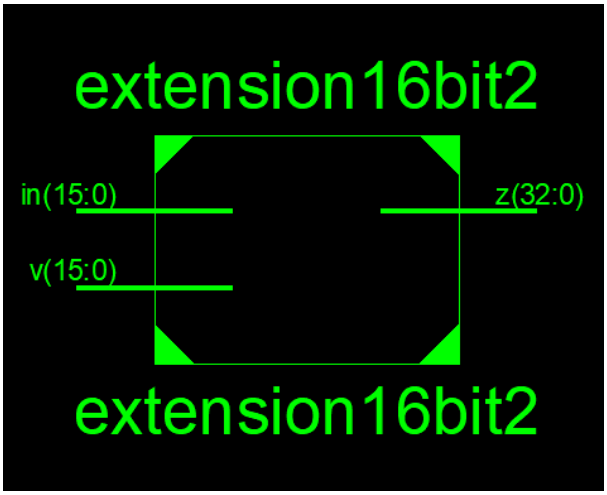

Fig.8: RTL Schematic of FFT

Figure 8 shows RTL block level schematic of the implemented design. RTL refers to register transfer level. This is the schematic produced by the tool based on the code designed by the user as per the top module of the circuit.

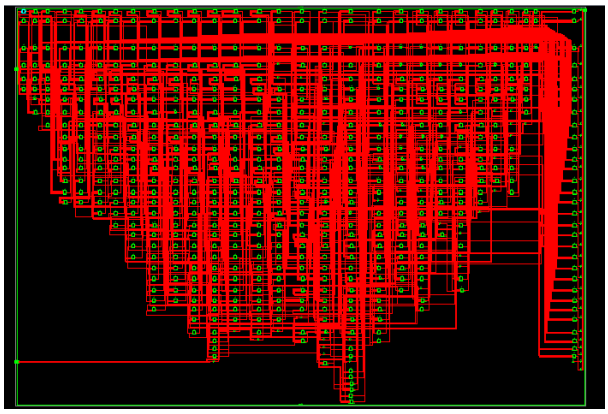

Fig.9 Technology schematic of 16 bit approx. multiplier

Figure 9 shows Technology schematic of the implemented design. This is the schematic produced by the tool based on the optimization of code designed by the user as per the top module of the circuit which converts the entire code into LUT blocks and forms a schematic which is technology schematic and this varies based on the type of FPGA device selected during the project creation in the synthesis tool.

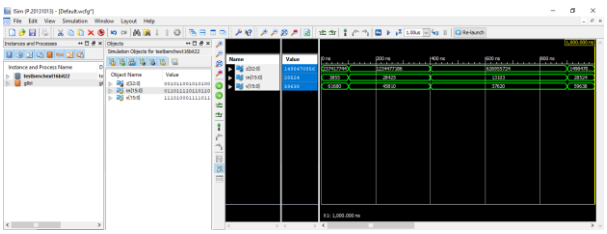

Fig.10: Simulation results for 16 bit approx. multiplier

Figure 10 shows the simulation results of waveforms for implemented design using test bench. In this, we observe that when the based on the input signals and, for every set of input values, the output values are generated which are the approximate results that makes use of the proposed compressor for the reduction of partial products in the multiplication process.

	AREA (LUT's)	DELAY (ns)	POWER (W)
proposed 4:2 COMP	2	6.23	0.034
4:2 HIGH SPEED	2	6.23	0.034
4:2 DUAL STAGE COMP	2	6.23	0.034
8 BIT DUAL STAGE COMP	98	11.98	0.034
8 BIT MULTIPLIER USING HIGH SPEED COMP	95	12.12	0.034
proposed 8 BIT MULTIPLIER USING DUAL STAGE COMP	111	10.62	0.034
16BIT MULTIPLIER	524	44.8	0.034
16BIT MULTIPLIER proposed	558	42.3	0.034

Table2: comparison between Existing and Proposed methods.

Table2 describes the comparison of performance parameters such as Area and Delay between multipliers implemented with high speed and dual stage compressors (Existing) and multipliers using novel compressor (Proposed). Based on these findings, we claim that the suggested method's duration is minimized by deploying an innovative compressor approach. Integrating preexisting compressors with creative compressors which are later proposed, a tradeoff between area overhead and computational delay is built between existing and later implemented 8 bit and 16 bit multiplication algorithms.

IV. CONCLUSION

Here in this article, a new compressor based multiplier is designed and implemented. In comparison to traditional compressors, the proposed design has a faster speed and a higher degree of accuracy. To validate the comparator design, the 8 x 8, 16 x 16, Dadda multiplier was utilised. In terms of performance and accuracy, output waveforms indicates that it outperforms existing approx. multiplier designs. In the future by making considerations and by establishing a tradeoff we can attain better outcomes.

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Modified Vedic Multiplier Based on Homogenous Hybrid Adder for RISC V Applications

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ABSTRACT

16-bit RISC processor with Vedic multiplier architecture is used in this project. In addition to multiplier which is implemented using vedic mathematics we are also proposing an adder which is hybrid adder for building higher bit adders in an area efficient which is implemented in addition as well as for compression in vedic mathematic to obtain the output. The multiplier unit is developed utilizing Vedic Sutras, which is the primary accomplishment of this study. The primary premise of Vedic mathematics is to minimize the computational complexity by reducing the usual calculation of conventional mathematics to a very simple calculation. The suggested RISC processor is extremely primitive, and it can only execute 14 instructions. The accomplishment of this study is that in the case of MAC and ALU, power savings and minimized latency are realized as compared to traditional ALU and MAC. Following that, the Vedic MAC and ALU are combined with other processing blocks to create a 16-bit Vedic processor. As a result, the major features of the developed RISC processor are an increase in operating speed, a decrease in power consumption, and a reduction in area consumption.

Keywords : Reduced Instruction Set Computer; Von Neumann architecture; Verilog HDL, Vedic Mathematics, Urdhva-Tiryagbhyam Sutra.

I. INTRODUCTION

Bharati Krishna, a researcher explained that Vedic mathematics is divided into 16 sutras and 13 sub-sutras, which makes it easier to solve mathematical equations. The prehistoric Vedic Mathematics method was enlightened by Swami Bharati Krishna Tirthaji Maharaj, Goverdhan Peath's Shankaracharya. Frequency domain filtering (FIR, IIR) and frequency transformations such as DFT, FFT, and DCT are among the tasks that digital signal processing must undertake. Multiplication is a crucial hardware component for these tasks. As a result, the multiplier's presentation is a critical factor in determining the framework's overall exhibition. This is because the multiplier is the framework's slowest and most time-consuming component. As a result, increasing the multiplier speed and area is a significant challenge for

the framework designers. Binary multipliers are used in digital circuit plan which makes them quick, dependable and easy to carry out in any activity.

The Urdhva Tiryakbhyam sutra's reasoning is quite similar to that of a traditional array multiplier. The Nikhilam Sutra is divided into nine sections, the first of which begins at number nine and ends at number ten. It finds the complement of the huge integer from its nearest base in order to conduct the multiplication operation. Ekanyunena Purvena denotes anything that isn't quite the same as the one before it, or something that isn't quite the same as what came before it. This sutra may be used to multiply integers with a multiplier of 9 or a cluster of 9 multipliers. In digital signal processing (DSP) situations where multiplication involves repeated addition operations, the squaring job comes in handy. To get the square of a number, the Ekadhikena Purvena Sutra is summarized.

Parameters such as latency, area, and power are traded off in many adder designs which have been proposed. Next by replacing multiplier and accumulator (adder) with existing designs, a number of MAC unit design may be created. There are comparisons in terms of latency, area, and power between different MAC unit models. Based on Vedic Mathematics, this paper shows many multiplier architectures that are both quick and low power.

The four Vedas include Vedic mathematics. It is part of the Sthapatya-Veda (Civil Engineering) upaveda (supplement) of the Atharva Veda. Vedic Maths explains arithmetic, geometry, factorization, trigonometry, quadratic equations, and calculus. An extensive investigation in the Atharva Veda produced 16 sutras (formulae) and 16 Upasutras (sub formulae). Vedic mathematics deals with a variety of basic and advanced number problems. The term vedic comes from the word Veda, which meaning all learning's storage place[7]. Vedic mathematics deals with a number of different aspects of mathematics, the most important of which are the 16 Sutras: (Anurupye) Shunyamanyat, Chalana-Kalanabyham, Ekadhikina Purvena, Ekanyunena Purvena, Gunakasamuchyah, Gunitasamuchyah, Nikhilam Navatashcaramam, Paraavartya Yojayet, Puranapuranabyham, Sankalana-vyavakalanabhyam, Shesanyankena Charamena, Shunyam Saamyasamuccaye, Sopaantyadvayamantyam, Urdhva-tiryagbhyam, Vyashtisamanstih, Yaavadunam

These sutras can be used to answer issues in any discipline of mathematics. Vedic Mathematics lends itself to FPGA implementation because of its regularity. By constructing the data route operators with Vedic Mathematics, a greater throughput may be achieved.

A recent tendency has been to create RISC processors that are efficient for certain applications and fulfil the application's basic needs. The key criterion for such CPU design is performance. The fundamental distinction between CISC and RISC architecture is that RISC processors are optimized with a high number of registers and instruction pipelining, which allows for a low number of clock cycles per instruction. The LOAD/STORE architecture is also a key component of RISC.

II. EARLIER WORK

As the name suggests the Multiplier and Accumulator (MAC) unit have multiplier and an accumulator in it. For An N-bit MAC unit, it is having N-bit multiplier and a (2N+-1)-bit accumulator. A three-step multiplier is common. First step of the process is to generate partial products. Next step is to produce a partial product matrix. For unsigned multiplication, AND gates are used. Further step is reduction of partial products. The PPM may be reduced to two rows by utilizing either the Dadda tree or Wallace tree approaches. The final addition comes in the third stage. The summing of the last two rows is done using final adder. A (2N-1)-bit adder is required for last step addition. In a traditional MAC unit, additions in multiplications and additions in accumulations must be performed twice. It is important to keep in mind

that carry propagation takes time. As a result, the PPR process's input is sent back to the multiplier output. Because the accumulation is handled by the final adder, only one carry propagation is required.

In multiplication the major problem is the high time consumption. For overcoming this problem various methods such as high-radix, scalable, and signed-digit multipliers have been proposed. When compared to previously developed design the proposed MAC unit is capable for performing ordinary arithmetic but not modular arithmetic.

The multiplier is one of the most important arithmetic blocks, and it is frequently utilized in a variety of applications, particularly signal processing applications. The multipliers may be built in two different architectures: sequential and parallel. Sequential designs are low-power, however they have a very long delay. Parallel architectures, on the other hand, (such as Wallace tree and Dadda) are quick but use a lot of power. Parallel multipliers are utilized in high-performance applications where their excessive power consumption might result in hotspots on the chip. The adjustment of these parameters for multipliers becomes vital since power consumption and speed are critical elements in the design of digital circuits. Frequently, one parameter is optimized while the other value is constrained. In particular, given the restricted power budget of portable devices, obtaining the necessary performance (speed) is a difficult issue. Furthermore, achieving the system's intended performance may be hampered by a predetermined degree.

It's a logic circuit that combines two types of logic. One AND gate and one EX-OR gate may be connected to design it. The A and B input terminals make up a half-adder circuit. Both of these algorithms add two input digits (one-bit values) and provide a carry and a total as output. As a result, the output terminals are split into two.

The total of both one-bit values is obtained from the EX-OR gate's output. The output of the AND gate is nothing but carry. But carry propagation is not achieved due to lack of a logic gate that can process it. The Half Adder circuit gets its name from this.

The output equation for both gates may be expressed as a logical operation performed by the logic gates. The sum equation is written as an EX-OR operation, whereas the carry equation is written as an AND operation.

Two AND gates, two EX-OR gates, and one OR gate make up a complete adder. The complete adder multiplies three binary digits together. The carry, which we get from the previous addition as C-IN, is one of the three, and the other two inputs are A and B. C-OUT is the input carry and is SUM is represented as S.

A full adder is an extension of half adder. However, there are more logic gates on it. As a result, it multiplies the preceding carry to get the final result. The Full Adder gets its name from this.

Using one OR gate and two Half Adders, a Full Adder may likewise be created. The OR gate creates a carry following the addition. The second Half Adder produces the total of these numbers as output.

The sum of all binary digits is the equation for the output that the EX-OR gate can produce. The carry obtained by addition is the output from the AND gate in this case. This is a logical operation

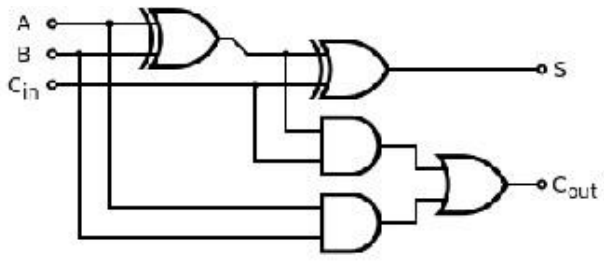


Fig 1. Full adder

Multipliers are utilized in a variety of applications including digital signal processing. Many academics have focused on design considerations for greater performance as a result of developments in current technology. High speed, precision, low power consumption, layout consistency, and a small footprint are only a few of the design goals.

Multiplexers, adders, and MAC are only a few of the computational components of a DSP processor. In comparison to prior versions, the operation and execution performance of these blocks has improved. The speed at which multipliers operate is determined by two factors: technology of semiconductor used and design of multiplier. The multiplier's speed depend on the adder's operating speed since adders are the basic component in it. Multipliers come in a variety of shapes and sizes, with the 44 array multiplier being one of the most sophisticated. There are three key phases in the multiplication procedure: Partial product generation, Partial product reduction and Final addition.

The most common multiplication process is "add and shift "algorithm which is shown below:

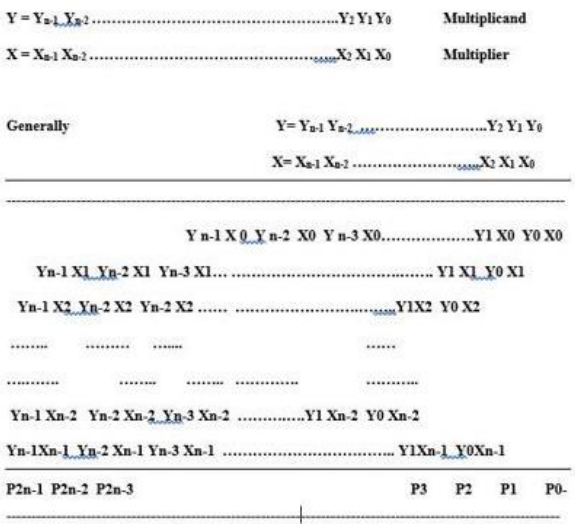


Fig 2. Array multiplier

Where, Multiplicand = N-bits**,** Multiplier = M-bits and Partial products = N*M.

The add shift algorithm underpins the multiplier circuit. The array multiplier's key benefit is its straightforward design and consistent form. An array multiplier's downside is that it has a long delay and uses a lot of energy. In order to execute continuous and complicated operations in digital signal processing, the MAC unit performs multiplication and accumulation procedures several times. To govern its operation, the MAC unit also has a clock and a reset.

The Array Multiplier (AM), which is made up of partial products formed using AND Logic, is one of the finest traditional multipliers. The Half Adder (HA) and Full Adder (FA), depending on the amount of input bits, are used to add all partial products. The multiplication mechanism is comparable to that of an array multiplier in a ripple carry array multiplier with row bypassing approach. However, depending on the carry value obtained in the adder stage, certain product steps are bypassed from one state to the next.

As array multiplier is degrading the performance of the RISC processor we are going for the utilization of vedic multipliers. Vedic multiplication is the fastest way of implementation and these are derived at very ancient times which were given in vedas.

The hardware architectures of 2×2, 4×4 bit Vedic multiplier unit based on Urdhva-Tiryakbhyam. In Vedic multiplier, a concurrent execution approach is applied on the fractional product creation and additions. Hence, it is well adapted to parallel processing. This reduces delay and this is primary motivation behind this work.

Vedic Multiplier for 2×2 bit Module

The technique is illustrated in Figure 1 for two two-bit values A and B, where A = a1a0 and B = b1b0. Initially, the method considers the multiplication of LSBs to arrive at the final product's LSB (vertical). The LSB of the multiplicand is then multiplied by the multiplier's next higher digit, followed by the addition of the result and the product of the multiplier's LSB and the multiplicand's next higher bit (crosswise). The summation provides the second bit of the final result, and the carry is added to the part product formed by multiplying the most significant bits, which comes before the sum and carry terms.

$$S_0 = a_0 b_0 \quad (1)$$

$$c_1 s_1 = a_1 b_0 + a_0 b_1 \quad (2)$$

$$c_2 s_2 = c_1 + a_1 b_1 \quad (3)$$

The 2×2 Vedic multiplier module is implemented using four input AND gates along with two half-adders.

B. Vedic Multiplier for 4×4 bit Module

Incorporating four such modules of 22 multipliers completes the 444 bit Vedic multiplication unit. For the 44 multiplier, the processing is shown in the form of a block diagram in Fig.

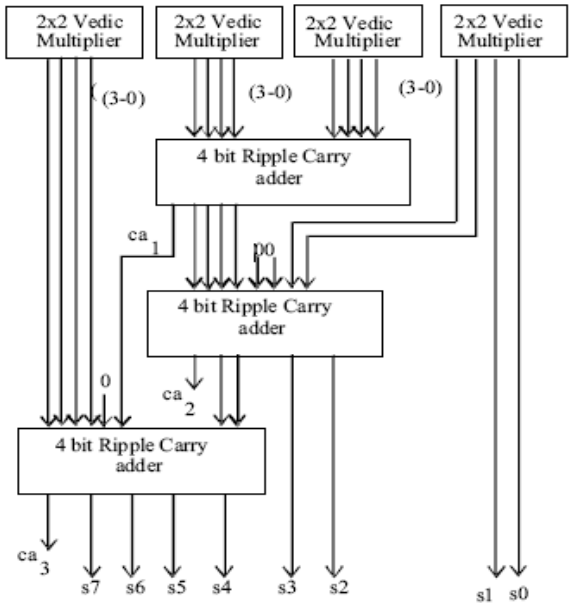


Fig 3. Schematic diagram of 4x4 bit Vedic mathematic based multiplier

C. Vedic Multiplier for 8×8 bit Module

Four 4x4-multiplier modules are used to create the 8x8 Vedic multiplier modules. In the diagram below, the Vedic technique is used to process the 8x multiplier. With two 8-bit numbers, a=a7a6a5a4a3a2a1a0 and b=b7b6b5b4b3b2b1b0, the result is S15-S0. Additionally, the integers a and b are separated into two equal four-bit pieces, aH-aL and bH-bL. P = a b = (aH-aL) (bH-bL) = aH bH + (aH bL + aL bH) + aL bL is now known as the 16 bit final product term. Following then, the operation of multiplication is carried out by feeding four bits concurrently to the four-bit multiplier unit, and then adding the output to get two eight-bit values as the final result.

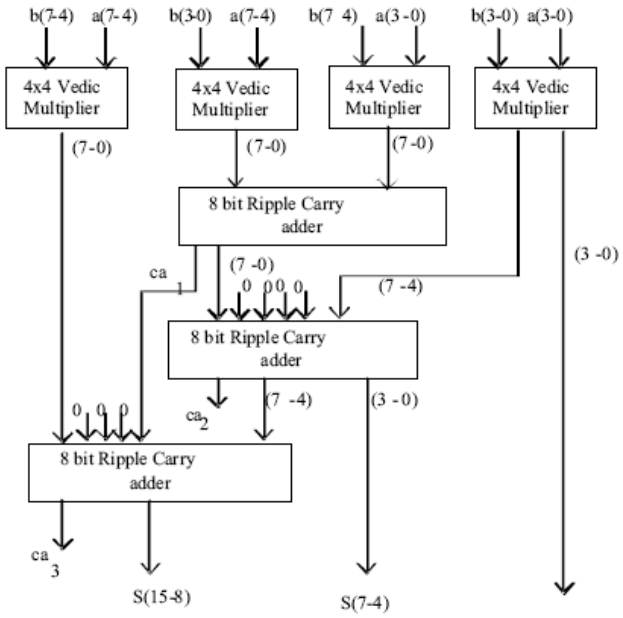


Fig 4. Schematic diagram of 8x8 bit Vedic mathematic based multiplier.

III. PROPOSED WORK

The processor's job is to efficiently execute all of the instructions in the machine language. The ALU stands for Arithmetic and Logical Unit in a combinational circuit. The purpose of this unit is to do a variety of calculations utilizing a variety of instruction sets. ALU inputs in a processor are made up of an instruction (machine word) and certain operands. The opcode instructs the ALU on which and what operation to do, and the operands are subsequently employed in the operation.

Register bank is a modest collection of data storage facilities. The ALU saves the outcome of the operation in an accumulator, which is then stored in a storage register, and it verifies the bits to see if the operation was successful. If the command is not properly executed, a status register, also known as a Z-Flag, will be shown. Its job is to run programs and keep data in memory running smoothly. A processor contains a set of instructions, which are nothing more than instructions for a computer to accomplish a task. Decoding the op-code, detecting the instruction, determining which operands are in memory, fetching the operands from memory, and finally issuing a

command to a processor to execute the instruction are all tasks that IR does. This is accomplished through the use of a control unit that creates timing signals that control the different processing parts involved in the instruction's execution.

The address in the program counter is applied to memory, and the current instruction is put in the Memory location following the increment in the PC to the next address. The MAR is full of Binary words that point to the word's position in RAM. The instruction is kept at this area.

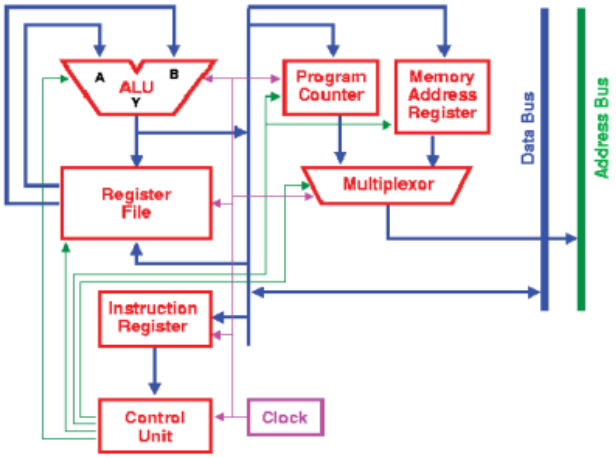


Fig 5.block diagram of processor

The sutra Urdhva Tiryakbhyam (Vertical and Crosswise) (Algorithm). It's a universal multiplication formula that works in every situation. All partial product and sum are generated in one step using the procedure. For nxn bit numbers, the procedure has been generalized. On comparing proposed multiplier with other multipliers, it is having an advantage of increased gate latency and area. The line's digits are multiplied, and the result is added to the preceding carry. When there are many lines in a single step, the results are summed together. The least significant digit of the number so produced serves as one of the result digits, while the remainder serves as the carry for the following step. The carry is set at zero in the beginning.

MODULE OF N×N VEDIC MULTIPLIER

An N×N bit Vedic multiplier module is designed similar to previously mentioned different Vedic multipliers. In the figure below there is a block diagram of N×N bit Vedic multiplier

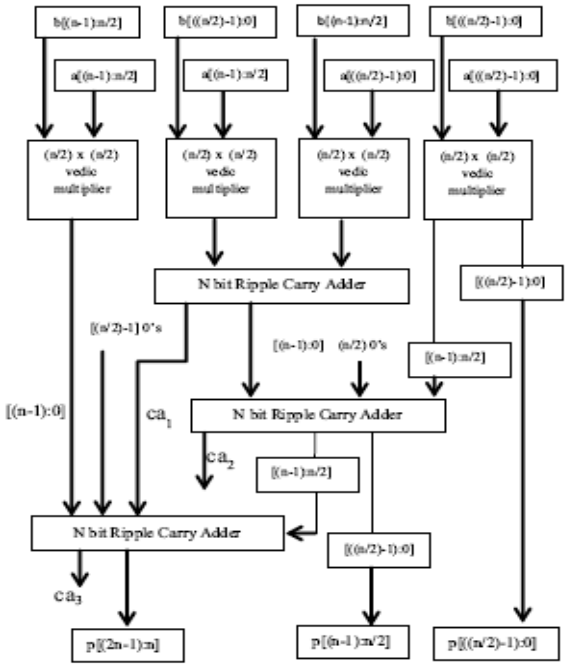


Fig 6. Schematic block diagram of N×N bit Vedic multiplier

In comparison to a conventional multiplier, the UT Technique based Multiplier is a more efficient hardware design for multiplying two integers; it is mostly used for high-speed multiplication. Figures 4 and 5 showthe d the block diagrams of 44 and 88 bit UT multipliers. Garbage Bits are the last two output bits, P8, P9 (for 4x Multiplier) and P16, P17 (for 8x Multiplier).

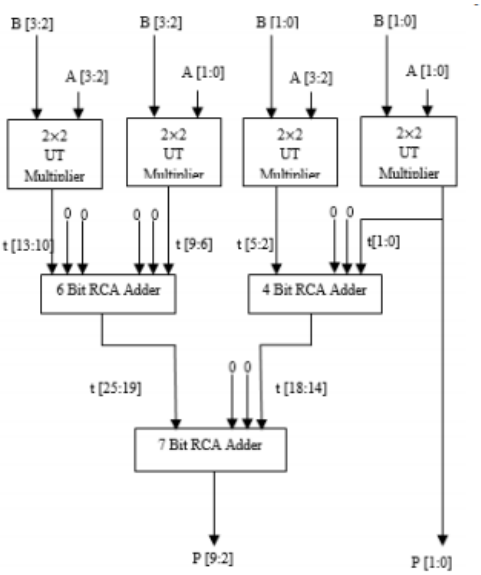


Fig 7. Block Diagram of Proposed 4×4 UT Multiplier

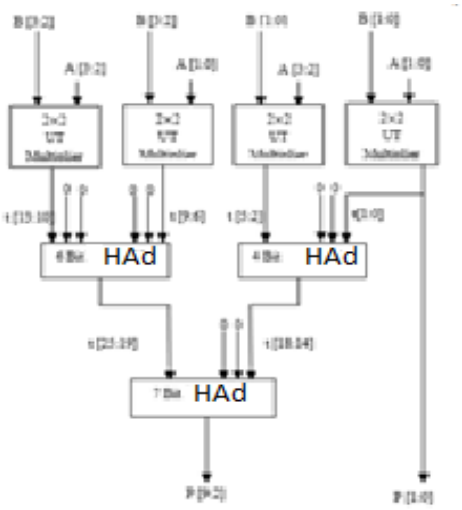


Fig 8. Proposed Hybrid Adder based UT vedic multiplier

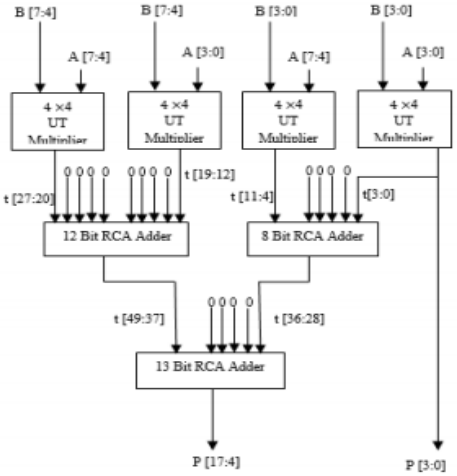


Fig 9. Block Diagram of Proposed 8×8 UT Multiplier

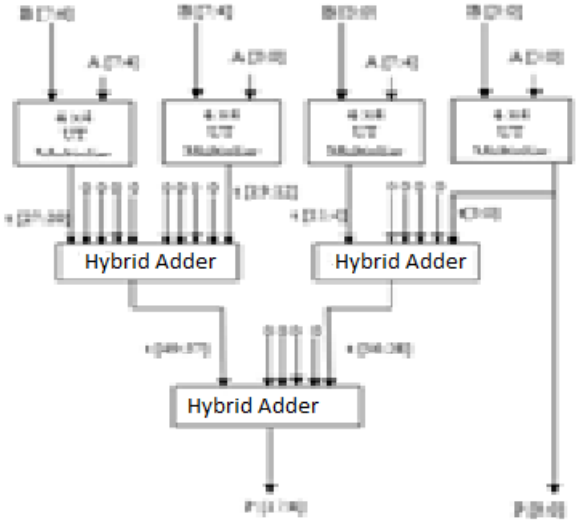


Fig 10. proposed hybrid adder based vedic multiplier

The next instruction to be performed is indicated by the program counter. After the processor gets the instruction from the memory address designated by the program counter, the instruction is loaded into the instruction register in the entire instruction cycle. Because this circuit creates the timing and control signals for the activities done by the CPU, the Control Unit is a crucial aspect of any type of computer or system. The ALU is in charge of signal transmission between the CPU, memory, and different buses, therefore communication is between it and the main memory.

The input selector of the multiplexer block is used. It has the ability to control certain lines through wires. It's a circuit that accepts many inputs and outputs a single signal.

HYBRID ADDER

The term hybrid adder refers to an adder that is built by incorporating one or more logic. Figure 6 shows a hybrid adder's block diagram. In modules 1, 2, and 3, we may use the same or various types of adders to give sum and carry as output. Using different adders or the same adder can produce multiple logic values.

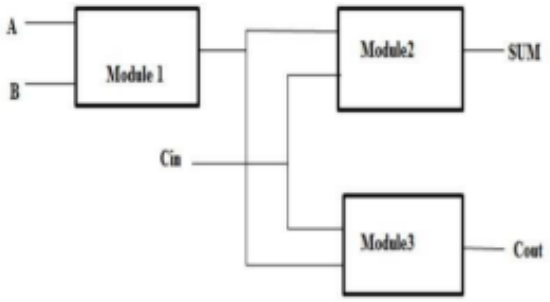


Fig 11. Generalized block diagram of hybrid adder

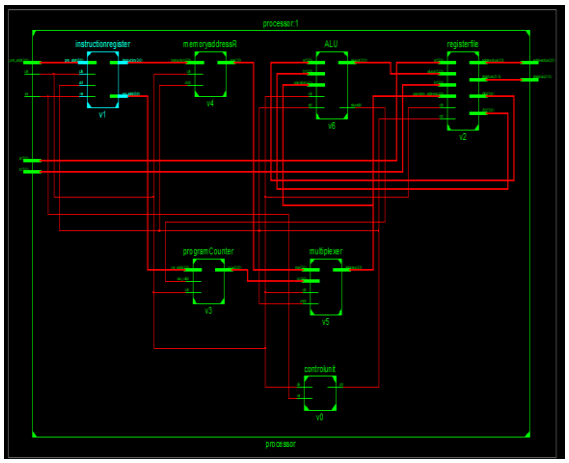
In order to build a hybrid adder, there are two forms of architecture. Homogeneous is a word that may be used to describe anything that is similar Homogeneous architecture is created by combining two or more adders of the same kind. Heterogeneous is a word that describes a group of people that have different Heterogeneous Architecture is formed by the fusion of two or more types of adders. The concept of combining designs to create a hybrid

structure results in products that are both high-performing and low-cost. The engineers that created the designs Can create a hybrid adder by considering the limitations and benefits of separate adders.

Homogenous hybrid adders are higher-bit adders made from a smaller number of n-bit adders, allowing for greater space savings.

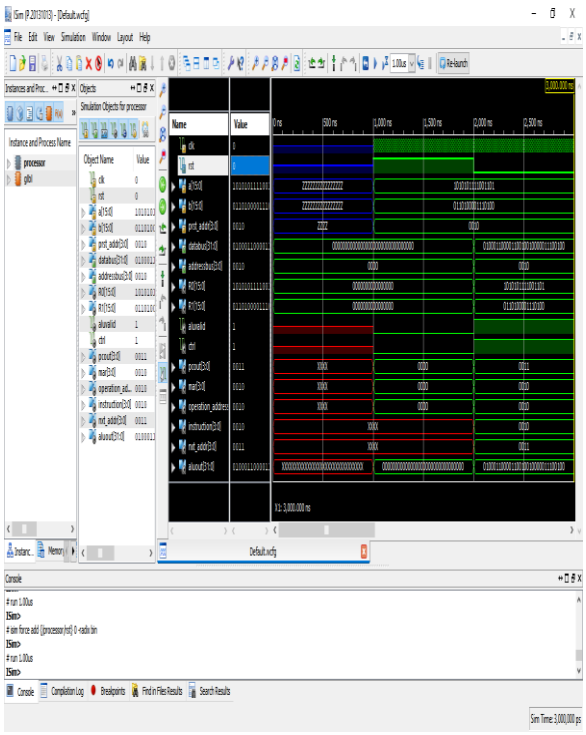
IV. EXPERIMENTAL RESULTS

RTL schematic:



Technology Schematic:

Simulation results:



Area:

```
Device utilization summary:
---------------------------

Selected Device : 7a100tcsg324-3


Slice Logic Utilization:
 Number of Slice Registers:              204  out of  126800     0%
 Number of Slice LUTs:                  1289  out of  63400      2%
    Number used as Logic:               1289  out of  63400      2%

Slice Logic Distribution:
 Number of LUT Flip Flop pairs used:    1416
   Number with an unused Flip Flop:     1212  out of   1416     85%
   Number with an unused LUT:            127  out of   1416      8%
   Number of fully used LUT-FF pairs:     77  out of   1416      5%
   Number of unique control sets:          7

IO Utilization:
 Number of IOs:                           74
 Number of bonded IOBs:                   74  out of    210     35%

Specific Feature Utilization:
 Number of BUFG/BUFGCTRLs:                 1  out of     32      3%
```

Delay:

```
Timing Details:
---------------
All values displayed in nanoseconds (ns)

=========================================================================
Timing constraint: Default period analysis for Clock 'clk'
  Clock period: 25.673ns (frequency: 38.952MHz)
  Total number of paths / destination ports: 35437937459262702000 / 280
-------------------------------------------------------------------------
Delay:               25.673ns (Levels of Logic = 112)
  Source:            v2/R1_0 (FF)
  Destination:       v6/aluout_0 (FF)
  Source Clock:      clk rising
  Destination Clock: clk rising

  Data Path: v2/R1_0 to v6/aluout_0
```

Evaluation table:

	Area (LUT's)	Delay (ns)
proposed	1289	25.673
extension	1267	25.672

V. CONCLUSION

In this paper, RISC processor based on vedic sutras in ALU has been implemented. Vedic Multipliers are used for multiplication to improve the speed and reduce the area and power budget of the Multipliers and in addition to it adders are getting replaced with hybrid adders which will improve the area efficiency slightly and hardware complexity will be optimized compared conventional adders. In this work, Vedic processor is designed using Vedic MAC and Vedic ALU along with other conventional blocks in processor. The instruction set architecture of 14 instructions using register addressing modes is implemented using instruction register and 1-bit Z flag register which checks the status of the arithmetic group instructions. The comparison of simulation result of Vedic ALU and MAC design is done with the existing ALU and MAC results by using hybrid adders not only for multipliers addition operation in ALU can also be improvised. The 16-bit Vedic processor reduces the delay and saves power compared to conventional processor. Hence the improvement in speed of operation, reduction in power utilization and less area utilization are the key features of designed RISC processor.

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Synthesis of Titanium Oxide Nanoparticles Using Pulsed Laser Ablation Method in Deionized Water

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ABSTRACT

The synthesis of titanium oxide nanoparticles (TiO_2NPs) has been successfully carried out using pulsed laser ablation in deionized water to produce titanium oxide nanoparticles. This synthesis is included in the top-down method which aims to produce high-purity nanoparticles synthesis. Experimentally, an Nd:YAG laser beam (with 1064 nm, 85 mJ and 10 Hz) was focused on the surface of a high-purity (99.9%) titanium plate placed in deionized water. The high energy pulsed laser Nd:YAG laser makes the titanium plate ablate for 30 minutes. This is because the melting of the titanium plate surface causes the formation of small titanium oxide particles. When these particles hit deionized water this synthesis titanium oxide will form a colloid. Furthermore, colloidal titanium oxide nanoparticles have been successfully produced with a bluish-white color. The absorbance of TiO_2NPs was shown at 239.75 nm as the appearance of colloidal TiO_2NPs and the average diameter at 73.47 nm. Therefore the synthesis of TiO_2NPs by pulsed laser ablation method can produce nanoparticles.

Keywords: TiO_2NPs, pulsed laser ablation, deionized water, titanium plat

I. INTRODUCTION

Nanoparticle describe material in range nanometer size, at least under 100 nm[1]. The nanoparticles had developed in many field section such as biomedical, environment, industries, etc[2], [3]. Synthesis nanoparticles can produce by bottom-up method and top-down method. The bottom-up method produced by chemical and biological agents from molecules and atoms shapes that combine until nanoparticle size while the top-down method using bulk material for reducing material in micrometer size to nanoparticle size[4].

Bottom-up synthesis is classified under biological and chemical methods containing natural or chemical solutions to produce nanoparticles. The biological method actually uses green synthesis which uses leaves, flowers, fungi etc. and combine with some chemical agent in the process of forming

nanoparticles[5]. Chemical method in synthesis nanoparticles such as chemical vapor deposition, sol-gel, solvothermal and hydrothermal methods that contains chemical material to generate nanoparticles. These methods have side effects because of using hazardous materials[6].

Top-down synthesis is classified in physical method which include mechanical milling, sputtering and laser ablation that produce nanoparticle by using high temperature, high pressure and other properties [7]. This study used pulsed laser ablation because it is one of the most common top-down approaches for nanoparticle synthesis and can produce high-purity nanoparticles. Laser ablation in liquids is applied to the synthesis of nanoparticles, the advantages of using this method are that it reduces the heat effect of the sample source, reduces preparation time, and is environmentally friendly[6].

Synthesis nanoparticle using metal to find physical and chemical properties such as using titanium metal because of high melting, resistance of corrosion and low conductivity[8], [9]. Synthesis nanoparticles of titanium plat in liquid with pulsed laser ablation can make titanium oxide nanoparticles (TiO_2NPs) that had been popular in commercial section because of biocompatibility properties, low cost, non-toxicity and high chemical stability[10]. Due to that advantages, titanium oxide nanoparticles can apply as anti-microba, water purify, coating, etc[10], [11]. This study purpose to produce titanium oxide nanoparticles that it can apply in many sections.

II. METHODS AND MATERIAL

This study uses a neodymium-doped yttrium aluminum garnet laser (Nd:YAG laser) by Quantel with the Q-smart 850 model, the basic wavelength of the Nd:YAG laser is 1064 nm. The Nd:Yag laser uses 85 mJ and repeats at 10 Hz as a device to synthesize titanium oxide which can produce colloidal nanoparticles of high purity. The laser beam is focused on the surface of a titanium plate with a high purity 99.9% titanium plate which is placed in a beaker containing deionized water as a liquid medium and the ablation process happens. This study operates an Nd:YAG laser to ablate titanium plates in deionized water for 30 minutes. Then the set-up of this study is presented in Fig. 1 to produce titanium oxide nanoparticles by pulse laser ablation method in deionized water medium.

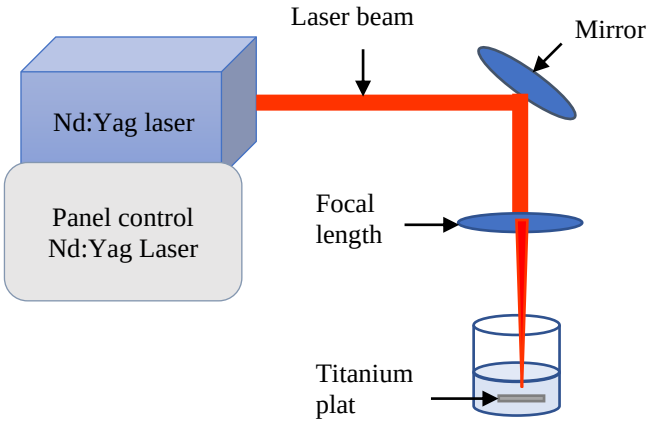

Figure 1. Set-up pulsed laser ablation method in deionized water

III. RESULTS AND DISCUSSION

The laser beams of Nd:YAG laser (85 mJ and 10 Hz) was focused onto pure titanium (99.9%) in deionized water. The interaction between the target surface (titanium 99.9%) and the laser results in the excitation of electrons on the target surface in the liquid. When the target surface of titanium is given high energy by laser photons, the photon energy is absorbed. The amount of photon absorbed depends on the intensity of the laser light source and the thickness of the target surface according to Beer Lambert's law. This energy absorption causes heating of the target surface so that the target surface melts and then evaporates[12]. This explains that laser ablation will erode the target surface in the liquid microscopically. The transition of the ablated material

from the solid to the gas phase produces a plasma plume.

Figure 2. Colloidal titanium oxide nanoparticles in deionized water

During the irradiation process in the target surface, charged particles (electron and ion) in the plasma plume are induced by laser pulses. Pulse laser contribute to the process of ionization and subsequent plasma formation. After the plasma plume is not irradiated by the pulse laser, the plasma plume will explode due to the temperature difference between the plasma plume and deionized water so as to produce colloidal nanoparticles[13]. Colloidal TiO2NPs as synthesis product of synthetic titanium oxide nanoparticles in deionized water media are shown in Figure 2 which produces TiO2NPs with a bluish-white color. The color of deionized water was transparent then changes to bluish white color due to use of titanium plate ablation with a pulse laser method.

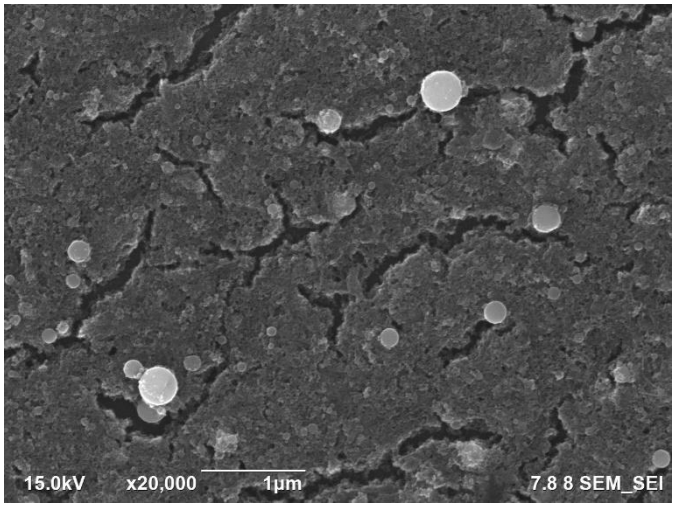

Figure 3. Morphology of titanium oxide nanoparticles in deionized water by FESEM analysis

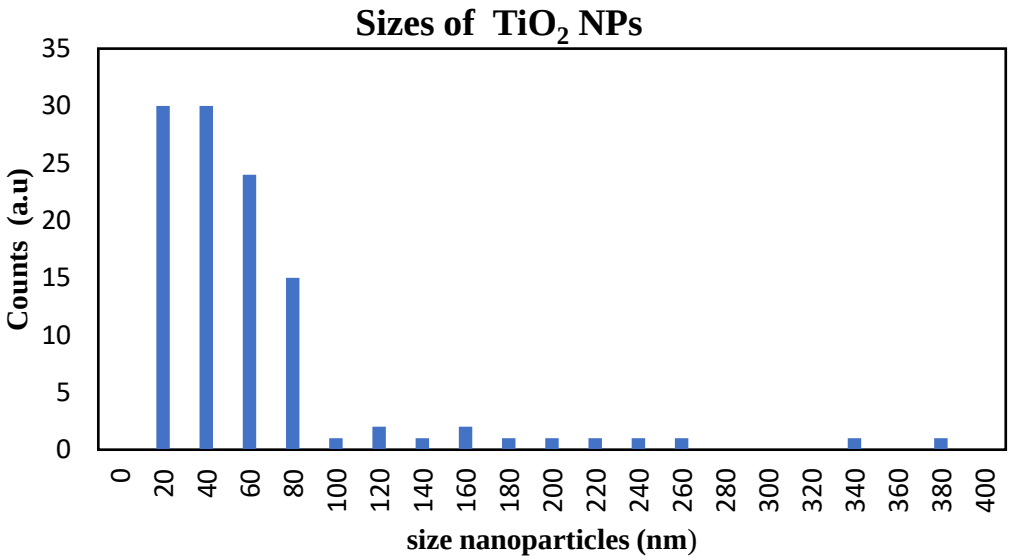

Figure 4. The histogram of titanium oxide nanoparticles in deionized water by FESEM analysis using ImageJ Software

The morphology of titanium oxide nanoparticles in deionized water had shown in Fig. 3 which produces spherical. These nanoparticles are displayed in various sizes. The largest ones are higher than 100 nm because they agglomerate in this liquid. The distribution of various sizes nanoparticles had been shown in the Fig. 4 in histogram form. Most of the nanoparticles were found in the diameter range of 20-80 nm. Then the average diameter of the TiO_2NPs in 73.47 nm.

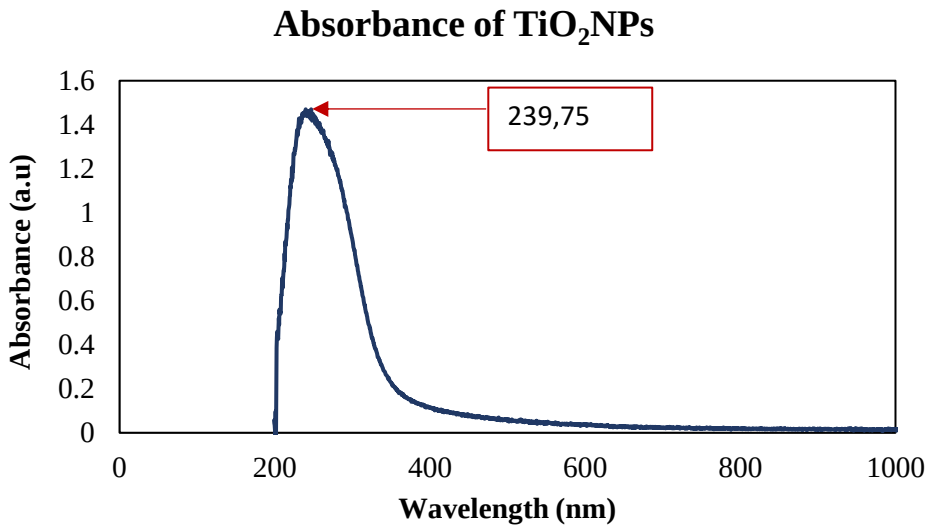

Figure 5. Spectrum of titanium oxide in deionized water

The optical characteristics of TiO_2NPs are shown in Fig. 5 which illustrates the presence of TiO_2NPs in colloids. The absorbance of TiO_2NPs using ultraviolet-visible (UV-Vis) spectroscopy was 239.75 nm with a maximum absorption of 1.47 arbitrary units (a.u). Thus, TiO_2NPs can exist in the optical spectrum of 258.78 nm with the average diameter size of the nanoparticles at 73.47 nm.

IV. CONCLUSION

Pulse laser ablation method is capable of producing high-purity nanoparticles characterized by a bluish-white color. The titanium dioxide nanoparticles produced by this method have a wavelength of 239.75 nm and can produce small nanoparticles with an average diameter of 73.47 nm. However, the nanoparticles formed will experience an increase in the size of the particle diameter because the deionized water causes agglomeration so that the deionized water cannot stabilize the nanoparticle size. Therefore, a stabilizer or surfactant is needed to stabilize the nanoparticle size.

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Image Compression using Hybrid Wavelet Transform

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ABSTRACT

Image Compression is used to decrease the storage of data and transmit the data easily without reducing or affecting the image quality. In this project, the hybrid wavelet transform, DWT-Lift hybrid wavelet transform is proposed for better image compression that improves the performance of the wavelet transform and implemented image security for the compressed image using the AES Algorithm. This hybrid wavelet transform gives better performance and less quantization error. This paper obtains a better compression ratio after multiple decomposition levels are held. The image can be recreated or reconstructed without losing the contents of the original image. Some IQA measurements using Peak Signal to Noise Ratio (PSNR) and Mean square error (MSE) are calculated for result performance.

Keywords : Image compression, Lifting Scheme, DWT, Haar, AES Algorithm, Image quality measurements.

I. INTRODUCTION

In computer operations, Digital images are extensively used. Digital images that aren't compressed bear further capacity for storing the data and transmission bandwidth. The effective way of image compression results is getting more critical with the recent growth of data-intensive, multimedia-based web operations.

Image contraction is used for numerous operations which may have huge data storage, transmission, and reclamation i.e., for multimedia, documents, videotape conferencing, and medical imaging.

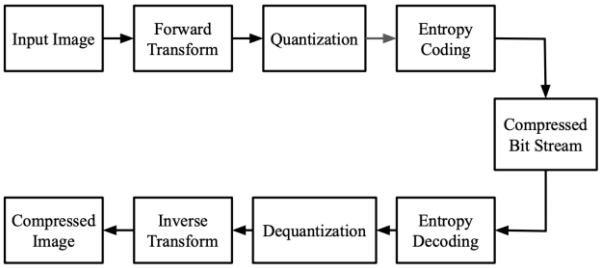


Figure 1 : Image Compression Model

The main goal of image compression is to lessen the redundancy of images for transmitting or storing information in a much more effective manner. This effective transmitting or storing of information could in turn cause the size of the file to get decreased. As a result, additional images could easily be stored in any taken quantum of memory or disk space.

A new and well-organized Image compressing schema has been devised by relying on DWT, which results in much-reduced sophistications in the computation and compromising the quality of the image could also be lesser. The IQA quantifications of the devised methodology have been differentiated from other compression standards.

II. RELATED WORK

H.singh et al. [1] executed image compression using Discrete Wavelet Transform, Discrete Cosine Transform & Huffman encoding mechanism. Image compression compacts lessen the number of bits needed to recognize an image by removing unnecessary data. Image Compression is distributed into two types, Lossy and Lossless depending on whether the original image can be recovered with fine perfection from the compressed image.

I.Daubechies et al. [2] discovered DWT which is used in lossless JPEG2000 contraction of grayscale images, reduced to rudiments. High-position DWT provides multi-resolution image representation attained by multi-level corruption. The Effective parcels of a lifting scheme have made it useful to make significant transforms for lossless images including separate sea transforms.

Chen et al. [3] admit that the discrete wavelets adaptively choose the best lifting way and use the interpolation procedure to make predictions according to their local characteristics. Discrete Wavelet Transform, which can flexibly select the best lifting ways and use the Large range interpolation technique to make predictions based on its local characteristics.

C.H.son et al. [4] JPEG 2000, a high-performance image compression algorithm. This algorithm has been divided into two types: Lossy and Lossless Image compression. The lossy compression technique focuses on high compression percentage compared with the Lossless technique.

G.BheemeswaraRao et al. [5] recognized the Lossy Compression image which may not give a good vision or quality of the image but achieved a good compression ratio. After DWT Processing the Bit plane Encoder handles the DWT coefficient for compression. Bit Plane encoder encodes an image segment from the most significant bit (MSB) to the least significant bit (LSB).

III. HAAR DWT

Alfred Haar (1885-1933) was a Hungarian mathematician who worked in analysis studying orthogonal systems of functions, partial discrimination equations, Chebyshev approximations, and direct inequalities. In 1909, Haar introduced the Haar wavelet proposition. A Haar proportion is the simplest type of wavelet. In separate forms, Haar wavelets are related to a fine operation called the Haar to transform

Haar also known as a simple possible wavelet. The fine prerequisites will be kept to a minimum; indeed, the main generalities can be understood in terms of addition, deduction, and division by two. We also present direct algebra perpetration of the Haar sea transfigure, and mention important recent conceptions. As all wavelet transforms, the Haar transform decomposes a separate signal into two sub-signals of half its length. The Haar wavelet transform has more advantages

1. It's conceptually simple and fast
2. Its memory is effective since it can be calculated in place without a temporary array.
3. It's exactly reversible without the edge goods that are a problem with other sea transforms.
4. It provides a high compression rate and high PSNR(Peak signal to noise rate).
5. It increases detail in a recursive manner.

Then both the high pass and low pass filters are used. In which the low pass filter is used for the approximation of the original image and the high pass filter is used to take out some features.

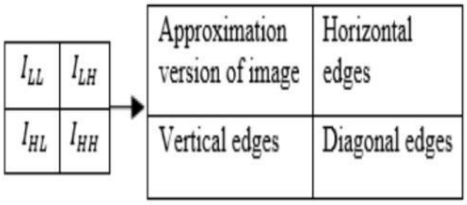


figure 2: Image Decomposition levels

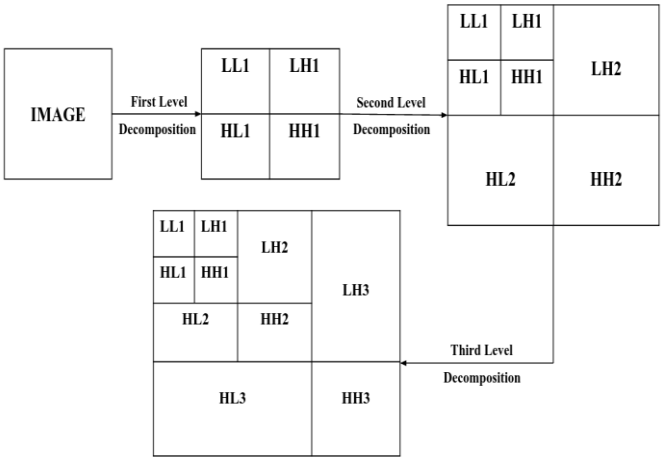


figure 3: Haar DWT Decomposition

ILH output is passed through a high pass filter.So it will give the horizontal features of the image. if we repeat the same operation by making an approximation output as the input, then the resulting image is the second level of the original image. By repeating the same procedure, a third level of the decomposed image is obtained.

IV. LIFTING SCHEME

The lifting scheme is the effective perpetration of a wavelet transform algorithm. It was primarily developed as a system to improve wavelet transformation, and also it was extended to a general system to produce so-called alternate-generation ripples(i.e.Ripples which don't inescapably use the same function prototype in different situations). The lifting scheme perpetrates the filtering operations at each position.

The lifting scheme consists of three steps:

1. Split: In this step, the data is split into even and odd elements.

2. Predict: It deploys a function that has the potential to approximate the taken dataset. The variations are existing intermediaries to the real-time data and approximated data replace the already existing constituents of the dataset. The constituents that are of the "even" type are kept unattended and they serve as the input for the subsequent stage in the transformation. In predict step, where the odd sample is "predicted" from the even sample is described by the equation

$$\text{odd } y+1, x = \text{odd } y, x - P(\text{ even } y, x) \quad (1)$$

3. Update: The update step substitutes the even samples with the average of the samples. This results in input for the next step of the wavelet transform. The odd samples also point to a source dataset approximation. Thus, it permits the filters to get built. The stage of the update takes place right after the stage of prediction. The source magnitudes of the samples of the type "odd" get altered with the dissimilarity that's the existing intermediary to the odd samples and its even "predictor". While calculating an average the update phase must operate on the differences that are stored in the odd elements

$$\text{even } y+1, x = \text{even } y,x + U(\text{ odd } y+1, x) \quad (2)$$

A simple lifting scheme forward transform is shown in the figure.

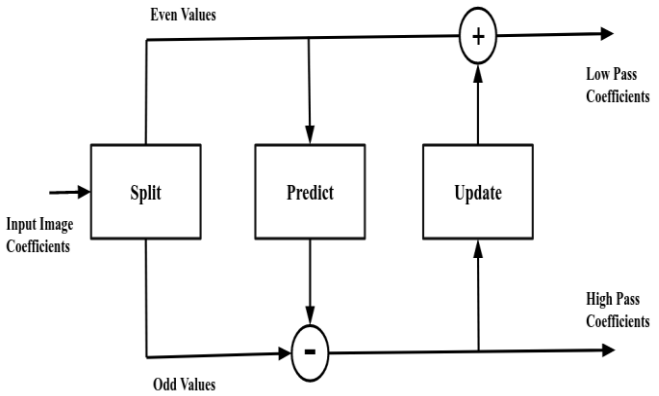


Figure 4: Lifting scheme forward wavelet transform

The split phase initiates each forward transform step that moves the odd samples to the alternate half of the array, leaving the even samples in the lower half. At the end of the transform step, the odd samples are replaced by the differences of the elements, and the even samples are replaced by the average of the elements. The even samples act as the input for the coming step, which again starts with the split phase.

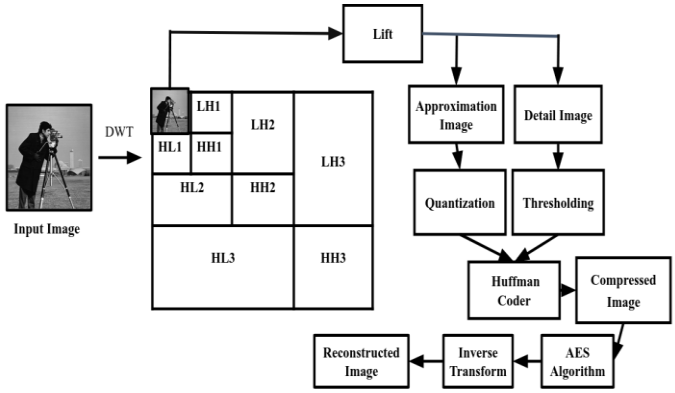


Figure 5: DWT lift compression Model Block diagram

One of the elegant features of the lifting scheme is the inverse transform is the opposite of the forward transform. The inverse Lifting Scheme block schematic is shown in fig. 5. In the case of the Haar transfigure, additions are substituted for deductions and deductions for additions. The merge step restores the split step.

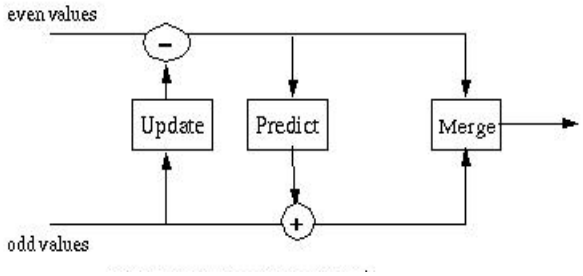


Figure 6: Lifting scheme inverse wavelet transform

V. AES ALGORITHM

The AES algorithm comprises a 128-bit containing LFSR-Linear Feedback Shift Register and the core of AES that's got masked for generating the encryption of the masks. The core of AES has masked processes encryption of the type "128-bit". The operation gets carried out in ten rounds depending upon the size of the key, estimating one revolution every round. Also, the equipment of every revolution gets reutilized for cutting down the area. Our devised methodology of masked AES has been indicated in the following Figure:

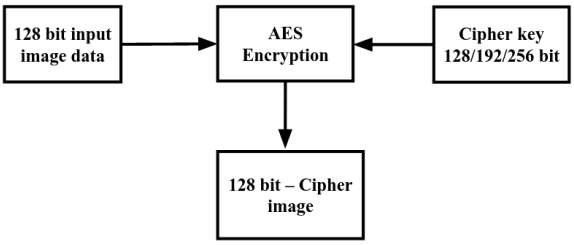


Figure 7 : AES Encryption Block Diagram

Here, the text that's plain (source information) gets initially masked by an arbitrary mask. The plain text that got masked along with the mask itself is next given via the core of AES that's got masked, which is responsible for the encryption of the masked information by containing a confidential key. The cipher-text that's masked is obtained as an outcome, which is then input into those that remain unmasked to arrive upon cipher-text.

1. AES is a block cipher.
2. The key size can be 128/192/256 bits.
3. It encrypts data in terms of blocks with128 bits each.

ROUNDS	KEY SIZE
10	128
12	192
14	256

Table 1: Number of rounds based on key size

Each round comprises 4 steps:

1. SubBytes
2. ShiftRows
3. MixColumns
4. Add Round Key

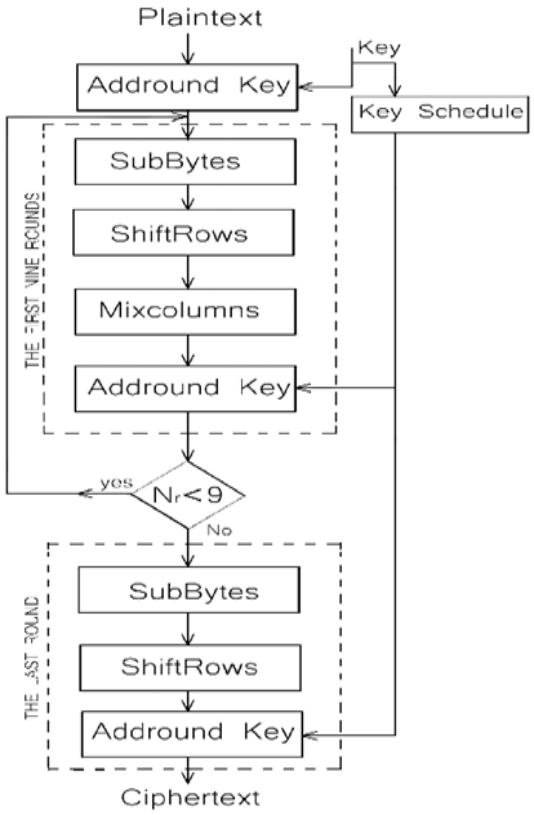


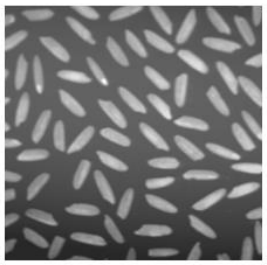
Figure 8: steps in AES Algorithm

The last round doesn't have the Mix Columns round. The SubBytes perform the substitution and Shift rows and Mix columns execute the permutation in the algorithm.

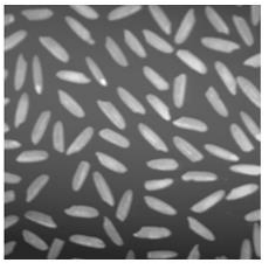
VI. RESULTS AND DISCUSSION

The proposed work deals with the implementation of DWT-LIFT. This work aims at obtaining better PSNR and MSE values and obtaining highly compressed images for the purpose of data storage and image data transmission more easily, compared with existing work, image reconstruction without degrading the original image quality. Implementation of DWT-LIFT for image compression and image security using AES algorithm results are obtained below.

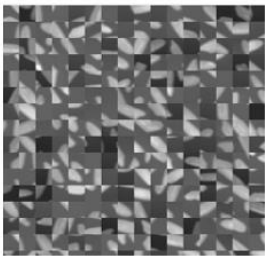
(1) Simulation Results of an 256 x 256 image 'rice'



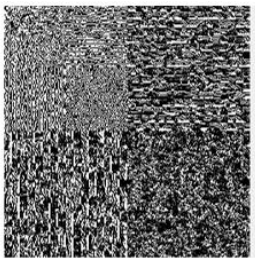
(a) Original Image



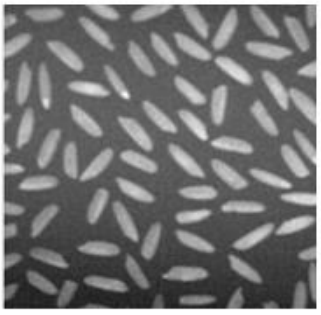
(b) Compressed Image



(c) Image Encoding



(d) Image Decoding



(e) Reconstructed Image

Comparison of Haar and Lift for an image 'rice'

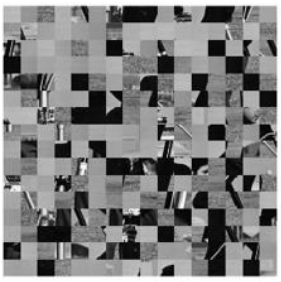
Wavelets	PSNR	MSE
Haar	12.94 dB	66.26
Lift	34.38 dB	24.71

Table 2 : Performance Analysis of an image 'rice'

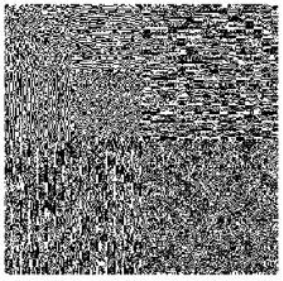
(2) Simulation Results of a 256 x 256 image 'photographer'

(a) Original Image

(b) Compressed Image



(c) Image Encoding



(d) Image Decoding

(e) Reconstructed Image

Comparison of Haar and Lift for simple image 'Photographer'

Wavelets	PSNR	MSE
Haar	10.28 dB	122.08
Lift	28.92 dB	84.47

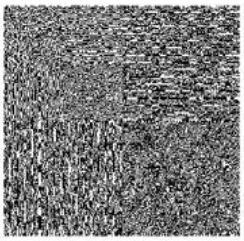
Table 3: Performance Analysis of an image 'photographer'

(3) Simulation Results of a 256 x 256 image 'lena'

(a) Original Image

(b) Compressed Image

(c) Image Encoding



(d) Image Decoding

(e) Reconstructed Image

Comparison of Haar and Lift for simple image 'lena'

Wavelets	PSNR	MSE
Haar	12.48 dB	72.28
Lift	30.16 dB	63.61

Table 4: Performance Analysis of an image 'lena'

From the above observations we came to know that the MSE got by Lift is less than that of Haar. Less MSE value indicates less error in the image.

The PSNR earned by Lift is more than Haar. More PSNR indicates better picture quality.

VII. CONCLUSION

In this paper, we have proposed a new approach to image compression using hybrid wavelet transforms. It increases the time performance of the system computationally. The compressed image is formed using DWT and Lifting Scheme. To add security to the image, the AES algorithm is used. This proposed system was developed for fast image compression. The proposed method is compared with the existing method by using its image quality assessment parameters such as peak - signal - to - noise - ratio (PSNR), Mean Square Error (MSE). The results obtained related to reconstructed image quality as well as maintenance of significant image details, while on the other hand parallel achieving good compression rates.

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Development and Evaluation of Hospital Management in India

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ABSTRACT

The hospital industry is emerging very rapidly due to progression in technology and growth in various diseases across the country. Earlier people use to trust on Government Doctors and Hospital but due to globalization and accessibility of better facilities and treatment in Private Hospitals, they have become quite common too. Across the country, there are various Private Hospitals which treats the patients not only from the country but are also famous for their experienced Doctors and treatment facilities all around the world. The purpose of this study was to develop and evaluate hospital performance measures to include aspects of hospital behavior beyond the traditional use of hospital profit margins for policy analysis. A number of measures have been used in the literature that are purported to reflect a variety of hospital behaviors. The reliability and validity of these and new measures were assessed using descriptive statistics and factor analysis on a sample of hospitals for a 3-year period. The sample consisted of all hospitals for which there were Medicare Cost Report and balance sheet data during the federal fiscal years 1987 through 1989. Using a subset of three hospital groups, 33 measures were evaluated, from which five were selected to represent the critical aspects of hospital performance important for policy analysis. The measures are: TEM, a new technical efficiency measure using data envelopment analysis techniques; the current ratio, depicting short-term financial performance; the ratio of long-term debt-to-net fixed assets, representing long-term viability; total margin, portraying profitability; and Medicare margin, characterizing Medicare's contribution to hospital financial position. Each represents different aspects of hospital efficiency and financially viability.

Keywords - Hospital Management, Artificial intelligence, Electronic Health record, Hospital development and HMIS

I. INTRODUCTION

HOSPITAL MANAGEMENT & HISTORY OF HOSPITAL MANAGEMENT

Medicine and surgery date back to the beginning of civilization because diseases preceded humans on earth. Early medical treatment was always identified with religious services and ceremonies. Priests were also physicians or medicine men, ministering to spirits, mind and body, Priests/doctors were part of the ruling class with great political influences and the temple/hospital was also a meeting place. Medicine as an organized entity first appeared 4000 years ago in the ancient region of Southwest Asia known as Mesopotamia. Between the Tigris and Euphrates rivers, which have their origin in Asia Minor and merge to flow into the Persian Gulf.

The first recorded doctor's prescription came from Sumer in ancient Babylon under the rule of the dynasty of Hammurabi (1728-1686BC) Hummurabi's code of law provides the first record of the regulation of doctors cures were related to miracles and divine Intervention, the Greek recognized the natural causes of diseases and rational methods of healing were important Hippocrates is usually considered the personification of the rational non-religious approach to medicine, and in 480 BC, he started to use auscultation, perform surgical operations and provide historians with detailed records of his patients and descriptions of diseases ranging from tuberculosis to ulcers.

The temples of Saturn, Hygeia and Aesculapius, the Greek god of medicine all served as both medical schools for practitioners and resting places for patients under observation or treatment The Roman talent for organizations did not extend as readily to institutional care of the sick and injured Although infirmaries for the sick were established, it was only among the military legions that a system for hospitalization was developed. After the injured were cared for in field tents, the soldiers were moved to valetudinarians, a form of hospital erected in all garrisons along the frontiers. Apparently those stone and wooden structures were carefully planned and were stocked with Instruments, supplies and medications.

Hippocrates is usually considered the personification of the rational non-religious approach to medicine, and in 480 BC, he started to use auscultation, perform surgical operations and provide historians with detailed records: of his patients and descriptions of diseases ranging from tuberculosis to ulcers. The temples of Saturn, Hygela and Aesculaplus, the Greek god of medicine all served as both medical schools for practitioners and resting places for patients under observation or treatment.

The development of efficient hospitals was an outstanding contribution of the Islamic civilization. The Roman military hospitals and the few Christian hospitals were no match for the number, organization and excellence of the Arabic hospitals. The Arab's medical inspiration came largely from the Persian Hospital in Djoundisa bour (sixth century Turkey), at which may of them studied. Returning to their homes, some of the best known of the great hospitals in the middle ages were in Baghdad, Damascus and Cairo. In particular, the hospitals and medical schools of Damascus had elegant rooms, an extensive library and a great reputation for its cuisine. Separate wards were set aside for different diseases, such as fever, eye conditions, diarrhea, wounds and gynecological disorders. Convalescing patients were separated from sicker patients and provisions were made for ambulatory patients. Clinical reports of cases were collected and used for teaching Indian Hospitals.

Historical records show, especially the Chinese traveler Fa Hein who reported in his books, that efficient hospitals were constructed in India by 600 BC. During the splendid reign of King Asoka (273-232

BC), Mughal emperor Feroz Shah Tughlaq. Indian hospitals started to look like modern hospitals. They followed principles of sanitation and cesarean sections were performed with close attention to technique in order to save both mother and child. Physicians were appointed -one for every ten villages-to serve the health care needs of the populations and regional hospitals for the infirm and destitute were built by Buddha.

The middle ages: Religion continued to be the dominant influence in the establishment of hospitals during the middle age. From the early fourth century to the fifteenth century trade was almost totally suppressed and many city dwellers returned to the land. Religious communities assumed responsibility for care of the sick. The rational nonreligious approach that characterized Greek medicine during the era of Hippocrates was lost, as hospitals became ecclesiastical, not medical institutions. Only the hopeless and homeless found their way to these hospitals, in which the system of separation of patients by diseases was eliminated, three to five patients were accommodated in each bed and principles of sanitation were ignored Surgery was avoided, with the exception of amputation, in order not to disturb the body and to avoid the shedding of blood per the church edict of 1163 that, in effect, forbade the clergy from performing operations. Religious order emphasized nursing care, the first religious order devoted solely to nursing is considered to be the St Augustine nuns, organized in approximately 1155. Yet hospital construction increased in Europe during the middle ages for two reasons. First, Pope Innocent III in middle ages for two reasons. First, Pope Innocent III in 1198 urged wealthy Christians to build hospitals in every town and second, increased revenues were available from the commerce with the crusaders. The oldest hospital still in existence are the Hotel-Dieu in Lyons and Paris, France. The term Hotel-Dieu indicates that it is a public hospital. The earliest mention of the Hotel-Dieu in Lyons is found in a manuscript of 580 AD, in which its establishment by Childebert is recorded.

The Hotel-Dieu of Paris was founded by Bishop Landry in 660, on the LLe de la Cite. In 1300, the hospital had an staff of physicians and surgeons caring for 800-900 patients, and its capacity was doubled in the fifteenth century. In these hospitals more attention was given to the wellbeing of the patient's soul than to curing bodily ailments. The growth of hospitals accelerated during the crusades, which began at the end of the 11th century. Pestilence and disease were more potent enemies than the Saracens in defeating the crusaders. Military hospitals came into being along the traveled routes: the knights Hospitalers of the Order of St John in 1099 established in the Holy Land, a hospital that could care for some 2000 patients. It is said to have been especially concerned with eye disease and may have been the first of the specialized hospitals. This order has survived through the centuries as the St John's Ambulance Corps.

In contrast, in Asia and Africa, during the same period, construction of effective and efficient hospitals was spurred by Islamic rule and the Crusades. The two hospital systems enforced sanitary measures performed surgery and separated patients according to disease: the Islamic hospitals because they were still following the Greek and early Roman traditions, and the hospitals created by the Crusaders because injuries sustained in combat necessitated surgery and the presence of pests and contagious disease necessitated sanitary conditions and the strict separation of patients. For the first time, medical systems of the East and the West vied for the supremacy of medical care. Arab hospitals were notable for the fact that they admitted patients regardless of religious belief, race or social order.

DEVELOPMENT OF HOSPITALS IN INDIA.

After Independence there was growth of industrialization and population expansion which caused a lot of medical and health problems. At that time there were 7400 hospitals and dispensaries in India there were 1,13,000 beds, 19 medical colleges and 19 medical schools in India. Considering the rise in poverty and limited resources Committees like the Bhore Committee, Mudaliar Committee, Jain Committee, Shrivastava Committee, Siddhu Committee, Rao Committee, Bajaj Committee. According to Health Information India (1995-96) as on 1st January 1996 there were 146 medical colleges, 15,097 hospitals, 623819 beds admitting 30 million in patients every year. The out patients were countless. Out of these there were 421 rural hospitals, 10416 urban hospitals, 4473 government hospitals and 10289 private and voluntary, 335 local hospitals. The patient to bed ratio as suggested by Mudliar committee is 1 be per 1000 population but it is 0.67 which is below the required ratio. This will lead to overcrowding and mismanagement in hospitals. 6000-7000 beds need to be added every year to maintain the ratio. History of Government and Private Hospitals (Year1800-2012) Health care is a social sector and it is provided at State level with the help of Central Government. In the Constitution of India, health is a state subject. Central governments intervention to assist the state government is needed in the areas of control and eradication of major communicable & non communicable diseases, policy formulation. international health, medical & para-medical education along with regulatory measures, drug control and along with regulatory measures, drug control and prevention of food adulteration, besides activities concerning the containment of population growth Including safe motherhood, child survival and immunization Program. Another major component of the central sector health programme is purely Central schemes through which financial assistance is given to institutions engaged in various health related activities. These institutions are responsible for contribution in the field of control of communicable & non communicable diseases, medical education, training research and parent-care. Government hospitals are owned and governed by governments, State or Central. These hospitals rely on subsidies and grants for part of their operations and perform more charity than other hospitals. Because these hospitals are tax supported, government agencies are likely to monitor operations and have the authority to increase or decrease funding through budgeting processes Other nonprofit hospitals are privately owned and usually community hospitals or physician group hospitals. Physician Influence tends to be stronger in these hospitals. These hospitals rely also on patient fees and public donation. Hospital Management provides a direct link between healthcare facilities and those supplying the services they need. This procurement and reference resource provides a one-stop-shop for professionals and decision makers within the hospital management, healthcare and patient care industries.

A hospital is a health care institution providing patient treatment by specialized staff and equipment. Government of India website data from the Health ministry site upto 2009 mentions that Eleven thousand six hundred and thirteen (11,613) allopathic hospitals are existing in India. Today the total value of the healthcare sector is 6% of GDP. 15,393 Hospitals were there in year 2002 in India. Indian Scenario.

A recent study in India indicates that healthcare is delivered by a multitude of public and private providers. The government infrastructure is large in both rural and urban India. In rural areas, the government has a vast base of primary healthcare centers, community health centers and sub centers. The public infrastructure in urban India consists of tertiary medical colleges, district and taluka hospitals and urban health posts. The private healthcare delivery sector consists of a large number of private

practitioners, for profit hospitals and nursing homes and charitable institution. The average size of such hospitals is less than 22 beds-much lower than developed countries.

The purpose of for profit, investor owned hospitals was primarily to increase the value of invested capital. Prior research finds that for profit hospitals tend to locate in more profitable areas and are smaller than nonprofit hospitals. For profit hospitals obtain fewer donations and are not tax subsidized and so rely primarily on patient fees. Church hospitals are owned and governed by religious organizations; they were originally organized to provide services for church members, to restrict procedures that are contrary to religious beliefs and to permit patients to follow the tenets of the religion for last rites and other ceremonies These hospitals rely on both patient fees and donations. Government hospitals are owned and governed by governments, State or Central. These hospitals rely on subsidies and grants for part of their operations and perform morel charity than other hospitals. Because these hospitals are tax supported, government agencies are likely to monitor operations and have the authority to increase or decrease funding through budgeting processes. Other nonprofit hospitals are privately owned and usually community hospitals or physician group hospitals. Physician influence tends to be stronger in these hospitals. These hospitals rely also on patient fees and public donation.

Non- profit firms may earn profits. In fact, many, including hospitals, do. Rather nonprofit firms are precluded from distributing profits to persons who exercise control over the firm. Although such firms can pay reasonable compensation to suppliers of inputs, resulting earnings cannot be distributed. Such earnings must be retained and used by the firm. Because of the non- distribution constraint, nonprofit firms have no owners, that is, persons who control and share residual earnings. Ownership form and hospital behavior: The social welfare implications of for-profit versus nonprofit ownership, and private versus public ownership, have been of interest to economists for decades. In stylized microeconomic models of organizations, theory predicts that the for profit organizational form is efficient because of the high powered incentives that arise from the presence of a well- defined residual claimant with legally enforceable property rights. Researchers exploring the effects of for profit, private, non-profit and public hospital ownership on productivity have reported a wide range of empirical results. On one hand, some researchers report that the for-profit form achieves greater productive efficiency, on the other hand, many studies find that for-profit hospitals have higher costs or markups than do nonprofits. And a substantial literature argues that nonprofit hospitals have costs and /or quality similar to that of for profits, concluding that hospitals are socially indistinguishable on the basis of ownership status.
In 2021, Hospital Management Information System (HMIS) implemented in all the 695 hospitals and health units of Indian railways across the country

- RailTel, Miniratna Central Govt. PSU of Ministry of Railways, executed the project in record time during the peak pandemic period The milestone will make Railway health system more transparent, effective, efficient, accountable & patient-friendly
- HMIS is a web-based, multi-module, feature-rich, extraordinarily sophisticated, complex software system giving a unique, novel and improved experience to hospital administration and patients
- HMIS solution fully compliant with Ayushman Bharat Digital Mission
- HMIS is another important step in country's journey towards digital transformation which will have a positive impact on the lives of more than 75 lakh railway men

In India too, the above conclusion stands true. There are hospitals both in the private and public who

extend service quality par excellence. Due to the unregulated system, there are also the extreme cases of poor quality healthcare provided by hospitals, many operating with unskilled medical staff and in substandard facilities. Rather than the ownership model, it would be pruden an to mention that the leadership and the resultant vision mission and goals of the organization, is what determines the outcome and its quality in organization.

Healthcare industry is one of the most challenging industries in India with projected revenue of US$ 30 billion, it constitutes 52% of India's GDP The Indian health industry has had a growth of over 12% pa in the past four years and is expected to grow at 15% per annum to US$786, reaching 6 1% of GDP and employing 9 million people by 2012 The private sector plays a significant role by contributing 4 3% of GDP and 80% share of healthcare provision However, there is deficit with respect to access, affordability, efficiency quality and effectiveness, in spite of the high spending on overall private and public health in order to be comparable with the healthcare parameters of other developing countries India's healthcare sector faces many challenges For example, to reach a ratio of two beds per 1000 population by 2025, an additional 177 billion beds will be required which will need a total investment of US$86 billion There is an acute shortage of doctors, nurses, technicians and healthcare administrators and an additional 0.7 million doctors are needed to reach a doctor population ratio of 1 1000 by 2025 This paper concentrate on

1 To study Need and Scope of Service Quality in Healthcare sector
2. To present the Role of Government in Healthcare management
3. To analyze Service Quality in Hospitals

1.To study Need and Scope of Service Quality in Healthcare sector

The hospital system in India faces three major challenges — improving quality, increasing access, and reducing costs. While all three elements are important, there is growing evidence that the perceived quality of health care services has a relatively greater influence on patient behaviors (satisfaction, referrals, choice, usage, etc.) compared to access and cost. In Nepal, for example, the government made substantial investments in health care to increase access. Yet, according to Lafond (1995), utilization of the facilities remained low because of clients' negative perceptions [of quality]. Guldner and Rifkin (1993) also showed that in Vietnam and Uganda, poor quality of services in the public sector led to greater use of private providers.

Quality problems are also pervasive in Bangladesh where government allocations to health care were increased between 1991/92 and 1994/95 by almost US $70 million (Kawnine, Killingsworth & Thomas, 1995). While the authors do not provide actual figures, they indicate that the proportion of GDP allocated to this sector was more than doubled between 1985/86 and 1995/96. In addition, private health care has also been encouraged since 1982, leading to the establishment of 346 private hospitals in the country by June 1996 (Khan, 1996). Even with these improvements in allocation and access, however, there is evidence that those who can afford it are obtaining health care services in neighboring countries. The burden it places on the country's foreign exchange reserves is also not insignificant; one estimate (Bayes, 1999) places the loss of foreign exchange to health care providers in other countries at Tk.10 billion (US $1=Tk.50). Despite the overwhelming personal costs and inconveniences of going abroad, people in need of health care are doing so. In the process, they are conveying a strong message: they want quality services.

The fact that quality perceptions have a strong influence on one's inclination to avail health services is beyond dispute. Thus, expanding access or holding the line on costs is not enough if one's confidence in the quality of health care services is low. Perceptions of poor quality of health care may, in fact, dissuade patients from using the available services because health concerns are among the most salient of human concerns. If the system cannot be trusted to guarantee a threshold level of quality, it will remain underutilized, be bypassed, used only for minor ailments, or used as a measure of last resort.

Unfortunately, the quality of health care services in Bangladesh has often been severely criticized. In 1987, a World Bank assessment of the health sector suggested that overall performance of the sector was unacceptably low by all conventional measures (The World Bank, 1987). At the root of the performance gap were many problems: critical staff were absent, essential supplies were unavailable, facilities were inadequate, and the quality of staffing was poor. Problems of supervision and accountability exacerbated the problems. Ten years, later, Sen and Acharya (1997) noted some improvements in several health indicators such as infant mortality and life expectancy at birth and concluded that most of the improvements were made in preventive and not curative care. But they also concluded that "poor quality of health services…are persistent concerns." (p. 25). The Ministry of Health and Family Welfare also admits to this failure, stating that "Other issues of concern are poor utilization of government services…and quality of services" (HAPP-5: 1998–2003, p. 1).

The ever-growing population in Bangladesh is expected to place greater demands on the country's health care services. Unless quality improvement becomes a priority, the consequences are grim: In addition to preventing patients from quick recovery, thereby increasing their costs, poor quality also elevates the psychological barriers of using the system. Patients may hold out from availing healthcare services until their condition deteriorates irreversibly, or they may bypass the system in search of alternatives — mainly in other countries — that assure better quality of care. It is imperative, therefore, for healthcare providers to focus on and deliver quality services to regain patient confidence. In turn, such measures should bring patients back to a system that is designed to serve their needs as well or better than the services abroad.

To deliver quality services it is important, first, to understand what constitutes this concept. To this end, our study represents a preliminary effort at helping delineate the factors and measures of service quality in the context of a developing country — Bangladesh.

2. Role of government in public health:

Health system strengthening Important issues that the health systems must confront are lack of financial and material resources, health workforce issues and the stewardship challenge of implementing pro-equity health policies in a pluralistic environment.[5] The National Rural Health Mission (NRHM) launched by the Government of India is a leap forward in establishing effective integration and convergence of health services and affecting architectural correction in the health care delivery system in India.

Health information system The Integrated Disease Surveillance Project was set up to establish a dedicated highway of information relating to disease occurrence required for prevention and containment at the community level, but the slow pace of implementation is due to poor efforts in involving critical actors outside the public sector. Health profiles published by the government should be used to help communities prioritize their health problems and to inform local decision making. Public health laboratories have a good capacity to support the government's diagnostic and research activities on health risks and threats, but are not being utilized efficiently. Mechanisms to monitor epidemiological

challenges like mental health, occupational health and other environment risks are yet to be put in place.

Health research system There is a need for strengthening research infrastructure in the departments of community medicine in various institutes and to foster their partnerships with state health services.

THE ROLE OF PHARMACOECONOMICS IN CURRENT INDIAN HEALTHCARE SYSTEM

Pharmaeconomic studies compare costs, clinical, and humanistic outcomes associated with different therapies. The evaluation mechanisms delineated are often helpful in demonstrating the cost impact of innovative treatments, granting greater acceptance by healthcare providers, administrators, and the public.

There are four major types of pharmacoeconomic analysis:

A: Cost-minimization analysis
B: Cost-effectiveness analysis
C: Cost-benefit analysis
D: Cost-utility analysis
Pharmacoeconomic evidences can be utilized to support decisions on licensing, pricing, reimbursement, and maintenance of formulary procedure of pharmaceuticalsHence, it is a challenge for healthcare professionals to provide quality patient care with minimum cost. Given the limitations on healthcare resources, there is increased interest in assessing the value for money, or economic efficiency of healthcare treatments and programs. Economic evaluation, analyzing costs and outcomes of several alternative therapies can also be a useful approach; though can be very difficult to accomplish.[2]

ROLE OF ARTIFICIAL INTELLIGENCE IN INDIA

Artificial Intelligence (AI) is defined as intelligence that is demonstrated by machines which mimic human cognitive functions (Jiang et al., 2017). Nowadays, AI is being used in several fields such as defense, healthcare, banking and more. In order to provide quality healthcare, AI will be mainly utilized to tackle structural factors such as shortage of professionals, discriminatory access to healthcare or concentration of healthcare facilities in Tier 1 and Tier 2 AI is a game-changer, and the healthcare sector will be able to avail several opportunities from this technological development. The areas where AI has been rapidly emerging include machines that can sense, comprehend, learn and act in order to execute administrative and clinical healthcare functions (Radick, 2017). AI increases the scope of activities that can be done by machines such as natural language processing, chatbots, computer vision or machine learning. For example, machine learning can be deployed to understand the overwhelming healthcare data while reducing the decision processing time (Westgate, 2017). IBM's Watson is used in oncology procedures to prescribe the treatment which is more suitable for the patients (Reddy et al., 2015). There are new startups in India using AI to address challenges related to the quality delivery, automatic diagnosis, detection and screening of diseases or predictive healthcare diagnosis. Similarly, it will be conducive towards the eradication of discriminatory treatments based on social or structural backgrounds..

For example, Manipal Group of Hospitals implemented such technological advancements in order to help doctors to provide accurate treatments to cancer patients through IBM Watson, in its oncology specialization. private and public hospitals and ensuring the smooth distribution of healthcare benefits to the beneficiaries AI is being used in hospitals to detect diseases, handle pharmacy supply chain management, detect fraudulent activities, and organizing numerous administrative activities. Ayushman Bharat, one of the Indian government's flagship schemes, seeks to provide healthcare insurance to all the citizens of India. The scheme is likely to succeed as AI has and will play a major role

in its smooth functioning. In order to provide quality healthcare to rural India, telemedicine has been deployed and data securitization is confirmed by using AI.

ROLE OF STANDARD ELECTRONIC HEALTH RECORD (EHR) FRAMEWORK FOR INDIAN HEALTHCARE SYSTEM

Healthcare levels in India follows different approaches to manage the patient health information. Traditionally in India, most of the hospitals manage patient health information in paper based format, including PHC, SHC and THC level. In paper based approach, healthcare providers are unable to provide better care mainly because extremely useful patient health information is unavailable during episode of care. This is mainly due to the unstructured way of keeping the records in paper based system. Presently most of the secondary and tertiary care hospitals have started using computer based record system for managing the health care information (Dick et al. 1997). It allows healthcare professionals to manage medical information in a significant way compared to paper based chart. Healthcare provider can use this technology to store the data such as symptoms, treatment and prescriptions details of each visit of the patient in the hospital data repository. Electronic Medical Record(EMR) is an electronic version of patient health related information gathered from a single healthcare service provider. Hybrid record represents the individual patient health information in both paper based and electronic format. Today, majority of the hospitals maintain and manage health records in the hybrid format (Stausberg et al. 2003; Lærum et al. 2003). Some of the tertiary health centers have moved from the paper-based medical records to the electronic repository, which connects different departments of tertiary health centers to a centralized data warehouse. This electronic repository allows healthcare professionals to access the patient data irrespective of departments. This system assists the healthcare professionals in receiving and sending patient data within the hospital and also controlling the flow of information at the point of care.

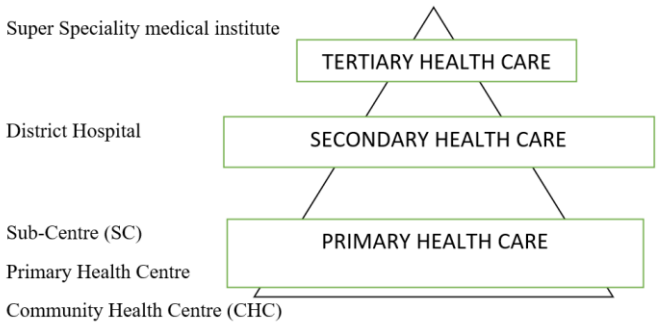
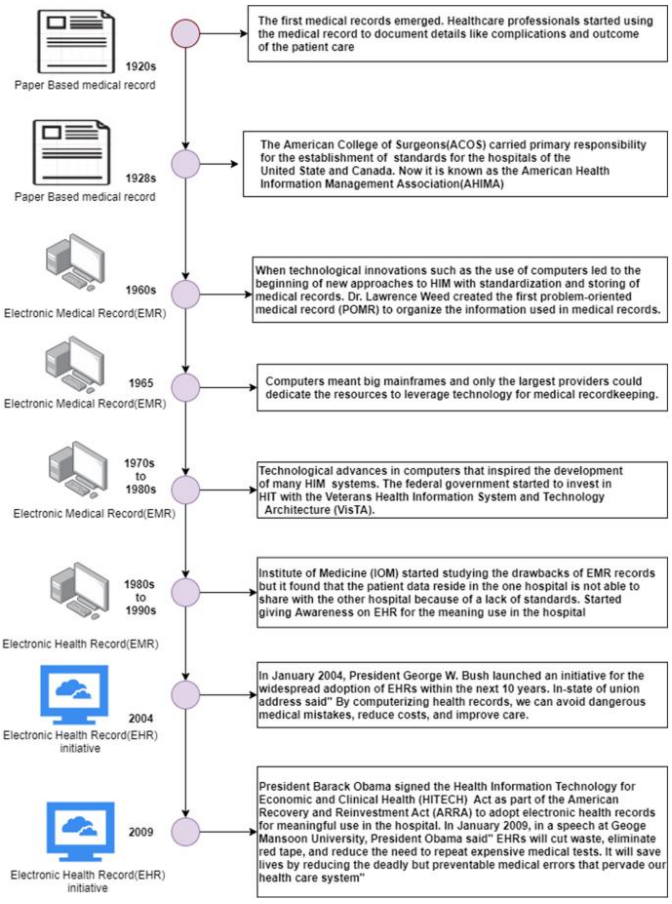


Figure 1 : Levels of healthcare system



DISCUSSION AND CONCLUSION

India has made prominent progress in health standards in the post-independence era. Still, many feel that the financial resources for the health sector should be increased. International developments in information technology need to be applied at the national level in an attempt for health data

documentation. The continued efforts to control the country's population and the political determination to march towards the millennium development goals in health will help India to make a noteworthy impact on the international health scene.

Taking into account this particular growth of Indian healthcare, it is estimated that there will be an inherent need for more healthcare and hospital administrators to properly supply the manpower needed to supplement the growth of the industry. Hence there will be an increase in the need for education in this particular field. Keeping in mind this particular need, there will be a fresh wave for the education courses imparting knowledge about hospital administration, healthcare management as well as public health.

In contrast to this growth of healthcare industry, all of the calculation has been disrupted due to the Coronavirus pandemic. Although the importance of the need for an established healthcare industry and the presence of skilled healthcare workers and administrators is more evident now. We urge our readers to stay safe at homes and also salute those workers who are working in various health-setups, risking their life every-day to control the pandemic.

The models presented here have permitted the construction, using personnel and laboratories within the hospital, of a system of models that permit a response in appropriate time to the needs of the HS and HTA evaluations in the hospital environment. Furthermore, the standardization of the schedules, reports and methodologies permits the hospital management to plan the number of requests and increase the in-hospital evaluation team through a training itinerary. The evaluative activity has had a strong increase, especially for the speedy evaluations (1-week report), in the second semester of activity, after its centralization in the first semester had been for the design and development of the models themselves. Regarding the applicable case of the IORT, the requests have been completely satisfied. The evaluation had a high and punctual participation by the in-hospital users involved in the analyses (6/7), in addition to the development of a supporting report that albeit producing specific information, gives the in-hospital decision-maker a "capacity for movement and planning" for its own strategic analyses. In fact, the example supplied by the estimated cost of purchase of used equipment, shows how the report, though supplying quantitatively clear elements, allows the calculation of the precise figure for the in-hospital planning and expected and/or predicted activity (number of yearly operations). The health-based clinical evaluation of the IORT shows a clinical efficacy comparable to traditional techniques, identifies expected improvements for the impact, the weight of the illness and the social aspect as well as considering it, in the specific analyzed context, a strategic element for the territory. Finally, the criticalities of the technology are the negative impact of its installation on the in-hospital organization, for the necessity of specific training of the medical technologist personnel as well as the alterations of the itineraries and process of hospital care.

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High Performance ALU Design using Energy Efficient Borrow Select Subtractor

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ABSTRACT

The fundamental architecture of any processor, or ALU, is a key factor in determining how efficiently it operates. Addition and subtraction is considered to be an important operation in ALU so the circuit which performs these operations has a drastic impact on the processor's performance. The pace of operation in the subtraction process is determined by the sequential borrow bit, which travels from LSB to MSB encompassing all bits in the operands. Two modified borrow choose subtractor designs with improved area efficiency and lower power consumption are used in the proposed ALU circuit. As a result,a lesser number of gates are used for the logical flow of the subtraction process by employing blocks with fewer logic gates, which results in a reduction in the number of devices, area, and power dissipation. The proposed designs were implemented using Xilinx ISE 14.7 tool.

Keywords: ALU, Adders, Subtractors, Borrow select subtractor, Xilinx ISE 14.7

I. INTRODUCTION

The size, functionality, and dependability of the design were historically the three key considerations for VLSI circuit designers. However, as the need for portable gadgets has grown in recent years, designers' top concerns—on par with those of space and speed—are power and battery life. Since portable devices need extended battery lives and non-portable equipment need significant heat removal the low power VLSI designs are significantly more important. The two things which a low power VLSI circuit needs to tackle are its Analysis and optimization. The Analysis is focused on power or energy dissipation during the various designing stages of the circuit. The effectiveness and efficiency of various analysis methodologies varies. Depending on the information used to create a certain design, analysis might vary in accuracy. The process of optimization entails coming up with the best design possible while yet adhering to the design requirements. A subtractor's important work is to produce a binary divider. Power dissipation emerged as the main design constraints in systems since applications are battery-operated gadgets. Processor speed, circuit speed, space, performance, price, and dependability were formerly of utmost

importance. The secondary issue was power usage. Power usage, however, has received equal weight in recent years. The rapid growth of mobile computing devices and wireless communication systems, which require quick computations and intricate functionality with little power usage, is likely to be to blame for this changing trend. High performance CPUs also need a lot of electricity, which drives up the price of cooling and packaging. After that, the dependability is hampered by an increase in the power density of VLSI processors. A number of Silicon failure mechanisms have been found to cause silicon-based components to fail at a rate that is roughly doubled for every 10 degrees higher operating temperature. From an environmental standpoint, less heat will be dissipated in rooms, which will have a good effect on the environment at large. This is because less power is lost by electrical components. It will also use less power. The implementation of three-bit subtraction via a complete subtractor circuit. Minuend is the first bit, subtrahend is the second, and borrowed is the third bit in input. Borrow and difference bits are used for output.

The reference signal is used by the subtractor circuit to examine the data before allowing the signal to be used in the desired operation without altering its original form. The subtractor circuit is a highly helpful tool for signal processing, data processing, quick multiplication, and signal propagation. With the introduction of low-power manufacturing methods, circuit approaches, dynamically programmable power supply, and power-efficient microprocessors, low-power IC design has evolved as an active field of research and development. The subtractor circuit keeps the signal level constant and provides a lossless feed to the DSP processor circuit.

Due to the significance of arithmetic circuits in the operation of signal processing units, the Adder-Subtractor circuit is a need. The Ripple Borrow Subtractor (RBS) has a simple architecture which is commonly used for subtracting unsigned values. The time taken to propagate LSB to MSB limits RBS performance. The size of the binary word influences the RBS delay. To look into limitations of present RBS circuits with different RBS circuits, borrow select subtractor (BSLS) architecture is proposed. The final difference and borrow is selected post multiplexers (MUX). It is shown that the BSLS is an area waster since it makes use of a lot of RBS circuits. Addition of the two's complement is the standard method of subtraction for signed numbers.

The suggested structures are contrasted with the standard two's complement technique used in the literature, which essentially uses an addition. For comparing the two's complement approach with the suggested architectures, the adder has been taken into consideration. A BSLS variation is suggested for signed number subtraction. Our motto in this paper is area reduction and less power consumption which is done by implementing logic blocks having fewer gates that take up less space while keeping the same degree of logic capacity.

II. EARLIER WORK

Peripheral devices with addresses and various communication response times are employed with a data processing device. Values that reflect different address ranges make up the wait status, which is saved in programmable registers that may be addressed. The number of wait states determined by the value kept in one of the addressable programmable registers is the number of wait states that are generated when the digital processor asserts an address to the peripheral devices. Given the various peripheral device communication response times, this correlates to one of the address ranges where the asserted address occurs. The subtractor circuit uses a reference signal to assess the data and permits the signal to be used in the relevant operation without altering its original form. The subtractor circuit is a highly helpful tool for signal propagation, quick multiplication, and

signal processing. As a consequence of the introduction of low-power manufacturing processes, circuit approaches, dynamically programmable power supply, and power-efficient microprocessors, low-power IC design has grown into one of the most active fields of research and development.

Using an XOR gate, a NOT gate, and an AND gate, Fig. 1 depicts the structure of a half subtractor. A maximum delay of two is experienced by the half subtractor structure while creating the output. Difference D has a 1 delay, whereas creation of borrow B has a 2 latency. An XOR gate and an AND gate are used to create a half adder in Fig. 2. This half adder incurs a maximum of one delay in producing sum S and carrying C. Using two XOR gates, two NOT gates, two AND gates, and one OR gate, Fig. 3 depicts the internal construction of a complete subtractor. A maximum delay of 4 is experienced by the entire subtractor understanding of differences D experiences a 2 delay, but borrowing from B results in a 4 latency.

The implementation of an XOR, AND, and NOT gate in a 2-bit Binary to Excess-1 Converter (BEC) is depicted in Fig. 4. Five logic groups comprise the unsigned 16-bit BSLS. Each group divides the total into equal halves and borrows for any number of bits. Every functional group save the first has a (2n+2):(n+1) multiplexer, an n-bit BEC, and two n-bit RBS. In the first group, there is just one RBS with two bits.

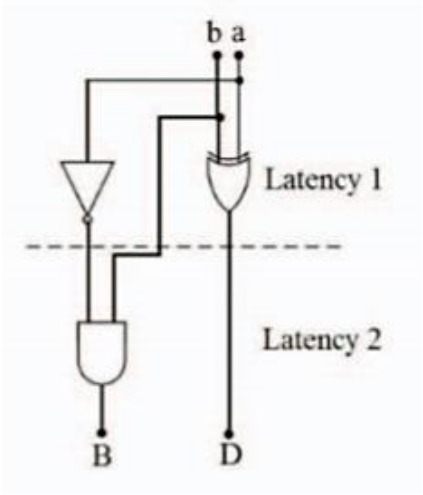

Fig. 1. Half Subtractor

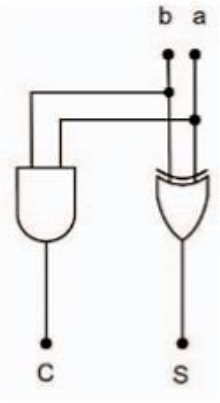

Fig. 2. Half Adder

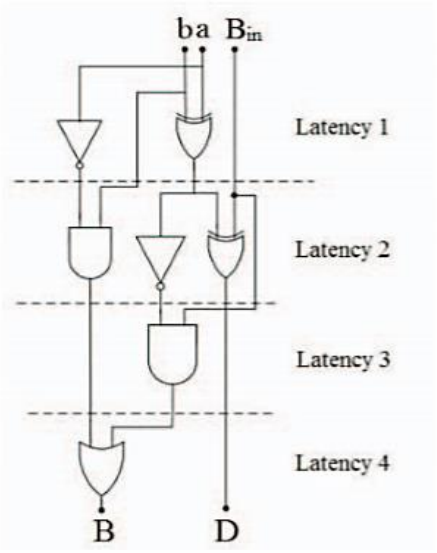

Fig. 3. Full Subtractor Gate Structure

RBS receives inputs from minuend and subtrahend The production of the difference bit is accounted for borrow if the previous step is 1. The borrow bits for difference and borrowing are provided as 0 and 1. Using the MUX, the borrow bit gained from the prior stage is used to determine the appropriate output.

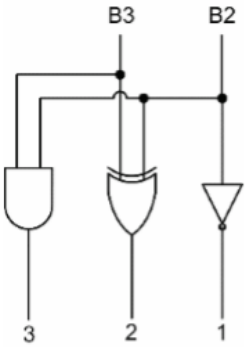

Fig. 4. 2-bit BEC

If the subtrahend is bigger than the minuend, the difference is taken as 2's complement. The number of

blocks required for changing into two's complement form into signed magnitude form are more. Successful results are obtained when the unsigned BSLS's borrow output is zero. As a result, signing the output's magnitude is not necessary. Similar to that, the result is unfavorable as 1 is the borrow output. The borrow-out output is then complemented, and the whole result is then performed using the 2's complement to represent it in signed magnitude form.

$X_0 = \sim B_0$ (1)

$X_1 = B_1 \text{ xnor } B_0$ (2)

$X_2 = B_2 \text{ xor } \sim (B_0 + B_1)$ (3)

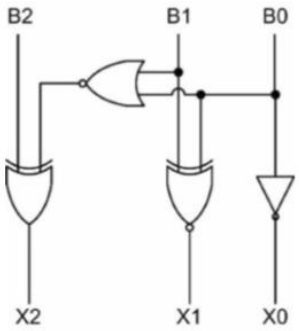

Fig. 6. 3-bit Binary-Less-One (BLO)

Despite the fact that the internal parts are different, this is similar to an adder. When the Bin reaches 0, it borrows after accepting them as input and deducts one from the difference. Whenever Bin is 1, the difference, borrow, and the BLO logic all are the same.

III. PROPOSED WORK

A modified Borrow Select Subtractor circuit using Binary-Less-One logic is proposed which is shown in Fig. 7. Leaving group 1 every other group uses Binary-Less-One logic to compute difference and borrow. The MUX circuit work is to select output difference and borrow based on Bin value from the previous stages. The difference and borrow from first n-bit RBS with Bin=0 and Binary-Less-One (BLO) read as Bin=1. The first group has 1 two-bit RBS and the remaining groups have an n+1-bit BLO, an n-bit RBS, and a (2n+2):(n+1) multiplexer.

One OR gate, two numbers of XOR, NOT, and AND gates, and one of these gates are commonly used to build entire subtractors.

You can build a half subtractor by using one XOR, one NOT, and one AND gate. The 2:1 MUX must be realized using 2 AND gates, 1 OR gate, 1 NOT gate, and 2 NOT gates. In order to process the first three bits using RBS, a half subtractor and two full subtractors are required. This specifies the initial 3-bit RBS's requirement for five XOR gates, five NOT gates, five AND gates, and two OR gates. Four gates—one XNOR, two XOR, two NOT, and one NOR—are used to implement the 4-bit BLO. The 8:4 MUX has four 2:1 MUX with 4 NOT, 8 AND, and 4 OR gates each.

In BSLS-BLO, group 3 requires a total of 40 gates. 7 XOR, 1 XNOR, 11 NOT, 13 AND, 6 OR, and 2 NOR gates were used to implement group 3 of the BSLS-BLO. In each and every group the second n-bit RBS, BEC-1, or n-bit BLO is substituted with an n-bit ripple borrow half subtractor.

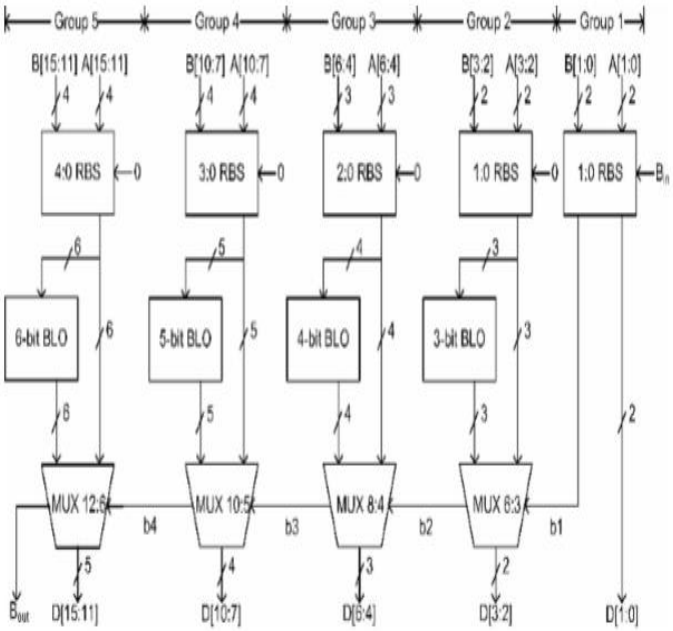

Fig. 7. Modified Borrow Select Subtractor using Binary-Less-One Logic

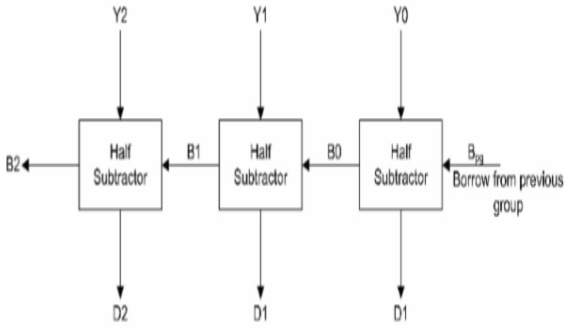

Fig. 8. 3-bit Ripple Borrow Half Subtractor

The received input is sent to the output as-is if borrow is set to 0. Otherwise, output is formed by taking away one from input (Bpg = 1). By using half subtractors, this is accomplished. The n half subtractors in an n-bit RBHS form the bit size. The n-bit RBS with Bin=0 serves as the input Y for each half-subtractor. Borrowing from the prior group or from the prior half subtractor serves as the half subtractor's additional input. The final borrow from the n-bit RBHS is the output of the nth half subtractor (Bout).

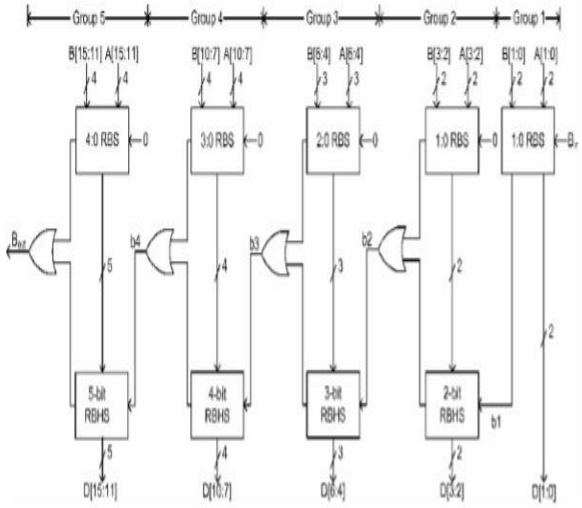

Fig. 9. Modified Borrow Select Subtractor using Ripple Borrow Half Subtractor

The proposed borrow select subtractor circuit is implemented using a ripple borrow half subtractor. By assuming Bin=0, the first n-bit RBS's difference and borrow bits are computed and then taken as input to n-bit RBHS. The difference and borrow are generated by borrow Bin from previous groups. A borrow-out bit called Bout is given to the OR gate along with n-bit RBS and n-bit RBHS.

For the present group and the following group Borrow-out and Borrow-in bits are the outputs of the OR gate respectively. In this architecture each group's (2n+2):(n+1) MUX is replaced by just one OR gate which reduces the gate count. One n-bit RBS, one n-bit RBHS, and one OR gate are present in each functional group, omitting the first group.

A high performance arithmetic hardware with the fewest clock cycles feasible that can execute fundamental arithmetic operations as well as the square, square root, and inverse. In this thesis, the design of the ALU was done with high performance and testability in mind. For the development of a high-speed arithmetic unit, architectures with a high degree of parallelism were investigated. Functional units were created with a 16 bit capacity for simplicity. Increases in operand size would only necessitate hardware duplication in parallel with current circuitry due to architectural parallelism. The ALU features independent hardware that can compute square, square root, and inverse in addition to standard integer arithmetic operations. A combined ADD/SUB unit was used to implement the hardware for addition and subtraction. Usually, two's complement addition is used for subtraction. Implementing high performance arithmetic hardware has always been a desirable design challenge due to the widespread usage of microprocessors and signal processors.

The workhorse of microprocessors and the component that controls how quickly the processor operates is the arithmetic and logic unit (ALU). Basic arithmetic computations can be performed independently by all contemporary CPUs. Processors come with rapid arithmetic hardware as well as on-chip memory (cache), which helps them operate much better by reducing delays brought on by data access from main memory.

The most crucial component in the architecture of a digital system is an arithmetic logical unit. It serves as a combinational logic unit and an essential component of a computer processor, carrying out

both arithmetic and logical operations. In very large-scale integrated circuits (VLSI), which range from CPUs to application-specific integrated circuits, ALUs of different fixed bit-widths and full precision bit widths are usually used (ASICs). Today's ALU is becoming more complicated and smaller to allow for the creation of processors and computers that are more powerful yet smaller.

As a result of computer, digital signal processing, and networking applications, there is a growing need for processors that operate at fast speeds, consume little power, and are interoperable. Multiplication, addition, division, subtraction, and other arithmetic operations are performed utilizing a variety of processor types that are employed in diverse applications.

Effective arithmetic circuits can be implemented to improve the performance of the ALU. A simple ALU that performs 4 separate operations has been created in this case. ALU architecture may be produced that is more effective than traditional designs by implementing an efficient subtractor as one of the operations.

IV. EXPERIMENTAL RESULTS

In the figure 8 & 9 RTL schematic and Technology schematic of ALU_BSL1 are shown below respectively.

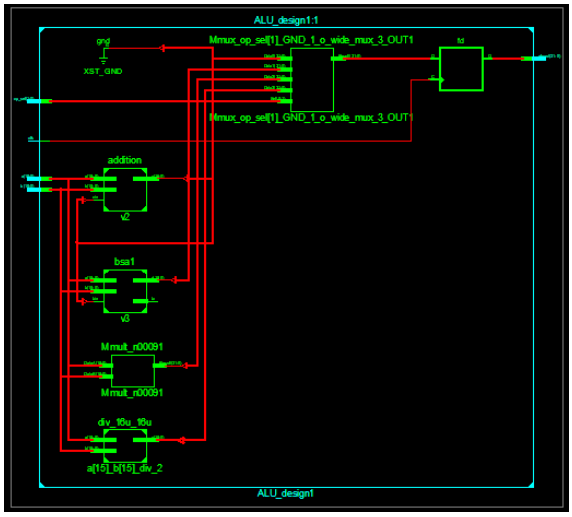

Fig.8: RTL schematic of proposed ALU_BSL1

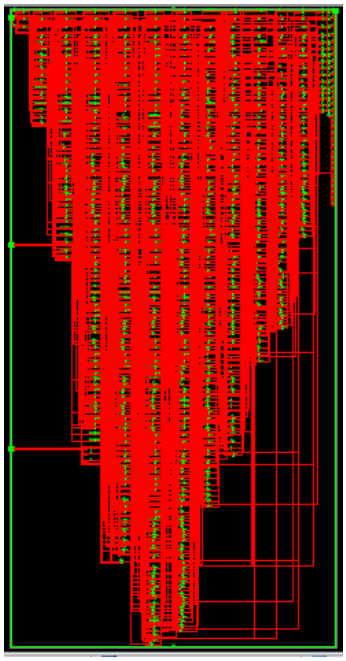

Fig.9: Technology schematic of proposed ALU_BSL1

In the figure 10 & 11 RTL schematic and Technology schematic of ALU_BSL1 are shown below respectively.

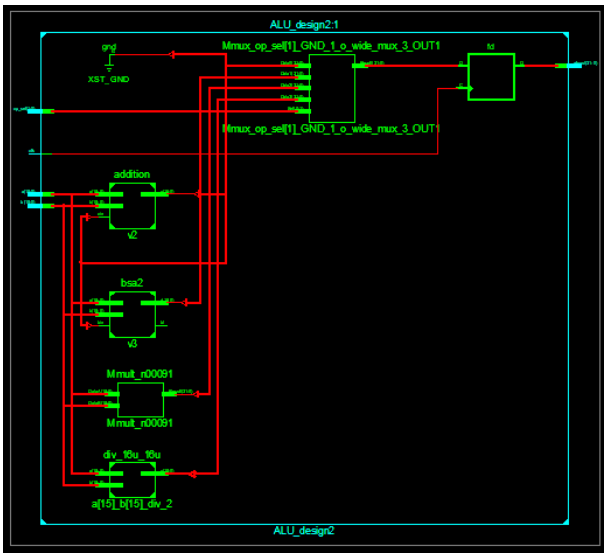

Fig.10: RTL schematic of proposed ALU_BSL2

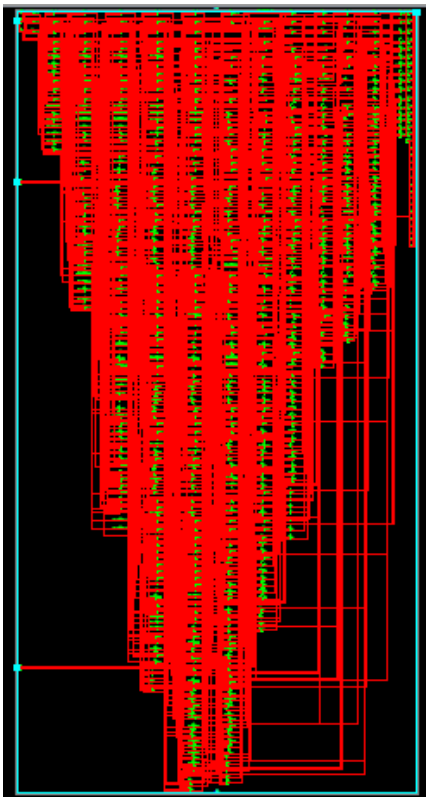

Fig.11: Technology schematic of proposed ALU_BSL2

Figure 12 & 13 shows the simulation results for the proposed ALU_BSL1 & ALU_BSL2 respectively.

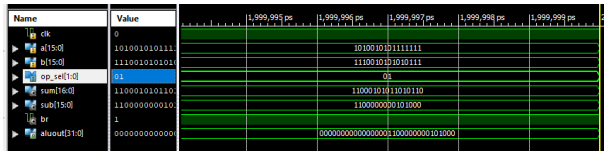

Fig.12: Simulation results of proposed ALU_BSL1

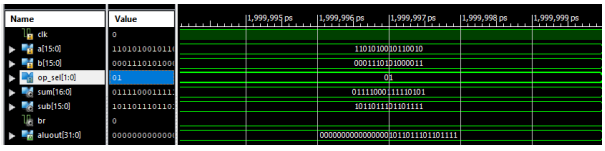

Fig.13: Simulation results of proposed ALU_BSL2

Evaluation Table:

	Area (LUT's)	Delay (ns)
ALU_BSL_1	450	33.657
ALU_BSL_2	443	33.441

V. CONCLUSION

The application to the suggested subtractor designs is what this paper's implementation is all about. We describe an ALU architecture that employs modified borrow select subtractors employing BLO and RHBS, respectively. In comparison to the equivalent designs, fewer gates are used in both modified architectures. Additionally, this design strategy results in a smaller overall footprint, less power consumption, and fewer transistors being used, all of which have an impact on how effective the ALU architecture is. The suggested ALU, which uses a modified borrow select adder and RHBS, takes up less space and has a shorter latency, according to the findings of the simulation.

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The Effect of Adding Burn Lime and Fresh Lime Variations to The Quality of Lime Mud

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ABSTRACT

Recausticizing units in mill pulp have a major role in converting green liqour into white liquor and produces lime mud as a by-product. In the recuaticizing process there is the addition of calcium oxide. Two types of calcium oxide are used, i.e burn lime and fresh lime. These two types will affect the quality of the lime mud produced. The objective of this research is to identify the effect of variations of addition burn and fresh lime to lime mud quality.The target parameters of $CaCO_3$ content >86%, total alkali <1% and Non-Process Elements (NPE) <2%. The range of combination addition burn lime and fresh is between 0% - 100%. The optimal composition of addition of calcium oxide in the manufacture of lime mud both from a technical and cost perspective is the second variation (75% burn lime and 25% fresh lime). The second variation gives content of CaCO3 86.80%, total alkali 0.1141% and Non-Process Elements (NPE) are P_2O_5 0.4260%, SiO_2 2.4344%, MgO 0.2260%, Fe_2O_3 0.1984% and Mn_2O_5 0 ,0068%. These result are in accordance with the lime mud quality standard.

Keywords: Recausticizing, Lime Mud, Calcium Oxide, Burn Lime, Fresh Lime

I. INTRODUCTION

Today kraft pulping technology still dominates the pulp industry. This Kraft pulping combines heat, chemicals and mechanical treatment in the manufacture of pulp [1]. In the kraft pulping industry, there is a chemical recovery unit which has an important role in reducing the generation of liquid waste and pollutants into the environment [2].

The chemical recovery unit has an important system which produces a cooking solution for the digester. This system is recausticizing plant. This solution comes from recycled inorganic chemicals produced from the recovery boiler and lime kiln [3]. The main function of the recausticizing plant converts Green Liqour to White Liqour by adding lime (CaO). This process decreased the content of Na_2CO_3 and increased NaOH. Another objective of the process is to make sure that the efficiency of carbonate conversion keeping as high as possible [4].

The block diagram of the recausticizing show in figure 1.
Smelt from the bottom of the recovery boiler tank is diluted with weak liquor and produces green liquor.

Green liquor will be converted into white liquor after going through 4 stages of clearence. The first is the opti disc filter, slaker, causticlear and the last is the white liquor disc filter. From all these stages, inorganic wastes are produced [5] namely dregs, grits and lime mud. This waste will be disposed of in landfills. After passing through 4 filter stages, the final product, namely white liquor, will be channeled to the digesting pulp section (figure 1)

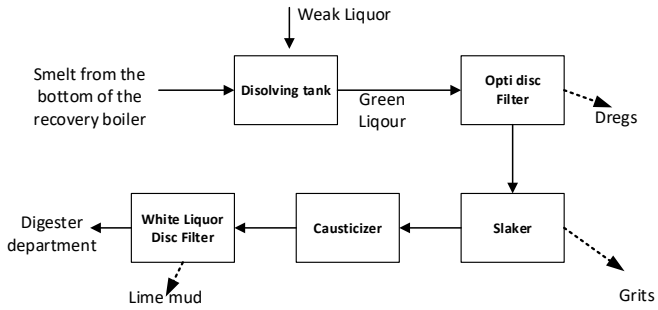

Figure 1 Recausticizing Process Plant

The reaction equation for the slaking process is as follows:

$$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s) \quad (1)$$

The reaction equation for the causticization process is as follows:

$$Na_2CO_{3(aq)} + Ca(OH)2_{(aq)} \rightarrow 2\ NaOH_{(aq)} + CaCO_{3(s)} \quad (2)$$

The reaction equation for the calcination process is as follows:

$$CaCO3(s) + Heat \rightarrow CaO(s) + CO_2(g) \quad (3)$$

Lime mud is a by-product of the recustization process, most of which is calcium carbonate. Lime mud produced from this process has a fairly high calcium carbonate content of 80%.

In the pulp industry, calcium oxide is used in the recausticizing process which will be reacted with green liquor to produce white liquor and lime mud. Calcium oxide can be produced by the lime mud calcination process in a lime kiln unit. In addition, calcium oxide can also be derived from natural stone calcination.

Burn Lime is a product produced from the calcination process in a lime kiln. Lime kiln is useful for converting calcium carbonate into calcium oxide as in Equation 3. Meanwhile, Fresh Lime or quicklime is a conventional product from the limestone industry [6]. Fresh lime is made by burning lime stone in a calcination furnace.

The type of calcium oxide used can affect the quality of lime mud, so that in the manufacture of the recausticizing process, knowledge is needed about the effect of adding different types of lime (calcium oxide). This is the main reason for research related to the effect of the use of calcium oxide on the quality of lime mud carried out . The parameters of the experimental results that are considered are the value of $CaCO_3$ content, Total Alkali and Non-Process Element (P_2O_5, SiO_2, MgO, Fe_2O_5 and Mn_2O_5). The above is the background for the author to conduct a study entitled "The Effect of Variations in Adding Burn Lime and Fresh Lime to the Quality of Lime Mud". The experimental parameters that are considered are the value of $CaCO_3$ content, Total Alkali and Non-Process Element (P_2O_5, SiO_2, MgO, Fe_2O_5 and Mn_2O_5).

II. METHODS

The preparation stage is the first stage carried out in research. At this stage, preparations are carried out starting from the preparation of raw materials, testing specifications for raw materials, and preparing tools. Testing the specifications of raw materials in the form of burn lime and fresh lime.

The second stage is the implementation stage. The implementation stage is to experiment with making lime mud with a lime mud quality target. In this study, two stages of implementation were carried out,

namely the manufacture of white liquor and lime mud slurry and the treatment stage of lime mud ready to kiln.

In this study, a trial was conducted on the manufacture of lime mud on a laboratory scale using the effective reaction time in previous studies. Making lime mud using burn lime and fresh lime as calcium oxide which will react with sodium carbonate to produce sodium hydroxide and calcium carbonate. Calcium oxide was varied, then the slaking stage was carried out for 20 minutes with the process temperature maintained at 101-104°C and the caustization stage was carried out for 220 minutes with the process temperature maintained at 98-100°C. The lime mud slurry formed will then be added with water with a density of 1.05 kg

TABEL 1
EXPERIMENTAL VARIATIONS FOR MAKING LIME MUD

No	Calcium Oxide (CaO)	
	Burn Lime	Fresh Lime
1	100%	0%
2	75%	25%
3	50%	50%
4	25%	75%
5	0%	100%

The testing stage is the final stage in the research. At this stage, lime mud quality parameters were tested. Among the parameters that are checked are CaCO3 content, Total Alkali and NPE (Non-Process Element).

III.RESULTS AND DISCUSSION

A. Raw Material Test Results

The results of testing the raw materials used will be presented in Table 2 and Table 3 as follow.

TABEL 2. CALCIUM OXIDE PURITY

Sampel CaO	Purity (%)
Burn Lime	74.95
Fresh Lime	89,05

TABEL 3. GREEN LIQUOR COMPOSITION

Parameter	Composition
NaOH	8,39 g/L as Na_2O
Na_2S	34,80 g/L as Na_2O
Na_2CO_3	87,32 g/L as Na_2O
Total Titratable Alkali	130,51 g/L as Na_2O

In this study, testing of raw materials was carried out which aims to determine the content contained in these raw materials. This content will affect the process and the resulting product.

Testing the purity of CaO was carried out to determine the amount of CaO content and impurity particles, the higher the purity of CaO, the smaller the impurity particles, and vice versa. In addition, the purity of CaO is used to determine the amount of lime (CaO) added in the lime mud manufacturing process.

Green liquor composition testing is carried out to determine the amount of alkaline composition contained in green liquor. Because the composition of alkaline green liquor will be used to determine the amount of sodium carbonate which will be converted into sodium hydroxide and calcium carbonate.

B. Lime Mud Test Result

1. $CaCO_3$ Content

The results of the $CaCO_3$ content test aim to determine how much $CaCO_3$ is contained in lime mud, because the amount of $CaCO_3$ content will affect the CaO produced. During the calcination process, the higher the $CaCO_3$ content, sufficient temperature and time, the higher the yield of CaO produced, and the higher the purity of CaO produced. Test results for CaCO3 content will be presented in Table 4 below.

TABEL 4. TEST RESULTS OF THE EFFECT OF ADDITION OF CaO TO $CaCO_3$ CONTENT

No.	Variation		$CaCO_3$ *Content* (%)
	Burn Lime	*Fresh Lime*	
1	100%	0%	85,96
2	75%	25%	86,80
3	50%	50%	90,15
4	25%	75%	92,95
5	0%	100%	97,11

From the above data processing, a graph is obtained regarding the effect of adding burn lime and fresh lime to the CaCO3 content as follows:

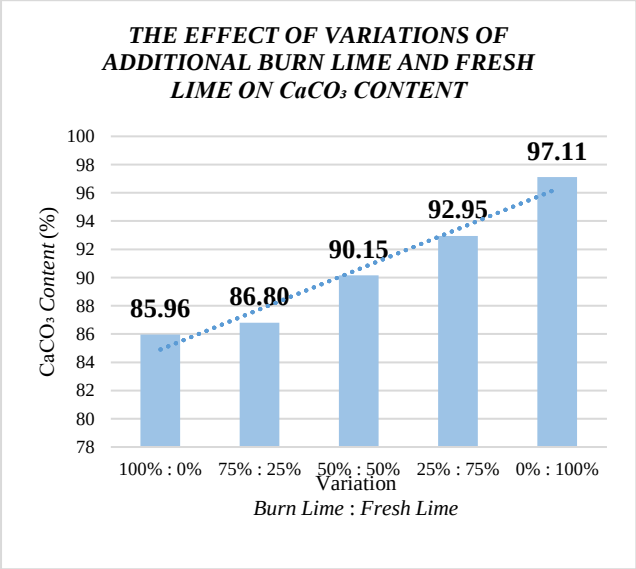

Figure 2 CaCO Content Test Results

The results of the test of $CaCO_3$ levels of lime mud samples with variations of 100% burnt lime and 0% fresh lime are 85.96%. The results of the test of $CaCO_3$ levels of lime mud samples with variations of 75% burnt lime and 25% fresh lime are 86.80%. The results of the test of $CaCO_3$ levels of lime mud samples with variations of burnt lime and fresh lime were 50% each, namely 90.15%. The results of the test of $CaCO_3$ levels of lime mud samples with variations of 25% burnt lime and 75% fresh lime are 92.95%. The results of the test of $CaCO_3$ levels of lime mud samples with variations of 0% burnt lime and 100% fresh lime are 97.11%.

Figure 3 showed that the increase in the percentage value of $CaCO_3$ content with the addition of fresh lime, where the highest percentage value of $CaCO_3$ was obtained with the addition of 100% fresh lime.

It can also be seen in Table 2. that the purity of lime type calcium oxide has a fairly high purity of 89.05%, the purity of this lime can affect the percentage value of the $CaCO_3$ content that will be produced or it can be said that the lime sludge produced will have good quality.

2. Total Alkali

The results of the total alkali lime mud test aim to determine how much alkali content is in lime mud. This test is also carried out to determine the effect of adding burn lime and fresh lime to the total value of alkaline lime mud. The test results for total alkaline lime mud will be presented in Table 5 below

TABEL 5
TEST RESULTS OF THE EFFECT OF ADDITION OF CaO TO TOTAL ALKALI

No.	Variation		Compound (%)				
	Burn Lime	*Fresh Lime*	P_2O_5	SiO_2	MgO	Fe_2O_3	Mn_2O_5
1	100 %	0%	0,57 47	2,68 48	0,24 23	0,23 07	0,00 71
2	75 %	25 %	0,42 60	2,43 44	0,22 60	0,19 84	0,00 68
3	50 %	50 %	0,40 40	1,70 25	0,21 98	0,15 83	0,00 63
4	25 %	75 %	0,34 04	1,65 13	0,20 85	0,14 67	0,00 60
5	0%	100 %	0,17 24	0,87 01	0,17 20	0,03 41	0,00 47

From the data processing above, a graph is obtained regarding the effect of adding burn lime and fresh lime to the total alkali lime mud as follows:

The results of the total alkali test of lime mud samples with variations of burn lime and fresh lime were 50% each, namely 0.1055%. The test results of total alkali lime mud samples with variations of burn lime 25% and fresh lime 75% were 0.0946%. The test results for total alkali lime mud samples with variations of burn lime 0% and fresh lime 100% were 0.0903%. From the test data, the total alkali lime mud sample with various variations has the expected value of 1.0%.

Figure 3 showed that the percent value of total alkali decreased with the amount of fresh lime added, where the lowest percent value of total alkali was obtained with the addition of 100% fresh lime. In addition, the more use of burn lime, the higher the percentage value of the total alkaline lime mud produced

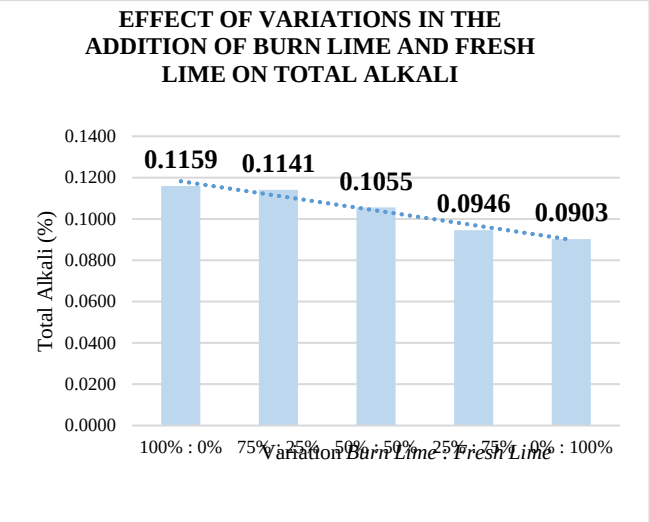

Figure 3 Total Alkali Test Result

The percent value of total alkali indicates that the amount of white liquor or alkali that enters the lime mud. In addition, the high percentage of total alkali will affect the high fuel consumption in the calcination process in the lime kiln. Then from the calcination process will produce large lime, because of the large size of this lime it will cause the inside of the raw lime. As a result of this condition, the lime produced will affect the process of recausticizing. It is known that the recausticizing process and the lime kiln process are part of the chemical recovery process in the kraft pulp industry.

3. Non-Process Elements (NPE)

The results of the Non-Process Element (NPE) test aim to determine how much metal compounds are contained in lime mud. This test is carried out by 2 methods, namely the gravimetry method and the ICP (Inductively Coupled Plasma) method. The test results for total alkaline lime mud will be presented in Table 6, as follows

TABEL 6

NON-PROCESS ELEMENT (NPE) TEST RESULTS

No.	Variation		TotaL Alkali (%)
	Burn Lime	*Fresh Lime*	
1	100%	0%	0,1159
2	75%	25%	0,1141
3	50%	50%	0,1055
4	25%	75%	0,0946
5	0%	100%	0,0903

From the above data processing, a graph is obtained regarding the effect of adding burn lime and fresh lime to the Non-Process Element (NPE) as follows:

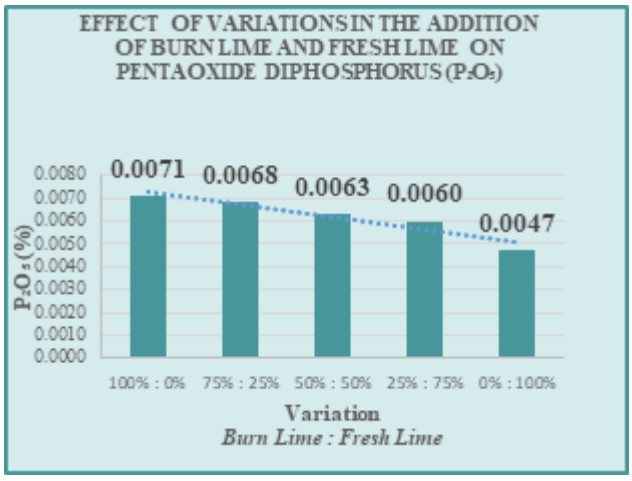

Figure 4 Pentaoxide Disphosphorus (P_2O_5) Test Result

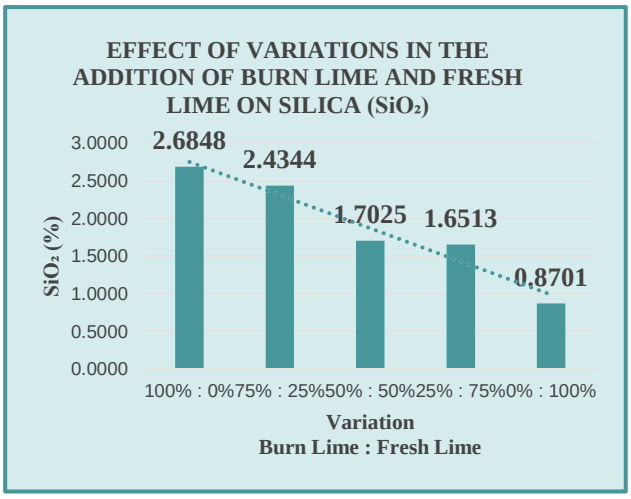

Figure 5 Silica (SiO_2) Test Result

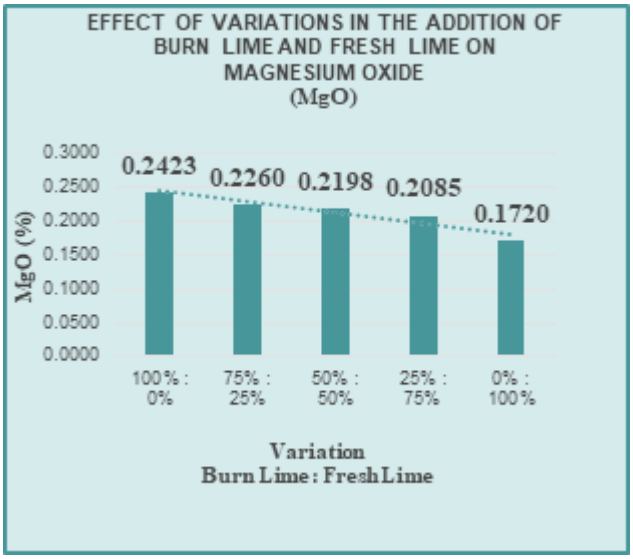

Figure 6 Magnesium Oxide (MgO) Test Result

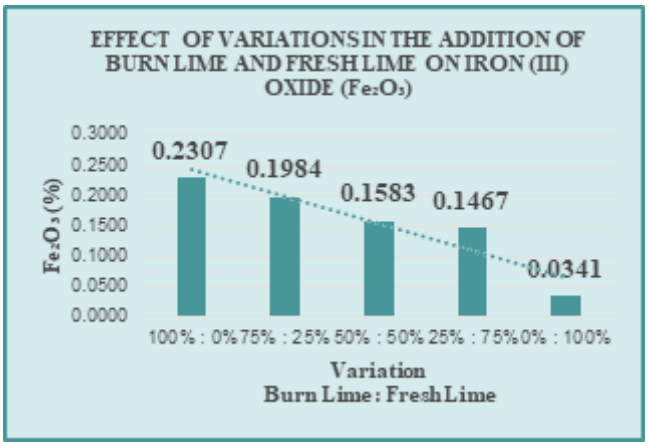

Figure 7 Iron (III) Oxide (Fe_2O_3) Test Result

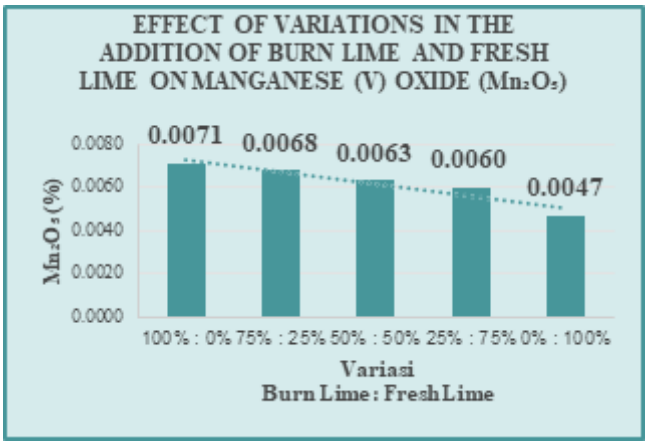

Figure 8 Manganese (V) Oxide (Mn_2O_5) Test Result

Non-Process Element (NPE) is classified as an element / element that is not needed in the process. In other words, NPE can be considered as an impurity in lime mud. This has been state that NPE enters the process through wood, bark, make-up lime, make-up chemical and process water [2].

Figure 4 up to figure 8. showed that the addition of CaO can affect the percentage of Non-Process Element (NPE) contained in lime mud. It can be seen from the figure that there are 5 types of NPE, namely P_2O_5, SiO_2, MgO, Fe_2O_3 and Mn_2O_5. These five types of NPE are impurity compounds that can interfere with the causticizing and lime kiln processes. P_2O_5, MgO, Fe_2O_3 and Mn_2O_5 compounds can be stated as high dead loads in the kiln in the lime cycle process

Figure 4 to figure 8 the percentage of 5 types of impurity compounds contained in lime mud shows that samples with more variations in the use of burn lime can cause the content of the impurity compounds to increase as well.

In addition, it can be seen from Figure 4 up to Figure 8 the graph presented of each impurity compound or NPE decreases along with the less use of burn lime. It can be said that the more use of fresh lime, the lower the NPE content in the lime mud produced. This is because fresh lime is a type of CaO produced from the natural limestone calcination process. This is different from burn lime which is a type of CaO produced from the kiln process, where the process converts calcium carbonate into calcium oxide. So that the quality of fresh lime is better than burn lime.

If the dependent variable is NPE 2%, then the percent SiO_2 with variations in burn lime 100% and variations in burn lime 75%: fresh lime 25% does not meet the desired or specified number, where the percent value for 100% burn lime variation is 2.6848% and the variation of burn lime 75%: fresh lime 25% is 2.4344%.

Figure 4 to 8 shows the percentage of NPE is quite good, where the percentage of the value is much less than 2%.

4. Cost Variasi Kalsium Oksida (CaO)

TABEL 7
COST VARIATION CALCIUM OXIDE (CaO)

No.	Variasi		Total Harga (USD/kg CaO)
	Burn Lime	*Fresh Lime*	
1	100%	0%	**3,2876**
2	75%	25%	**4,8780737**
3	50%	50%	**6,4699427**
4	25%	75%	**8,0608164**
5	0%	100%	**9,6512901**

Table 7 Obtained cost data for variations in the addition of calcium oxide (CaO). Where for each variation of the addition of calcium oxide (CaO) has a different cost value. The quality standards of lime mud used are CaCO content 86%, total alkali 1% and Non-Process Elements (NPE) 2%.

Based on information from the industry where this research was conducted, the burn lime price was 0.04 $/kg CaO and fresh lime was 0.13953$/kg CaO. For variations that use more fresh lime, the costs incurred will also be even greater. The results showed that the good quality of lime mud was found in the increasing composition of the addition of fresh lime. So the optimal composition from the technical and cost perspective is the second variation, where the composition of the addition of burn lime is 75% and fresh lime is 25%.

IV. CONCLUSION

Based on the analysis and discussion of the research data above, it can be concluded as follows.

1. The addition of burn lime and fresh lime will affect the percent $CaCO_3$ content. The more addition of fresh lime composition, the higher the percentage of CaCO3 content produced, namely the addition of 100% fresh lime composition. The percentage of CaCO3 content produced is 97.11%.

2. The addition of burn lime and fresh lime will affect the total alkaline lime mud. The more the addition of burn lime composition, the higher the total alkaline lime mud produced, namely the addition of 100% burn lime composition and the resulting value is 0.1159%. However, the lower the total alkali value, the better the quality of lime mud produced. With the addition of 100% fresh lime composition, the lowest total alkali value was 0.0903%.

3. The addition of burn lime and fresh lime affects the value of Non-Process Elements (NPE). In NPE, the lowest possible value is required, namely the addition of 100% fresh lime composition. The resulting NPE values were P_2O_5 0.1724%, SiO_2 0.8701%, MgO 0.1720%, Fe_2O_3 0.0341% and Mn_2O_5 0.0047%.

4. The optimal composition of addition of calcium oxide in the manufacture of lime mud either from a technical or cost perspective is the second variation, where the composition of the addition of burn lime is 75% and fresh lime is 25%.

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Deep Features for Image Copy Move Forgery Detection

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ABSTRACT

In this modern era, there has been a increase in the copying and moving of illegalities, distributing them, and then tempered images. These days even the most secured data sometimes go under devastating forgery. Copy-move forgery is seento be one the easiest tampering techniques without leaving any obvious traces of manipulating an image's content.Like working on the pixels of an image by geometrical and illumination techniques which are either cut or copied or pasted to a different location of the same image.In this paper, we propose copy-move forgery detection of an image by extracting and clustering SIFT key points for comparison.The first step is to find suspicious clusters of key points and patches to roughly estimate the dimensionality of SIFT. Secondly, it finds pixel level, scale, and color by comparingsimilar neighborhoods of matching duplicated regions. The results prove to be giving good performance scores, computational timing, and complexity.

Keywords : Copy Move Forgery Detection, Tempering, Convolutional Neural Network, Image Spilicing

I. INTRODUCTION

Due to technological advancement and inevitable use of web-based platforms and its ubiquitous presence in both personal and professional life the data is spread to large scale of audience. Our main source of information is digital images and the development of various image editing techniques which has eased the manipulation of image for attackers. They are now well equipped with tools to copy illegally, move, or distribute the manipulated data.Forgery image is basically manipulation of images to showcase the false information or hide some unrevealing data with the help of images.All these altering methods making it difficult to distinguish between the forged and original images.Manipulation methods mainly includeretouching of image, image being morphed, image resampling,splicing copy-move forgery, image regeneration, colorizations, and multi scale featuring. Image splicing refers to the usage of cut- paste operations to generate a brand-new photo with the aid of using merging quantities of or greater snap shots, while copy-pass forgery is a photo manipulation method wherein quantities of a photo are duplicated, this is taken and reposted in a few different region inside the identical photo. The vicinity being duplicated might also additionally go through a few

manipulations, for example, scaling and brightness extrade earlier than being pasted someplace else.

Image retouching includes small, localized modifications commonly observed with the aid of using worldwide modifications like assessment adjustment, brightness control, and white balancing, at the same time as photo inpainting conserves the photo with the aid of using substituting broken or lacking photo content material according with the encompassing photo content material. Similarly, colorization, commonly takes grayscale snap shots and colorizes them with visually practical colors, inflicting discrepancy during precise objects/scenes identification/detection.

The forgery detection strategies are specifically categorized as energetic and passive techniques. The former depends on a few authentication statistics like a virtual signature or a watermark, embedded in the photo throughout advent or earlier than sharing a piece of action publicly. On the converse, the latest, passive detection strategies do now no longer depend on in-constructed statistics, as a substitute, they depend on the photo functions to perceive the tampered ones. These passive detection techniques are greater sturdy and feature a much wider variety of applicability as a maximum of the pix on social media do now no longer have embedded identification statistics. Conventionally passive photo forgery detection techniques have focused on detecting reproduction pass forgery, photo splicing, and photo retouching. Compared to different passive detection strategies, reproduction pass forgery is hard to come across as a variety of traits of the solid location like colour, texture, and tool residences are equal to relaxation of the photo. Further, using cropping, blurring, rotating, noise, etc., make the identity of reproduction-pass instead greater challenging.

In this work, we describe a brand-new approach for dependable detection of duplicated and distorted areas in a virtual photograph. Our approach is primarily based totally on photograph key points and characteristic vectors which might be strong to regular photograph transforms. We formulate area duplication detection as locating converted equal areas in a photograph and use strong estimation to gain accurate key points matching and transforming among duplicated areas simultaneously. With the envisioned transforms, our approach in addition obtains the proper region and volume of the detected duplicated areas. Our approach is examined with a complete quantitative overall performance assessment on a database of routinely generated forgery pix with duplicated and distorted areas. We additionally document its robustness almost about unique JPEG characteristics and additive noise levels. We in addition show the effectiveness of our approach on numerous difficult forgery pix generated using ultra-modern photograph enhancing tools.

II. RELATED WORK

This phase provides the present-day CMFD strategies. Forgery detection strategies should be distinctly correct and reliable. Also, the algorithms should be double-quick, efficient, sturdy to numerous assaults like adding up noise, rotating and mounting, and should have low-slung computational density. These residences are usually taken into consideration at the same time as comparing the effectiveness of a CMFD procedure. The CMFD strategies are typically alienated into groups—block-primarily created CMFD strategies and key point– primarily created CMFD strategies. In the block-primarily based strategies, the photograph is split hooked on overlying or non- overlying square or round areas, observed with the aid of using extraction of positive functions for every area. Several preliminary processing techniques like photograph changes, shade area alteration and dimensionalities discount are utilized for characteristic abstraction. The literature assessment has additionally found out numerous mathematical transforms which might be used earlier than the distinctive abstraction step in the CMFD technique. Features just like the picture depth and

texture also are mined and secondhand to assemble the very last characteristic vector. The areas are then looked after the usage of the precise set of rules observed with the aid of using assessment to discover the resemblance of adjoining chunks. This identical stage is the maximum critical because it controls the occurrence of a replicated section.

However, the flexibilities furnished via way of means of this approach are restrained, and they cannot be prolonged for the detection of duplicated areas with standard distortions. As an opportunity to block-matching-primarily based detection techniques, numerous current techniques have explored the usage of matched picture key points to perceive duplicated areas. In, key factors and functions primarily based totally at the scale- invariant characteristic remodel (SIFT) set of rules are used to account for illumination modifications withinside the detection of copy-paste area duplication. However, the robustness of SIFT key points and functions to picture distortions isn't always completely exploited, which prevents this technique from being prolonged to discover affine converted duplicated areas. In our preceding paintings. We describe a SIFT-matching-primarily based detection approach which could find duplicated areas with rotation or scaling. Another current work makes use of SIFT key point matching to estimate the parameters of the affine remodel and get better matched key factors. But similar, it does now no longer offer the precise quantity and region of the detected duplicated area, however most effective presentations the matched key factors. Furthermore, those detection techniques are normally evaluated in opposition to easy forgeries in which human visitors don't have any hassle figuring out the duplicated areas, and their overall performance on challenging practical forgery pix is unknown.

III. METHODOLOGY

The primary goal for the CMFD is to differentiate between a unique and a fiddled image. For attaining this, the anticipated outline is split into fragments: the primary component plays minimum preliminary processing and on-the-fly actions, while the successive component is the changed CNN structure that excerpts the capabilities from those pre-administered photographs and plays a binary type of photographs as unique or altered.

The MICC-F2000 contains snap shots of length 2048 × 1536. Imageries of this length growth the estimated complication and the version take a stretch to congregate. Over diverse transforms, characteristic extraction and dimensionality discount strategies for CMFD, it's been proved that photograph length isn't always an element affecting high-satisfactory of calculations. The joint traits of a picture element organization are visible to have greater importance in comparison to individual pixel traits. Thus, the snap shots are decreased to a set length of seven hundred × seven hundred to make the calculation viable without distressing the photograph functions or traits. The resized pix are then standardized on the fly earlier than open- handed it as an enter to the anticipated Convolutional Neural Network primarily grounded totally planning.

The wished-for structure is a twin department Convolutional Neural Network primarily grounded totally structure, in which each the branches are linked to a not unusual place input. There are 3 convolution layers in every department with 16, 32, and 64 characteristic maps for the first, 2nd and 3rd layer, respectively. All the convolutional layers make use of Relu stimulation and every convolutional layer is accompanied through a two- by-two max-combining layer. To excerpt multi- scale capabilities from the imageries, Convolutional Neural Network layers in those branches have distinctive kernel sizes.

Since experiments had been carried out through various kernel sizes, subsequently in a few instances the addition of 1 zero-lining layer has been finished to make sure asymmetric yield. The output of the 3rd convolution coating from each branch is surpassed via a chain layer. This produces a heap of multi-rule characteristic plots mined from a not unusual place

enter. The concatenated result of this accretion is suckled to an international sail through-merging layer, which keeps the simplest most characteristic in line with the characteristic plot. This layer acts as a pulling-down sheet withinside the structure and converts 2D input to a 1D output.

This 128-period 1-D vector is handed into the additional final layer which is a impenetrable sheet with 32 units. This 32duration vector is fed to the ultimate thick layer with the simplest unit. Arched activation has been utilized in each of the thick sheet. The ultimate sheet generates the magnificence possibility 'p' that signifies the photo is reliable.

Henceforward, '1-p can be the possibility of the photo being fake. A choice portal of 0.5 is used to categorize unique and solid photos. An output possibility of more than 0.5 suggests a unique photo and in any other case a cast photo. In two- fold labels, '1' signifies a unique photo and '0' signifies a fake photo.

TABLE 1. Parametric values for proposed architecture

Kernel	**3×3 and 5×5**	**5×5 and 8×8**
Accuracy	0.96	0.96
Sensitivity	1	1
Specificity	0.93	0.93
Precision	0.89	0.89
Recall	1	1
F1 score	0.94	0.94
Mean ROC-AUC	0.94	0.95
Mean Precision-Recall-AUC	0.87	0.895

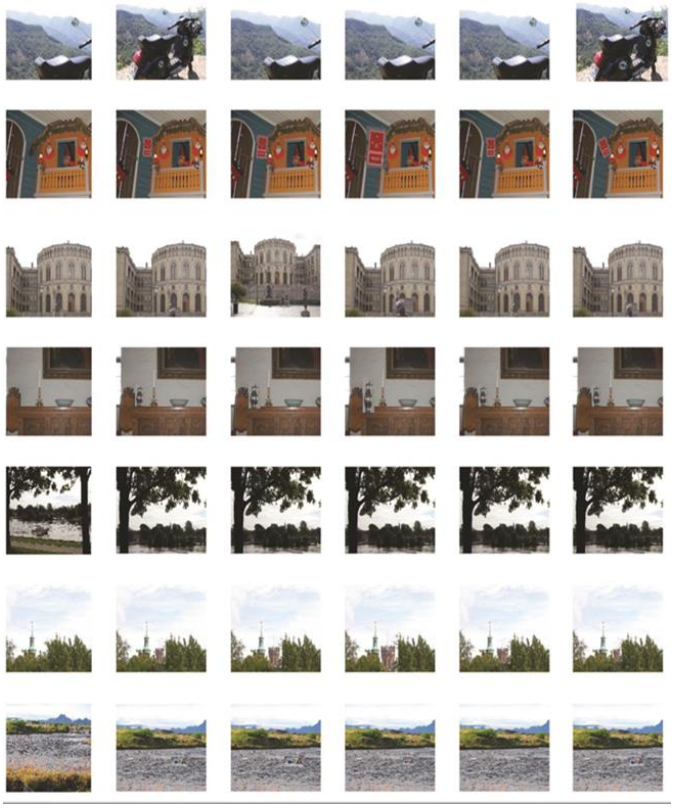

FIGURE 1 This picture depicts the novel image, Fake copy 1, Fake copy 2, Fake copy 3, Fake copy 4, and Fake copy 5.

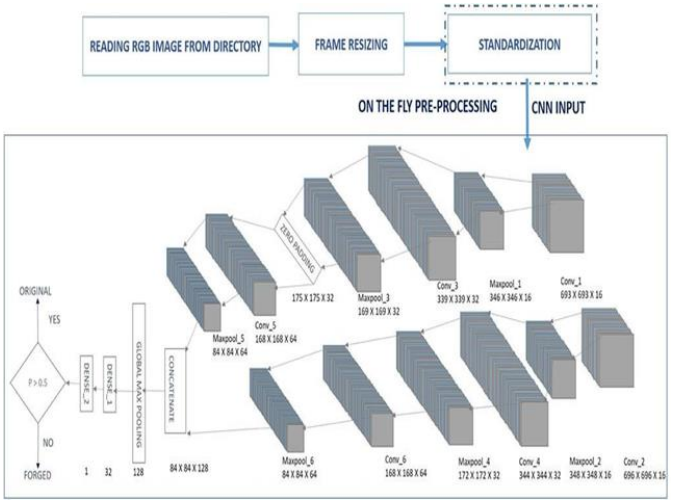

FIGURE 2 Block Diagram

IV. CONCLUSION

The present proposal gives a singular twin department CNN structure for the detection of replica pass forgery assaults in virtual photographs. The proposed structure has branches that implement distinct-sized cores for characteristic linage. With the well-hooked-up CNN structure as the backbone, the twin structure

makes sure linage of multi-scale structures, which can be then merged collectively to take the domainer characteristic for the binary type of photographs as solid or real. Extensive experimental and overall performance evaluation has been finished for the 2 distinct kernel length combinations. A thorough comparative evaluation with present-day work shows that the proposed structure is lightweight and might acquire top estimated accurateness. In the upcoming, the structure may be examined and evaluated on greater datasets with various photograph sizes, establishing distinct types of counterfeits to check the lustiness of the prototype.

DATA AVAILABILITY STATEMENT

Data is openly available in a public repository that does not issue DOIs. The data that support the findings of this study are openly available at http://lci.micc.unifi.it/labd/2015/01/copymove-forgery-detection-and-localization/.

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A Comparative Study of Blood Glucose Level Measurement Between Glucometer and Semi Autoanalyser

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ABSTRACT

Background; Glucometers are the excellent tools for self-monitoring of blood glucose (SMBG). Glucometer is widely used at hospitals and homes as a first line tool to get an idea about the current blood glucose levels. They are important especially in the circumstances where continuous monitoring is mandatory and at decision making levels. **Materials and Methods;** The Study was Conducted in Department of Biochemistry, Civil Hospital Tarn Taran. Proper informed consent was taken from all the participation, a total of 60 sample were taken. **Result;** We found that that at very high glucose readings (i.e. in group 3 patients having plasma glucose levels ≥ 251 mg/dl), glucometer overestimates glucose results. So, these values do not accurately reflect actual plasma glucose levels. **Conclusion;** Blood glucose testing with glucometer is a simple, rapid & cost effective method for glucose monitoring. On the other hand centralized laboratory glucose testing despite higher operational time and cost burden is still more reliable method for diagnosis and management of the patient. Finding in our study suggest that very high glucose values with glucometer do not accurately reflect actual plasma glucose levels; but it overestimates glucose results. So, the routine practice of performing only single testing with glucometers can lead to misdiagnosis. So, readings obtained using glucometers especially at the critical hyperglycemic levels, should be cautiously interpreted and verified with centralized laboratory. Medical professionals should depict diabetic patients the importance of periodic centralized laboratory glucose testing. A further detailed study for comparison of plasma glucose levels using glucometer and GOD-POD method in hypoglycemic patients with a larger sample size is needed.

Keywords: Diabetes, Glucometer, GOD-POD method

I. INTRODUCTION

Glucose is a simple sugar and approximately 4 grams of glucose is present in the blood of humans at all times. Glucose is stored in skeletal muscle and liver cells in the form of Glycogen. Glucose can be transported from the intestines or liver to other tissues in the body via the bloodstream. [1]

The normal fasting plasma glucose ≥6.1mmol/L (110mg/dl) and <7mmol/L (126mg/dl) per WHO 1999 criteria. ADA has choosen a lower cutoff at 5.6mmol/L or 100mg/dl. A persistently high level is referred to as hyperglycemia; low levels are referred to as hypoglycemia. [2] In humans, glucose is the primary source of energy, and is critical for normal function, in a number of tissues. [2] The mammalian brain depends on glucose as its main source of energy [3] , particularly the brain consumes approximately 60% of blood glucose in fasted, sedentary individuals. [1]

A glucose test is a type of blood test used to determine the amount of glucose in the blood. It is mainly used in screening for pre-diabetes or diabetes. [4] Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic disorders in which there are high blood sugar levels are a prolonged period. Diabetes can cause many complications. Acute complications can include diabetic ketoacidosis, hyperosmolar hyperglycemic state, or death.[5] Diabetes and glucose intolerance are diagnosed by measurement of

glucose in blood. Glucose is usually measured as venous plasma or capillary whole blood. [6] The post loaded glucose levels in capillary blood were significantly higher than those in venous blood. [7] The estimation of whole blood glucose levels are usually 10-15% lower than plasma glucose alone. The glucose concentration in the water that makes up plasma is equal to that of erythrocytes. Plasma has greater water content than erythrocytes and, therefore, exhibits higher glucose levels than whole blood. [8]

Use of venous derived blood glucose estimation using glucometers designed for capillary blood samples enables rapid treatment decisions during the treatment. The procedure has the advantages of: not requiring a capillary specimen, thereby minimising patient discomfort; decreasing the risks to staff from additional needlestick exposures; and reducing the risk of factitious hyperglycemia from finger pulp glucose contamination. [9] The aim of our study is to check the reliability of results obtained using glucometer in various ranges of glucose level in diabetics.

II. MATERIALS AND METHODS

The Study was Conducted in Department of Biochemistry, Civil Hospital Tarn Taran. Ethical clearance was taken from institutional ethical committee. Proper informed consent was taken from all the participation. These were divided into three groups based on their plasma glucose levels by GOD-POD method-.

Group 1: (n=20) 20 type 2 diabetes mellitus patients having plasma glucose levels ≤ 110 mg/dl by GOD-POD method.

Group 2: (n=20) 20 type 2 diabetes mellitus patients having plasma glucose levels between 111 mg/dl to 250 mg/dl by GOD-POD method.

Group 3: 20 type 2 diabetes mellitus patients having plasma glucose levels ≥ 251 mg/dl by GOD-POD method.

Inclusion criteria; Diagnosed type 2 diabetes mellitus patients of age group 30 to 65 and of either sex.

Exclusion criteria; Children, Pregnant female, Chronic ill patients, Increased TG patients, Incresed Uric acid patients.

SAMPLE TECHNIQUE/METHOD

Sample of the patients for the investigation of capillary blood glucose and venous blood glucose will be taken after obtaining informed consent. Capillary blood glucose sample will be taken by finger-prick method and reading taken by glucometer. 3 ml of the venous blood sample will be drawn from each subject under aseptic condition. The blood sample will be taken in Sodium fluoride vacutainer for chemical investigation. After 10-15 minutes, sample will be centrifuged at 3000 rpm for 10 minutes to separate plasma. The plasma will be analysed for the biochemical investigation. The data obtained was analysed statistically by computing descriptive statistics, the mean, standard deviation and correlation coefficient. The difference between each method was also calculated.

Principle of Glucometer[10,11] – Glucose meter systems are biosensors that operate on the following general scheme:

Glucose Selective membrane Enzyme layer Transducer Amplified, translated screen printing.

Glucose is oxidized to gluconic acid and hydrogen peroxide in the presence of glucose oxidase. Hyrogen peroxide further reacts with phenol and 4-aminoantipyrine by the catalytic action of peroxidase to form a red coloured quinoneimine dye complex. Intensity of the colour formed is directly proportional to the amount of glucose present in the sample.

Principle of GOD-POD method (Semi-automatic analyzer)[12]: Glucose oxidase enzyme (GOD) oxidizes the specific substrate beta-D-glucose to gluconic acid and hydrogen peroxide is liberated. Peroxidase enzyme acts on hydrogen peroxide to liberate nascent oxygen (O). Nascent oxygen then couples with 4-aminoantipyrine and phenol to form red quinoneimine dye. The intensity of colour is directly proportional to concentration of glucose in plasma. The intensity of colour is measured colorimetrically at 530 nm and compared with that of a standard treated similarly.

The present study was Conducted in Department of Biochemistry, Civil Hospital Tarn Taran with an objective to study the of a comparative study of blood glucose level measurement between glucometer and semi autoanalyzer for this purpose, a total of 60 sample were taken.

The mean plasma glucose levels in group 1 patients by glucometer and by GOD-POD method was found to be 125.80±27.75 and 103.45±23.51 respectively. Similarly in group 2 patients by glucometer and by GOD-POD method was found to be 214.15±34.82 and 185.75±25.95 respectively. In group 3 patients by glucometer and by GOD-POD method was found to be 349.65±47.98 and 287.60±32.30 respectively. p value was found to be 0.001 in all three groups which was statistically significant $p<0.05$

The correlation between plasma glucose values estimated using GOD-POD method and glucometer was found to be 0.93, 0.94 and 0.63 for Group 1, Group 2 and Group 3 respectively.

Table 1: Comparison between glucose values estimated using Glucometer and Semi Autoanalyser(GOD-POD) method in diabetic patients

	GLUCOMETER	SEMI AUTOANALYSER (GOD – POD)
Group 1	125.80±27.75	103.45±23.51
Group 2	214.15±34.82	185.75±25.95
Group 3	349.65±47.98	287.60±32.30

Table 2: Correlation between glucose values estimated using glucometer and Semi Autoanalyser (GOD-POD) method in diabetic patients

correlation 'r'	p-value
0.93	0.001, S, $p<0.05$
0.94	0.001,S,$p<0.05$
0.63	0.001, S, $p<0.05$

S-Significance, $p<0.05$

III. RESULTS AND OBSERVATIONS

IV. DISCUSSION

Self-monitoring of blood glucose using reagent impregnated strips is a simple and integral component of Diabetes care and management. The precision and accuracy of glucometers have improved over the years. These glucometer helps the patient to check his or her glucose level at home thus avoiding the need to go to a hospital or a diagnostic lab. In addition, these glucometers also help the physician to determine the glucose level in his or her clinic and provide good quality treatment to the patient.

Operational Factors: Approximately 91–97% of overall inaccuracies are due to operational factors. (23,24) The most common reasons are applying insufficient blood sample to the strip, expired strips, strips exposed to excess moisture or humidity, improper code, dirty meters, improper cleaning of the testing site and hemolysed sample. The limitations of this study are that these glucometers potential interferences were not studied. The study sample was also small and hypoglycemic patients (patients with low blood glucose levels) were not involved in the study. Substantial difference in performance of glucometers can affect the patient care significantly. In patients of severe hyperglycemia, a falsely elevated glucose reading by glucometer will risk the patient's life because of being overdosed with insulin, which can lead to hypoglycemia. They should advice their patients that whenever glucose readings are near the hyperglycemic thresholds by glucometer; verify the results with centralized laboratory, which has the added advantage of quality control as well. The technique of the user or operator of the glucometer is usually responsible for more inaccuracy than the technical specifications of glucometer itself. So, it is very important that medical personnel & patients utilizing the glucometers should be adequately trained in their usage and maintenance. Physicians, POC workers and clinical Biochemists should evaluate the performance of glucometer periodically.[13,] This will help to minimize the differences between glucometer and clinical laboratory.

V. CONCLUSION

Blood glucose testing with glucometer is a simple, rapid & cost effective method for glucose monitoring. On the other hand centralized laboratory glucose testing despite higher operational time and cost burden is still more reliable method for diagnosis and management of the patient. Finding in our study suggest that very high glucose values with glucometer do not accurately reflect actual plasma glucose levels; but it overestimates glucose results. So, the routine practice of performing only single testing with glucometers can lead to misdiagnosis. So, readings obtained using glucometers especially at the critical hyperglycemic levels, should be cautiously interpreted and verified with centralized laboratory. Medical professionals should depict diabetic patients the importance of periodic centralized laboratory glucose testing. A further detailed study for comparison of plasma glucose levels using glucometer and GOD-POD method in hypoglycemic patients with a larger sample size is needed.

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Piplantri an Ecofeminism Success Story

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ABSTRACT

To research how a small dessert village Piplantri transformed into an oasis. The paper covers the environmental, economic, political, social, and cultural aspects that contributed to the transformation. It demonstrates how the optimum use of government funds and knowledge of medicinal plants and the ecology of the village helped people undertake the transformation. The paper also includes the impact of the work both internationally and nationally and how the model is being duplicated in other such areas. Along with the ecosystem, the project has also transformed the mindsets of people in rural Rajasthan about many social evils specifically female foeticide and infanticide.

Keywords: Earth and environmental sciences; Environmental Effects on Ecosystems; Ecofeminism; Green economy; Piplantri

I. INTRODUCTION

Piplantri is a village located in the Rajsamand district in Rajasthan State, India. The village was plagued by marble mining in the surrounding area, the forest was cleared for the same which led to the reduction in the water table making the village land dry and the village people parched. But this story turned into an inspirational story about eco-feminism because of the actions of the village sarpanch Shyam Sundar Paliwal and the villagers. The villagers started planting trees on the occasion of the birth of a girl child, making the region greener and also celebrating the birth of a girl, something seen as a burden in India, especially in rural Rajasthan. The movement also provided livelihood to the villagers, improving the economy of the village. The government named this idea, the Piplantri model and this model has now been adopted both nationally and internationally. (Dore 2021)

II. Methods

Interview with Shyam Sundar Paliwal (ex-sarpanch of Piplantri) and various articles on previous research conducted on Piplantri.

How was the village transformed?

Rajsamand district is one of Asia's largest marble markets and mining is widespread in the district. Piplantri, a small village in the district, was hard hit by the effects of marble mining. There was large-scale cutting down of trees, illegal dumping of waste, reduction in the water table, and scorching of the land; which led to water scarcity and food insecurity. A life claimed by dehydration following the water

scarcity in the village was Kiran's (Sarpanch Shyam Sundar Paliwal's daughter). To mourn his daughter, Shyam Sundar planted a plant in her memory, but he didn't stop there. He made it his mission to make his village cleaner and greener. He started a campaign to plant 111 trees at the birth of a girl child in the village, a way to celebrate the birth of a girl as well as regenerate the village environment. Along with the plantation, he launched a program called the "Kiran Nidhi Yojna" under which the panchayat opens a bank account in the name of the girl child and an initial sum of Rs2100 is deposited. The entire village collectively provides Rs21,000 for the girl, Rs10,000 is taken from the family and the total sum of Rs31,000 is put in a fixed deposit which can be broken when the girl turns 20. The parents have to sign an affidavit affirming that they will not practice female foeticide or marry their daughter before the legal age and will educate her. This empowers the girls and makes them independent. (Kumar, Tendulkar, and Khemariya 2021)

An annual tree planting celebration takes place in August where all girls born in the preceding 12 months are honored. On the occasion of Raksha Bandhan (Hindu festival), all the girls in the village tie a rakhi (holy band) to the trees and in exchange ask the trees to protect the environment by bringing rain and protecting the soil from erosion. 11 trees are also planted when someone in the village dies. Shyam Sundar educated people about the economical advantages of plants, plants like Sheesham (Indian rosewood), neem, mango, banyan, peepal (sacred fig), amla (gooseberry), and bamboo are now planted. A plant for processing gooseberry and aloe vera has also been set up in the village. Gooseberry is used for juice, which is very popular locally, aloe vera is used both for juice and gel, and bamboo is used for furniture. Aloe vera plants were initially planted by the villagers to keep termites away from fruit-bearing trees, more than 2.5 million aloe vera plants were planted for this purpose. Villagers were unaware of the market aloe vera had, but when they realized this, they started processing and marketing it in a variety of ways. Many products started being made in the village itself, as mentioned above. Many steps have also been taken to conserve water, they include: trapping water runoff, and building ditches, bunds, and dams. (Rawal 2022)

Through these undying efforts of the villagers, Piplantri transformed from a barren wasteland to the most inspirational story in ecofeminism. The village today has more than 40 lakh plants and the water table has increased by 800-900 feet. The atmosphere has cooled down by 3–4 degrees Celcius. Owing to these improvements, the fauna in the village has also diversified with an increased number of birds visiting the village. The farmers have started to keep cows belonging to the 'gir' (or gyr) breed, buffalos of the 'Murrah' breed, and goats belonging to the 'jamunapari' breed - breeds that require more water and better quality feed. Earlier the farmers were deprived of the opportunity to keep these animals because of the dilapidated state of their village but now with the improvement in the environment, it has become a possibility. These breeds are more profitable and hence have led to the economic development of the village as a whole. The cultivation of several new crops has also started: sandalwood, mango, apple, fig, gooseberry, etc. The environmental improvement has led to economic stability in the village, with individuals benefiting from the developments. There are no mud houses in the village, all the villagers have shifted to solid and permanent dwellings. More and more people can now afford two-wheelers and use them to travel to work or to study. The village has become famous all over the world because of its success story in tackling degradation and converting a polluted desert into a haven. Over 100 tourists visit the village every day, to witness the miracle. "Tourists from countries like Denmark, Canada, and Namibia visited our village and appreciated the work we were doing," said Shyam Sundar Paliwal. It is interesting to note all these transformations have taken place owing

to government schemes and resources, this shows us the extent to which our country can achieve if only the opportunities are used effectively. Hearing about the success of the village, several individual Samaritans have also come forward.

Along with the environmental improvement, the project has also helped improve the situation of girls in the village. The village now has 52% girls, a majority, a rarity in rural Rajasthan. The village has also achieved the goal of 100% women's education, with all the girls in the village enrolled in school. Girls have also started to pursue higher education, Padmshri Shyam Sundar Paliwal said "They have their scooters now, they board them and head to college or for work". Sins like female foeticide and female infanticide have also been completely uprooted. No child in the village is malnourished. Several self-help groups have been created in the village for the processing of plant products like aloe vera. These groups create key employment opportunities for the villagers, especially women. (Paliwal, n.d.)

III. Piplantri model

The Piplantri model has 4 components: daughter, tree, water, and grazing land. Piplantri has been successful in achieving its goal of rejuvenating the village environment and fighting for gender equality while improving the economic and financial condition of the village. Inspired by the success story of Piplantri, other villages in India have started to follow its model of rejuvenation. The government has come forward to ensure this implementation. 46 other villages have been chosen as sites where the Piplantri model will be adopted said Archana Singh the district collector. Work to construct check dams and trenches has already started in some of these sites like the neighboring village of Tasaul. Groups of Block Development Officers (BDOs) also frequently visit the village to learn from the people and take inspiration from the work done so they can implement the same in other villages of the district. The model has not only gained national repute but has become internationally famous with the book '111 trees' by Rina Singh which has also been published in Canada and Japan told Mr. Paliwal. All the development work is done through government schemes. The Mahatma Gandhi National Rural Employment Guarantee scheme has been instrumental in the success story of Piplantri which guarantees 100 days of work. Under the scheme, villagers are hired to construct dams, trenches, water tanks, etc. This way the village gets transformed and so are employment opportunities for villagers created. The creation of such alternate employment opportunities diverts people away from their jobs as daily wage workers in the nearby mines, which used to be the primary source of employment for a majority of the villagers, and enables them to pursue profitable and stable careers. This has also reduced the mining operations resulting in an improved environment in and around the village. Integrated Watershed Management Programme is another scheme that has helped the process. A play pump- a water pump attached to a merry-go-round, was also constructed where fresh water was pumped and circulated every time the kids used the swing. This idea was primarily beneficial in inculcating the habit of conservation in kids at an early age.

The government hopes to use these programs and models to make every village in the state like Piplantri. ("Piplantri Model", n.d.)

IV. Conclusion

Piplantri receives the same amount of funds as all the other villages of the district yet Piplantri transformed from a mining devastated town to a desert oasis and the others remained in their destitute state. This is because the people used the funds effectively and for the collective good, keeping personal interests aside. The story of Piplantri also teaches us that environment conservation and economic growth can go hand in hand as when the people of Piplantri started planting more trees and conserving water the

economy of the village improved as did the people's personal wealth. The story of Piplantri also shows us the power of women, and how when given the same opportunities and respect as men, they can bring a positive change in society. As a girl belonging to Rajasthan with a will to conserve the environment, I can personally relate to and understand how big of a victory Piplantri's story is.

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Design and Synthesis of Multi-Operand Parallel Prefix Adder for Pseudorandom Bit Generator Applications

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ABSTRACT

Numerous cryptographies as well as pseudorandom bit generator (PRBG) algorithms are employing the 3-operand binary adder as the basic functional block to accomplish modular arithmetic. It is also used in a variety of other purposes. To realize the three-operand binary addition, the current technique includes a high-speed as well as area-efficient adder design related to pre-bit - wise addition with carry prefix processing mechanism. In relation to previous suggested approach such as the 3 operands carry save adder and the 2 operands oriented three operand HCA. Rather than the Han-Carlson adder, we were employing the Ladner Fischer adder. Because this takes up less space and has a shorter latency. The synthesis and simulation are verified by employing Xilinx ISE 14.7 Tool.

Keywords: Binary Adder, Parallel prefix adders, Pseudorandom bit generators, Cryptography.

I. INTRODUCTION

Implementing cryptographic techniques on hardware is required to provide optimal system performance by ensuring physical security. Multiple cryptographic techniques employ modular arithmetic for arithmetic operations which including modular exponentiation, modular multiplying, as well as modular adding. The effectiveness of the cryptography system will be directly affected by the congruential modular arithmetic process.

If the bit is beyond 32 bits, then it is polynomial-time unexpected but safe. Like a result, as any operand value increases in size, its MDCLCG's protection increases. Because its hardware architecture comprises of 4 three-operand modulo-2n adders, 2 comparators, with 4 mux in research previously, the area as well as critical path time effect increases. As a result, by effectively implementing the three-operand adder, the MDCLCG's efficiency can be enhanced.

Two operand Adders

Two operand adders are adders that execute adding among two operands or else two n-bit values provided as input source. To conduct such actions, adders including such ripple carry full adder, parallel prefix

adder circuit, carry skip full adder, and etc are often used.

Ripple Carry Adder

The RCA is the primary 'n' bit FA design. It allows for the addition of two operands. The RCA is reported to be made up with cascading of Full Adders.

An outcome under each step is acquired in a ripple-like pattern, with carry transmitting towards each level. Because the RCA is done purely with FAs, the area overhead is minimal. However, the greatest disadvantage is the time it takes to provide the results. Thus, every phase is reliant mostly on preceding one's carry.

Parallel Prefix Adders

Employing parallel prefix full adder, the basic objective is to calculate a tiny number of intermediary prefixes, whereupon locate next huge mass prefixes, and so forth, till every carry values were determined. So addition to creating the ultimate sum function, parallel prefix full - adder can be divided into three phases: 1. Initial-processing. 2. Carry signal creation 3. Ultimate Executing

Three operand Adder:

Trio operand full adder were adders that execute adding among 3 variable or else three input n-bit values. This CSA is a 3-operand adder that works with n-bit values.

Carry save Adder:

The carry save full adder is an electronics full adder which can rapidly combine 3 or even more digital sets of data. It varies from some of the other electronic full adder because it also produces two (or more) digits, which can be added together will produce the result to the initial total. Because a binary multiplier includes the adding of more than two binary integers following multiplication, a carry saving adder is commonly employed in binary multipliers.

Two steps are involved in the Carry save addition. The collection of full adders is the very first step, and these adders have no connectivity. So, every full adder calculates and saves carry as well as sum bits over the next phase. To obtain the overall summation output, the step 2 uses a ripple carry adder.

Two different two-operand full adder or perhaps 3 operand full adder that are employed to execute the 3-operand binary addition. The carry-save 3-operand adder is a space-efficient as well as commonly employed approach for performing three-operand binary combination employing modular arithmetic, which is utilized within cryptography techniques to ensure security.

The remaining portion of this work is laid out as follows: The three-operand adder using Han Carlson adder architecture is introduced in Section II. The suggested 3-operand adder architecture using Ladner Fischer adder is thoroughly described in Section III. Section IV contains the experimental outcomes. Section V deals with conclusion.

II. EARLIER WORK

The most common adder technology is a parallel prefix adder. The prefix adder, on either side, uses four-stage procedures rather than three to assess the sum of three binary values operands, comprising bit-adding logic, base logic, PG logic, finally summing logic. All four steps have the following logical expression:

Phase-1: Bit Addition Logic:

$$S'_i = a_i \oplus b_i \oplus c_i$$

$$cy_i = a_i . b_i + b_i . c_i + c_i . a_i$$

Phase-2: Base Logic

$$G_{i:j} = G_i = S'_i \, cy_{i-1}, \qquad G_{0:0} = G_0 = S'_0 \, C_{in}$$

$$P_{i:j} = P_i = S'_i \oplus cy_{i-1}, \qquad P_{0:0} = P_0 = S'_0 \oplus C_{in}$$

Phase-3: PG (Propagate & Generate)Logic

$$G_{i:j} = G_{i:k} + P_{i:k} . G_{k-1:j}$$

$$P_{i:j} = P_{i:k} . P_{k-1:j}$$

Phase-4: Sum Logic

$$S_i = (P_i \oplus G_{i-1:0}), \quad S_0 = P_0, \quad C_{out} = G_{n:0}$$

The 3-operand binary adder's conventional VLSI layout as well as internal workings are represented in the diagram following.

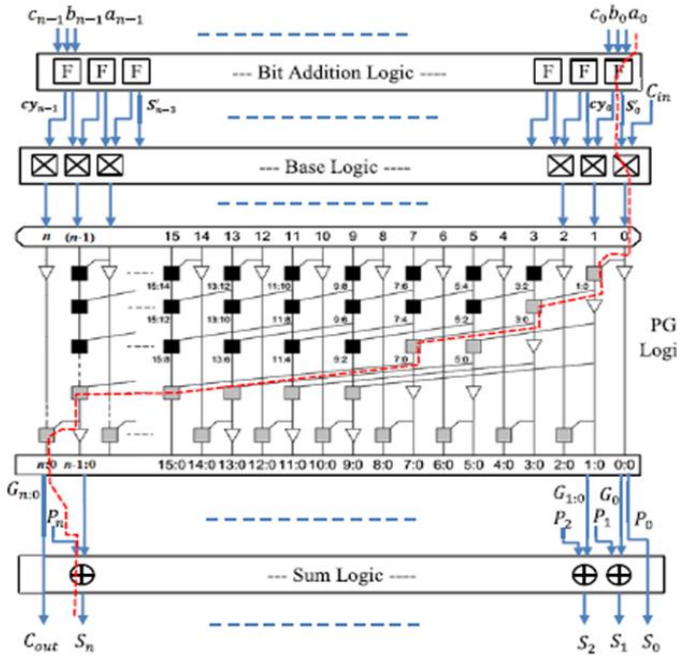

Fig1: Existing three operand adder

During first step, the typical full adder's desired output sum (Si) bit and also the right-adjacent full adder's output carry bit were combined to calculate the generate Gi as well as propagate (Pi) signs (base logic). The squared saltire-cell, as can be seen in Figure.2, is used to reflect the calculating of Gi as well as Pi values, and the base logic phase contains n+1 saltire-cells.

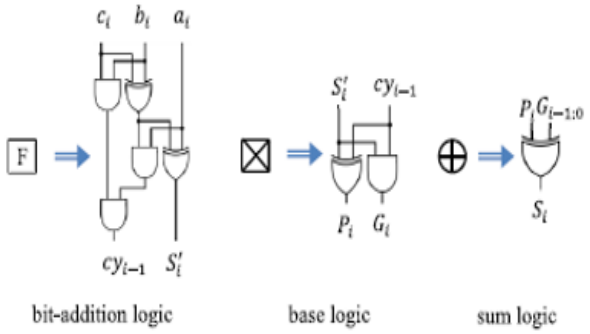

Fig2. Logical diagram of bit addition, base logic, sum logic

The carry estimation level, also known as generate as well as propagate logic (PG), the carry bit is pre-computed using a combination of black & grey cell logics. Figure 3 depicts a black & grey cell's logical structure which evaluates the carry create Gi: j as well as propagate Pi: j

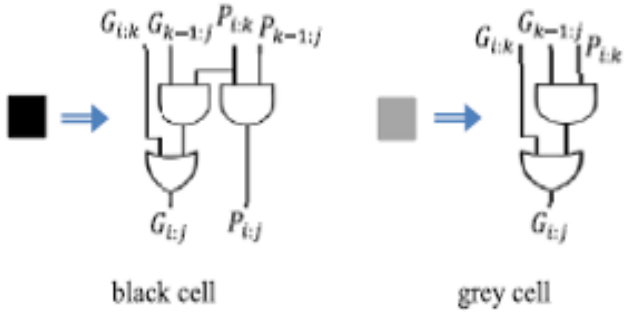

Fig3. Logic diagram black-cell and grey-cell.

This carry propagate sequence has a considerable impact on the present adder's critical path duration because the recommended adder has (log2 n+1) prefix calculation steps. In the last phase, which is symbolized as summing logic. The carryout response (Cout) can be stated that an individual as from carry generate value.Gn:0.

Han-Carlson adder

Among Brent-Kung and Kogge-Stone trees, Han Carlson trees belong to a family of tree structures. This tree uses Kogge-Stone upon that odd-numbered bits before employing another phase to ripple seen between even places. There are three main processes in total: pre-processing, carry generation, and the last one is post-processing. The propagating as well as generate data are found during the pre-processing phase, as well as the summation parameters are estimated during the post-processing phase, as illustrated in the diagram. For each parallel prefix adder, the carry generation is different. Here is a diagram of the Han-Carlson adder carry generation.

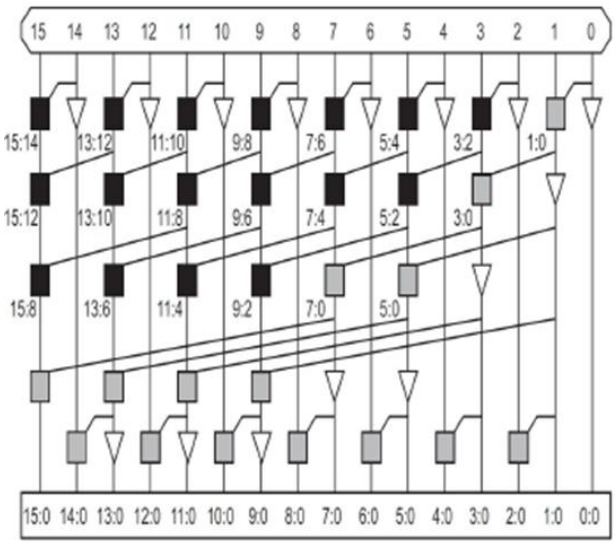

Fig4. The carry generation structure of Han-Carlson adders

Leveraging dual operand adders, a 3-operand adder could be created. Dual operand parallel prefix full adder are still used to speed up the process of the operation. Whenever the bit size grows, the Han-Carlson parallel prefix adder is the quickest of all. 2 HCA adders are required to complete the 3-operand adding.

In relative terms to the 3-operand CSA, the HC3A significantly reduces critical route latency. In addition, as the bit size of the adder grows, so does the area of the adder. As a conclusion, in created models, a modern high-speed as well as area-efficient 3-operand adder technique is combined with an advantageous VLSI architecture to lessen the area-delay trade-off.

III. PROPOSED WORK

This section employs the Ladner Fischer Adder to construct a new three-operand binary adder construction. In HCA the need of black cells and grey cells is more. Therefore, the area complexity is high in Han Carlson Adder. In order to overcome that, here proposing Ladner Fischer Adder.

FPGAs have become extremely popular in present generation due to their ability to enhance the speed of microprocessor related applications such as mobile communication, DSP, as well as telecommunication. The creation of gadgets is derived from research on binary operations as well as motivation.

The proposed solution uses the parallel prefix Ladner Fischer adder, as well as its VLSI structure, to perform three operands adding in modular arithmetic. Parallel prefix adders are the most prevalent adder technology. The prefix adder, on either side, uses four-stage procedures rather than three to assess the sum of three binary values operands, comprising bit-adding logic, base logic, PG logic, finally summing logic.

Ladner Fischer adder:

The prefix tree of the Ladner Fischer adder is basic. The Sklansky is a superstructure that divides as well as overcomes. By combining two smaller full adders on every stage, this Arrangement iteratively evaluates prefixes for 2-bit segments, 4-bit communities, 8-bit communities, 16-bit communities, and etc.

Carry generation phase Ladner Fischer adder: It calculates intermediary prefix bits together with large community prefixes to offer the latency of log2n phases employing the split as well as overcome method. The benefit of this adder is that its construction is simple as well as consistent, but it still has a fan-out issue because fan-outs double at every level.

Maximum fan-out: (n/2) +1.

The propagate as well as generate data are found during the pre-processing phase, and also the aggregate parameters are estimated during the post-processing phase, as illustrated in the diagram. To every parallel prefix adder, the carry generation is different. Here is a diagram of the Ladner Fischer adder carry production.

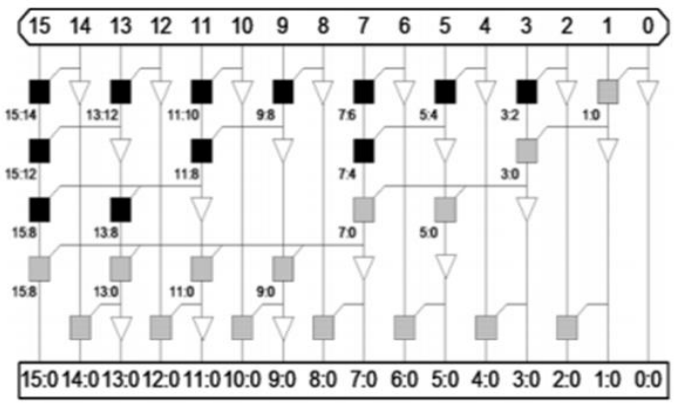

Fig4: Ladner Fischer Carry Diagram

Leveraging 2 operand full adder, a 3-operand adder can be created. Dual operand parallel prefix full adder are often used to increase the frequency of the operations. Whenever the bit size grows, the Ladner Fischer is the quickest across all types of parallel prefix adders. Employing 2 Ladner Fischer adders, a 3-operand accumulation can be done.

IV. EXPERIMENTAL RESULTS

In this paper, the proposed Ladner Fischer Adder architectures all are implemented using Verilog HDL with Xilinx ISE 14.7 tool.

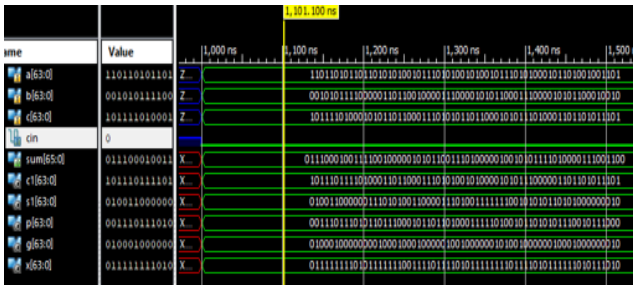

Fig7: Simulation results of proposed Ladner Fischer-based three operand adder

Figure 7 shows the simulation results for the three-operand adder using Ladner Fischer Carry production.

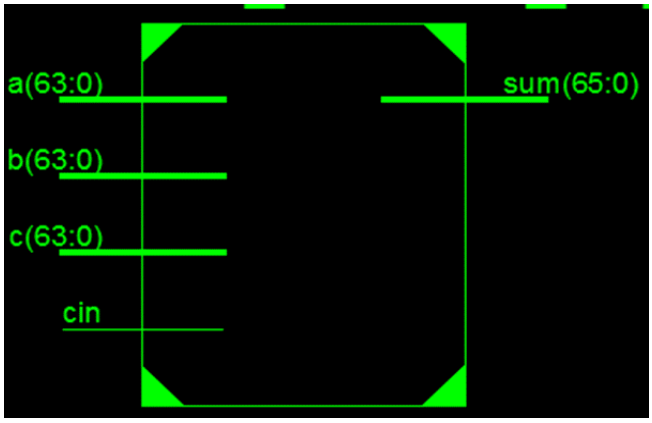

Fig 8: Block diagram of proposed 3-operand adder

Figure 8 shows the block diagram of three-operand adder using Ladner Fischer carry production architecture.

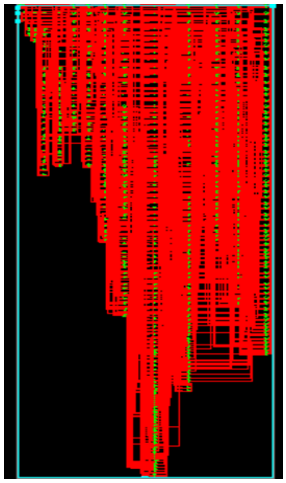

Fig 9: Technology schematic of proposed 3-operand adder

Figure 9 shows the technology schematic of three-operand adder using Ladner Fischer carry production architecture

Comparison between existing method and proposed method

	Area	Delay
Existing(Han-Carlson)	368	7.531ns
Proposed(Ladner-Fischer)	246	20.068ns

Table 1: comparison between Existing and Proposed methods.

Table 1 describes the comparison of performance parameters such as Delay and Area between Existing and Proposed for three operand adder designs. From these results, we conclude that the area is reduced in proposed method by using Ladner Fischer carry production.

V. CONCLUSION

The 3-operand binary summation is carried out in different cryptographic techniques. The suggested architecture is unique as it also reduces size in the prefix calculation phases of PG logic as well as bit-addition processing, leading to decrease in critical path latency altogether. When compared to certain other parallel prefix 3 operand full adder throughout the previous approaches, such as the Han-Carlson Adder, also it reduces the area overhead. Utilizing Xilinx ISE

software, the synthesis as well as simulation are confirmed.

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Design, Analysis and Implementation of Fuzzy Logic Controller based Grid/PV-BESS/Diesel Generator-integrated EV Charging Station

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ABSTRACT

This research works mainly aims to provide the continuous power supply in the Electric Vehicle (EV) CS (charging station). For this a solar PV-Battery and Diesel Generator set is employed. Whenever the power supply is unavailable from solar and battery the DG set or 3-phase grid will provides the continuous power supply in the charging station to charge an Electric Vehicle. Mainly 3-modes are considered over here namely grid connected mode, islanded mode or DG set mode. To achieve the maximum fuel efficiency from the DG set and its operation capacity is equal to 85% app. The voltage and frequency will be regulated by the CS (Charging Station) in coordination with the storage system. A voltage source converter is used to renovate the DC power to AC power. In this PI controller is employed to control the reference current by giving voltage and reference voltage as inputs. But by implementing the PI Controller will have less speed response of the system and less power quality also. In order to overcome these issues in this work PI controller is replaced with Fuzzy Logic Controller (FLC) to regulate the current in grid and DG set connected mode. MATLAB/SIMULINK 2018a Software is used to validate the performance of the flc based system.

Keywords: Battery, Solar PV array, Diesel Generator set, Voltage Source converter, FLC, Step up Converter, Electric Vehicle Charging Station.

I. INTRODUCTION

A global challenge is lowering CO_2 emissions to stop global warming. By 2040, electricity will make up almost a quarter of global energy consumption [1], therefore the power industry must lead the way in developing a decarbonized energy system. Electric versatility makes a huge commitment to expanding the manageability and effectiveness of the transportation business, including the utilization of electric vehicles (EVs), hybrid EVs, power device vehicles, and electric bikes [2]. To eliminate power quality issues, optimize EV interaction with other electrical appliances, and benefit from their use in the innovative approaches of microgrids, smart grids, and smart homes, the massive introduction of EVs into the electrical grid should be

monitored [3]-[4]. Electric vehicles (EVs) are evolving as an ecofriendly solution to the issue of rising carbon emissions in terms of load. While using EVs to address environmental issues has advantages, they also have a number of disadvantages for electrical power systems. EVs are regarded as a load on the distribution grid. Nonetheless, the simultaneous charging and discharging of a large number of EVs may endanger the grid's overall stability and power quality. Due to the increment in the power losses the behaviour of the EVs will also changes their behaviour in the DS (Distribution System), which cause prices to rise and reserve margins to decline. As proposed in [5]-[6], without considering any preventive measures, the increase in the harmonic content, no balance between demand and supply, and occurring the disorders in controlling the voltage are happened due to the disorganized behaviour of the EVs. The article's authors proposed using an aggregator-run EV charging system. Aggregators should manage EV charging to increase revenue while decreasing grid impact. In these cases, renewable energy sources (RESs) such as solar and wind energy production are effectively used for EV charging, lowering costs while reducing the grid's negative effects. However, in the case of a V2H system, discharge management has also been considered in terms of managing the energy at home, as per human activity and electricity costs [7]-[8]. [9] Outlines a grid-associated SPV structure with two power-handling stages that boost power from the SPV exhibit while supplying steady power to the network. The framework that balances power with meticulously planned control has the advantage over the two-stage geographies currently in use. As a result, the PV inverter has the ability to act as a VSC and delivers steady power to the lattice. This has an impact by reducing the PV vacillations that affect matrix power and increase effectiveness. New net metering features shorten the amount of time required for restitution, elevating this location above others. Aside from that, the system's reliability is enhanced, particularly for critical loads, by the accessibility of power during peak load demand periods and the lack of solar energy [10]. For the advancement of EVs, CS are a fundamental auxiliary organization. The charging load is an illustration of an indirect liability. The continued construction of the charging station will introduce significant consonant contamination, which will alter the nature of the force and the ability of the power system to function consistently [11]. While the number of charging stations is currently on the rise, there aren't many centers that focus on the analysis and management of sounds [12] MG is defined as a collection of stresses and dispersed ages to meet a substantial burden inclusion at the lowest conceivable activity cost in both structure associated and independent modes (DGs). A type of force circulation system known as an independent MG can make use of a variety of DG, particularly renewable energy sources (RESs), and is inaccessible to the utility network [13]. When the power supply from the grid is absent the DG cannot supply the required amount of power to the loads. So, in order to overcome this issues the microgrids [14] are employed which consists of the energy storage systems. This will acts according to the demand for power supply and generated power. For improving the power quality in the system many controllers like PI, SMC and FLC based topologies are employed in the VSCs. But as proposed in [15], the FLC has evaluated the best results than the other controllers. The THDs are in reduced count. The design and implementation is shown in this paper. This paper is formulated as follows: Introduction and Literature review is explained in the section-I, description of the system is depicted in section-II, strategies involved in the controlling topology is explicated in Section-III, the implementation of proposed FLC topology is described in section-IV, the description of simulation based results obtained is depicted in section-V. The conclusion of this work is explained in section-VI.

II. DESCRIPTION OF THE SYSTEM

In order to provide power supply to the Electric Vehicle Charging Station a solar PV, DG Set and a 3-phase grid, battery is employed in the system as shown in the below figure-1. The step up is connected to the solar PV to increase the magnitudes of PV Voltage. A battery is integrated across the solar PV. The obtained DC power from Dc sources is given to the DC-AC converter through a DC link. The VSC is fed to the grid and SEIG, an Electric Vehicle unit and a load that is non-linear through a coupling inductor. For reducing the harmonic contents that are obtained in the grid currents and generator a ripple filter is implemented at the PCC. The excited capacitor will consists of coupling of SEIG with the auxiliary winding.

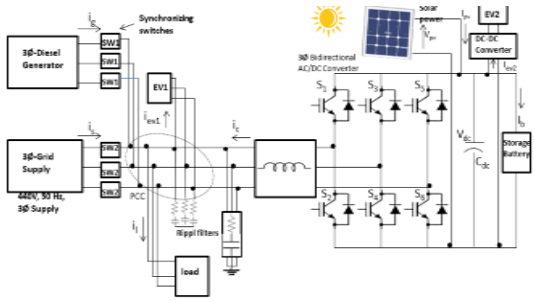

Figure 1: Proposed System

For disconnecting or connecting the charging station a switch (synchronizing switch) is employed. The SEIG primary winding can be crossed by a tiny capacitor.

III. STRATEGIES OF THE CONTROLLING TOPOLOGY

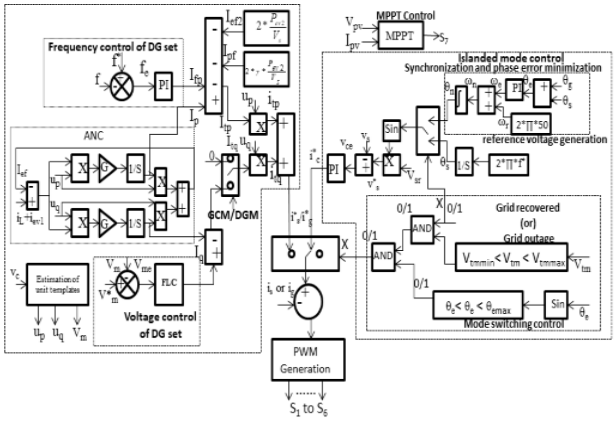

Figure 2: Proposed controlling topology for VSC (Grid connected and standalone mode)

A. VSC Controlling topology in Islanded mode:

In this controlling topology the power supply from grid is absent but the charging station need the continuous power supply at the same time the solar and EV should not affected. So, by this time the power supply can be considered from the solar, as well as battery will gets charged. In the voltage mechanism of DG set the voltage and reference voltage is given as input to the FLC to generate the reference currents. The equation for minimization of error and reference currents production is given as follows:

$$i_c^*(s) = i_c^*(s-1) + z_{pv}\{v_{ce}(s) - v_{ce}(s-1)\} + z_{iv}v_{ce}(s) \quad (1)$$

The comparison of reference currents and measured currents and passing them through the controller known as hysteresis controller will generate the required pulses to the VSC.

B. Controlling topology of VSC in Grid Connected mode or DG Set:

The determination of finding how much of electricity is transferring to the grid is the main aim of implementing this controller. For achieving the maximum fuel efficiency the DG will be operated in constant power mode. The active current of EV will leads to finding of the reference current in the grid connected mode. An ANC (adaptive notch filter) is used for extracting the fundamental frequency of the electric vehicle. In grid connected mode the calculation of reactive and active currents can be depicted as follows.

$$I_{sp} = I_p - I_{ef2} - I_{pf} \quad (2)$$

$$I_{sq} = 0$$

In the mode of grid connection the unity power factor should be equal to one. In this case the active power should need to consider whereas the reactive power should be kept to zero. This related equations are depicted below:

$$I_{sp} = I_p - I_{ef2} - I_{fp} - I_{pf} \quad (3)$$

$$I_{sq} = I_{vq} - I_q$$

From the above equation the EV's active and reactive currents are denoted by Ip and Iq, the pv array and ev feedforward terms can be denoted by Ipf and Ief2. In DG set connected mode the voltage and frequency terms can be denoted by Ivq and Ifq. The excess charging of the battery can be controlled by the PVs feed forward term in the grid connected mode is denoted by Ipf. In CC/CV mode the storage battery cannot be charged due to energy storage is coupling to dc link. The power from solar is fed into the grid for not exceeding the charging of battery. Figure-2 depicts about the feedforward term of solar pv in the mode of grid connected. γ which is known to be variable gain is multiplied to the feedforward term of PV array. If the battery is get drained or become empty the value of γ will becomes zero and if the charging of the battery is happened then the value will be equals to 1. The equation of the current will be as follows:

$$i_s^* , i_g^* = I_{tp}u_p + I_{tq}u_q \quad (4)$$

The grid voltage's synchronizing signals can be denoted by using q_p and u_p. As shown in figure-2, by using the hysteresis controller the creation of switching signal is happened.

C. Frequency and Voltage Control of DG set:

The frequency and voltage should be monitored/regulated for operating the DG set by using the vsc's decoupling capability at a single point. In this coupling method the control of voltage will be done by the reactive power and the controlling of frequency can be done by using the active power. For controlling the frequency and voltage the PI and FLC controllers are employed. The regulation of voltage can be done by the FLC.

Where $V_{me}= V_m *-V_m$ and the FLC is used. In the similar manner the frequency can be controlled by using PI. The equation can be depicted as follows.

$$I_{fp}(s) = I_{fp}(s-1) + z_{fp}\{f_e(s) - f_e(s-1)\} + z_{fi}\, f_e(s) \quad (5)$$

In connected mode which is depicted in figure-2, the outputs of voltage and frequency can be combined.

D. Topology of Switching control and Synchronization:

On the demand basis of charging and generating the charging station will be operated in many modes. So, there will be necessity of mode changing capability. By consuming this capability power the charging will be remained unchanged. The regulation of voltage in the islanded mode can be done by the FLC. This related equation can be depicted below for minimizing the phase synchronization.

$$\Delta\omega(s) = \Delta\omega(s-1) + Z_{pa}\{\Delta\theta(s) - \Delta\theta(s-1)\} + Z_{ia}\Delta\theta(s) \quad (6)$$

For the settings of the controller are denoted by Z_{pa} and Z_{ia}. Where phase difference is denoted by $\Delta\theta$.

- **EV2 Controlling topology:**

The controlling of EV can be possible in CV/CC (constant voltage/constant current) which is at the DC-Link through the boost converter. The charging of EV will be in charging upto the terminal voltage is reached to the condition of full charging position of the battery. Once after completion of this reaching terminal voltage the charging of EV will change to mode of CV. This operation can be seen clearly in the figure-3.

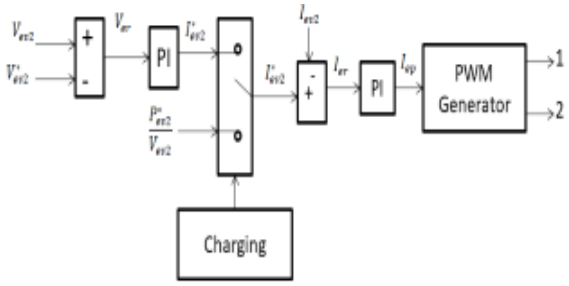

Figure 3: Proposed Controlling topology for EV2 (CV and CC Modes

The below equation depicts the charging's reference current:

$$I_{ev2}^* = I_{ev2}^*(s-1) + z_{evp}\{V_{er}(s) - V_{er}(s-1)\} + z_{evi}\, V_{er}(s) \quad (7)$$

From the above equation-7, the PI controller's gains are denoted by Zevi and Zevp and the error in voltage of EV battery can be denoted by Ver. By using the PWM technique and PI controllers the signals to the

switches can be generated. The calculation of duty cycle can be formulated as below.

$$d_{ev}(s) = d_{ev}(s-1) + z_{ep}\{I_{er}(s) - I_{er}(s-1)\} + z_{ei}\, I_{er}(s) \quad (8)$$

From the above equation the error in the current of EV battery can be denoted by Ier and gains of PI controller can be denoted by using Zep and Zei.

IV. Proposed Fuzzy Logic Controller (FLC) SYSTEM:

FLC, which operates based on logical rules formed by input and output arguments. And also it converts crisp values to fuzzy values (analog to logical). It is implemented by using the membership functions. The FLC system mainly compresses of 4 major parts known as fuzzification (converts fuzzy sets to crisp sets), rules base, inference engine and defuzzification (crisp sets to fuzzy sets) which can be depicted in below figure-6. This work related flowchart by using FLC is depicted below.

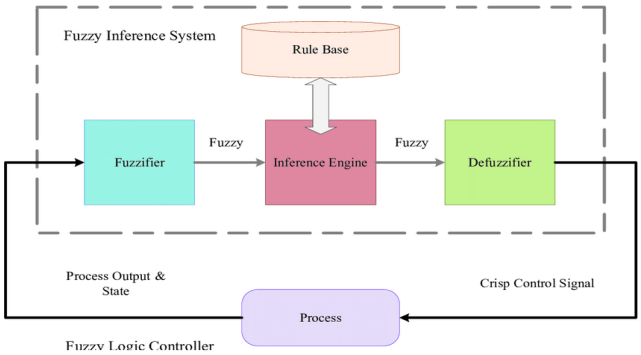

Figure 4: Schematic Representation of FLC

TABLE 1. Rules of FLC

$e\backslash\Delta e$	NB	N	Z	P	PB
NB	PB	PB	P	Z	Z
N	P	P	Z	Z	Z
Z	Z	Z	Z	Z	Z
P	Z	Z	N	N	N
PB	N	N	N	NB	NB

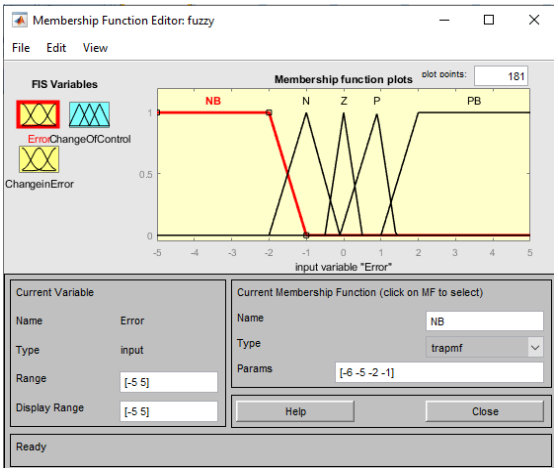

Fig 5: Input 1 MF (Error)

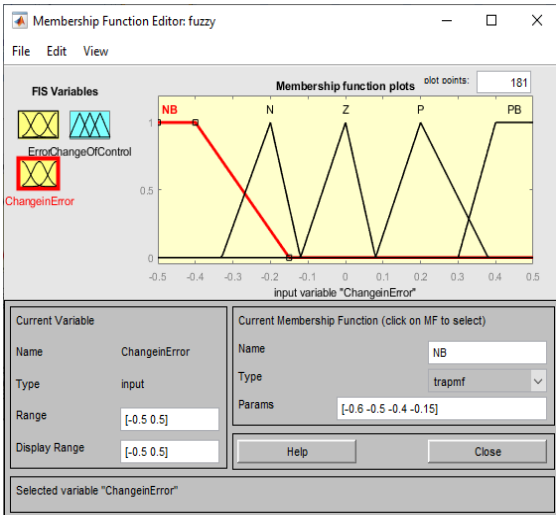

Fig 6: Input 2 MF (Change in Error)

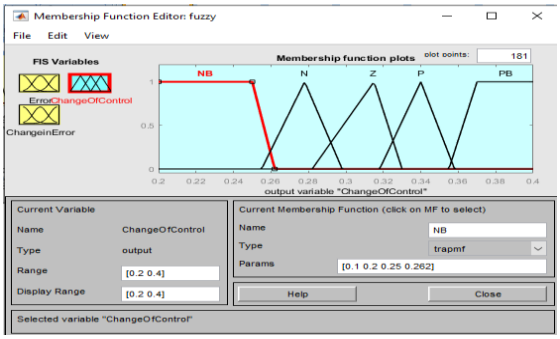

Fig 7: Output MF (regulated voltage)

The given inputs are error e(k) and change in error Δe(k) and then output is regulated voltage. Where the error (e) = Vmtref – Vmt. From the table-1, As 5 Voltage error variables and 5 change in Voltage error variables are taken as inputs, so that there will be a total of 25 rules, which will governing the decision making mechanism.

V. SIMULATION BASED RESULTS:

In this section, the simulation based results obtained by using both PI and FLC controllers in the controlling topology of VSC is evaluated. In this the controllers are used to regulate the voltage. The simulation based can be evaluated by using Matlab/Simulink 2018a Software.

1. Results with PI Controller:

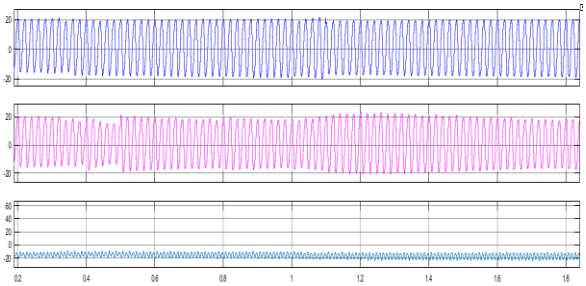

Figure 8: Ev1 current, load current, Ev2current

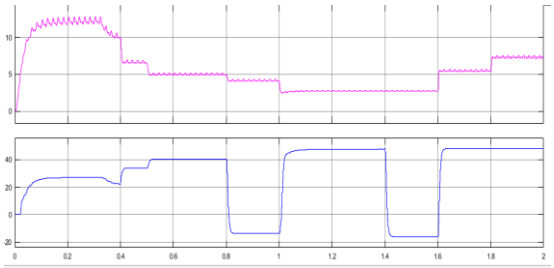

Figure 9: PV panel current (Ipv), battery current (Ib)

The above figure-8 and figure-9 depicts about the results obtained after system is affected due to synchronization and variation obtained in the irradiance. The currents obtained at ev1, ev2 and load is depicted in figure-8 whereas figure-9 describes the currents obtained at battery and PV panel.

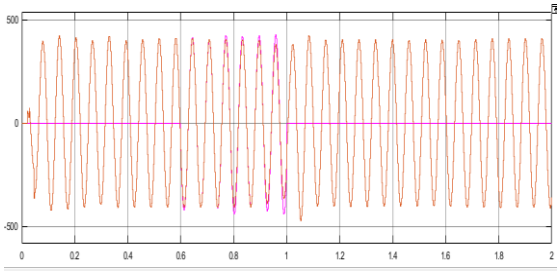

Figure 10: Grid (Vs) and AC link terminal Voltage (Vc)

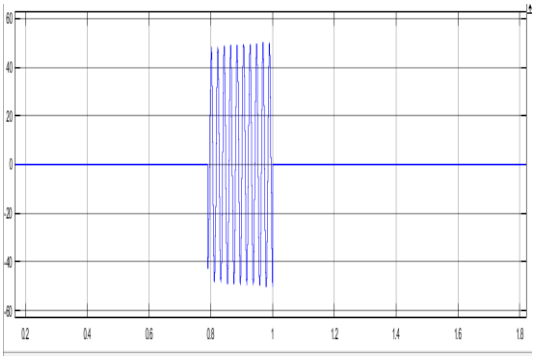

Figure 11: Grid current (Is)

Figure-10 and Figure-11 depicts the simulation results obtained in the absence of power supply to EV from solar. In this case the grid and battery will comes into act and provides the power supply. The grid will be in connected mode from 0.8 to 1s, whereas the battery will be in charging mode.

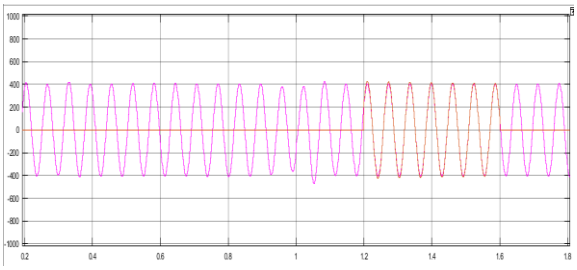

Figure 12: Converter (Vc) and dg set voltage(Vg)

As depicted in above figure-12, the DG set is in connected mode from 1s to 1.4s. At the same time the battery will be in the mode of charging and the rest of time will be in the mode of discharging. So, the DG current wave form is depicted in the above figure.

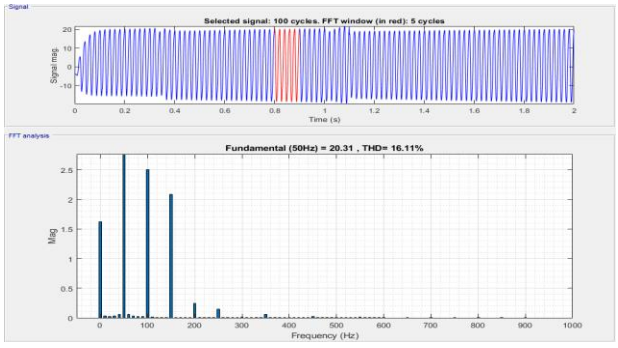

Figure 13: PI based Simulation result of THD

The above figure-13 will depicts about the THD obtained in the load current by employing PI controller for regulating the voltage. Therefore the value of THD obtained is 14.76%.

2. Results with FLC Controller:

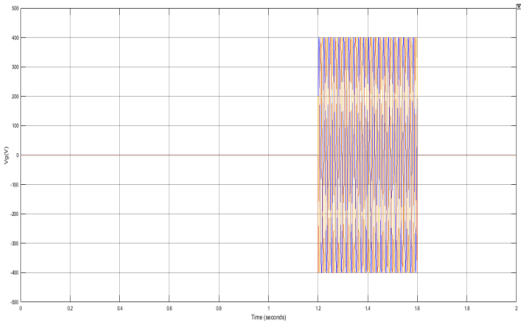

Figure 14: Output voltage (Vg) obtained at DG-set

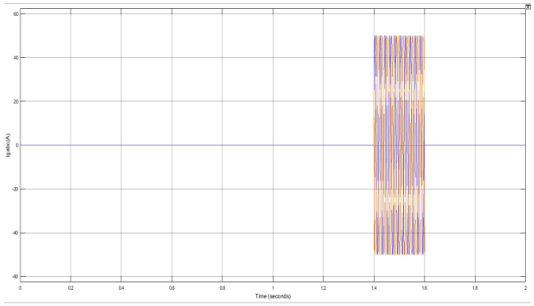

Figure 15:Current (Ig) obtained at DG set

In this the VSC is employed by using FLC to regulate the voltage. Due to the issues obtained by using PI controller, the PI controller is replaced with FLC. The above fig-14 and fig-15 depicts about the current and voltage obtained in DG set. The grid will be in the mode of islanded at initial state. The irradiance obtained will be varied from 1000-300 W/m2 at 0.32sec. As depicted in above figure-12, the DG set is in connected mode from 1s to 1.4s. At the same time the battery will be in the mode of charging and the rest of time will be in the mode of discharging. So, the DG current wave form is depicted in the above figure.

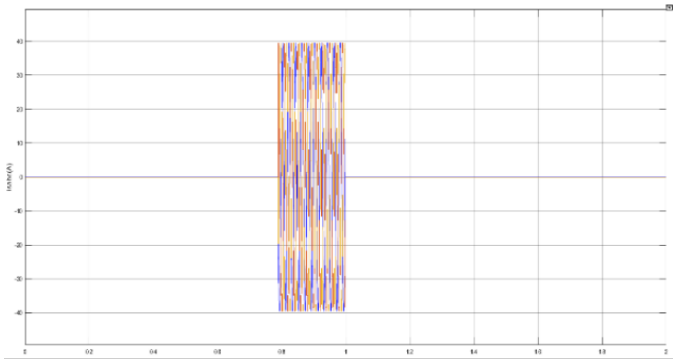

Figure 16: Source Current output (Is)

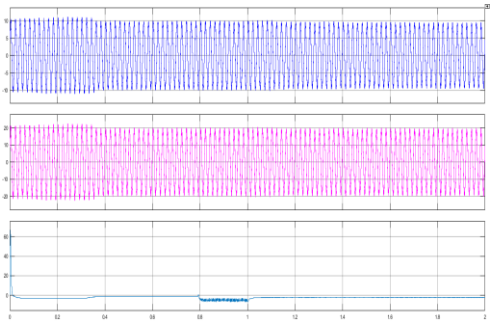

Figure 17: Current of electric vehicle 1(Iev1), load current (iL) and current of Electric Vehicle 2 (Iev2)

Figure-16 and Figure-17 depicts the simulation results obtained in the absence of power supply to EV from solar. In this case the grid and battery will comes into act and provides the power supply. The grid will be in connected mode from 0.8 to 1s, whereas the battery will be in charging mode. Hence this related results are shown below.

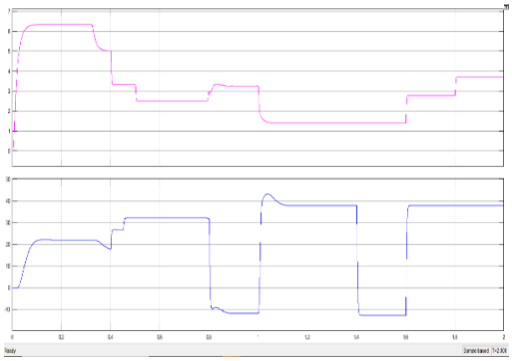

Figure 18: Ipv and Ib simulation results

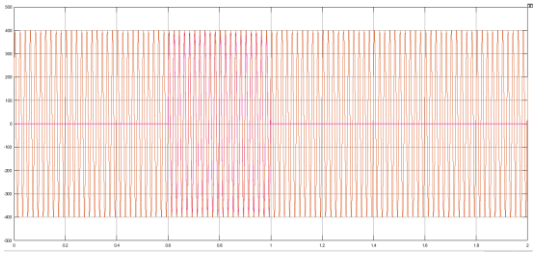

Figure 19: Vs and Vc related simulation results

The absence of power supply from the solar PV then discharging condition of battery will takes place. This related results are shown in the above figures 18 and 19.

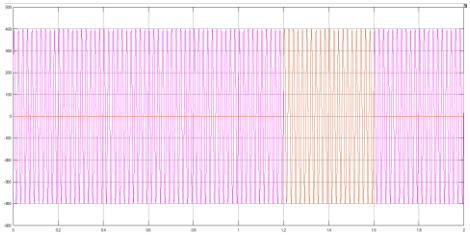

Figure 20: Simulation result of Vc & Vg

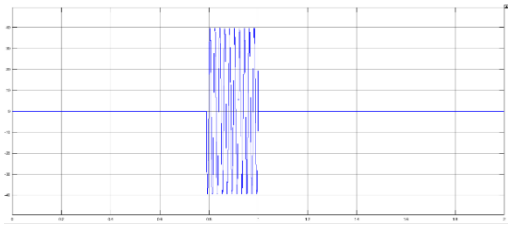

Figure 21: Simulation results of Is

The above figure-20 & 21 will depicts about the current and voltage obtained at the time of grid is in connected mode. In this scenario the DG set and grid will comes into act and supplies the required power in the CS due to absence of power supply from the Solar PV. It is happened from the time duration of 0.s to 1s. At this time the battery will gets charged.

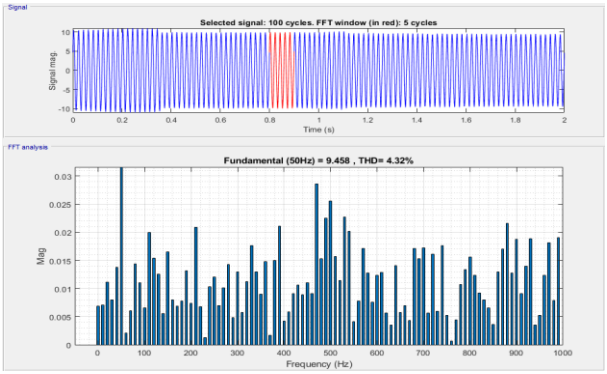

Figure 22: FLC based Simulation result of THD

The above figure-22 will depicts about the simulation result of THD obtained by using Fuzzy controller. The conventional PI controller will have disadvantages like less speed response of the system and high harmonic distortions. These issues can be overcomed by replacing PI with FLC. So, the THD is decreased from 16.11% to 4.32%. This evaluation can be seen in below table.

TABLE 2. THD Comparison

	PI controller	Fuzzy logic controller
THD (%) for load current	16.11%	4.32%

VI. CONCLUSION:

In this work, the performance analysis of 3-Phase Grid connected Solar PV-Battery and Diesel Generator based EV charging station by using FLC is evaluated. The continuous power supply in the CS to charge an EV is achieved. The operation of charging station in the three modes namely grid connected mode, islanded mode and DG connected mode possibility is evaluated by using only one VSC. The replacement of single phase grid with three phase grid can be used for three phase loads. Firstly, the controlling topology of VSC is employed by using PI controller. Later on, due to more harmonic distortions, PI controller is replaced with FLC. This controller has evaluated the best results than the PI controller and has less harmonic distortions. So, by using this these modified methods the power quality can be enhanced by providing the continuous power supply to the loads. The performance results of this is evaluated by using Matlab/Simulink 2018a Software.

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Design of Lector Based Approximate Adiabatic Logic for Enhancing Security

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ABSTRACT

On Internet of Things edge devices, approximation computing is used in error-tolerant applications is a viable choice for reducing power usage. Assaults via side channels, Differential power analysis, for example, is a distinct story, but it can be used to sabotage approximation calculation (DPA). The use of adiabatic logic in estimation edge computing could help to reduce energy consumption while simultaneously increasing security against side-channel attacks. Despite the fact that approximation and adiabatic logic-based solutions save space and improve security, they consume more power and take longer to complete. To reduce overall size the recommended approximation adders take advantage of adiabatic logic's dual-rail functionality to reduce both the use of electricity and the use of energy are two different things. The article starts with a proposed designs TSAA then moves on to a 2nd proposed design of TCAA.TSAA and TCAA based on adiabatic logic require fewer transistors than a CMOS-based accurate mirror adder. With a 45 nm technology node and a particular operational frequency, the adiabatic design of both proposed 1st & 2nd demonstrated significant power and energy savings over the conventional CMOS AMA. Both proposed architectures are also more resistant to DPA assaults, as demonstrated.

Keywords: DPA (Differential Power Analysis), AMA, TSAA, TCAA.

I. INTRODUCTION

The rise of IoT edge computing [1], [2], which places processing at the network's edge, necessitates more energy-efficient and secure solutions. Adiabatic logic and approximation computation are two new techniques for creating low-power circuits. Accuracy is a trade-off in approximate computing to save space. It appears to be promising for IoT edge device error-tolerant programs. Cyber security solutions, on the other hand, have not yet been adequately addressed [3, 4]. According to [3,] an approximation the adder's output and power consumption have a positive relationship that increases as the mistake rate increases. Non-approximation circuits, such as cryptography, run at lower frequencies and supply voltages than

approximate circuits, making reverse engineering easier [4]. In order to attack the approximation circuits, adversaries could employ

techniques like as well as reverse engineering and side-channel attack.

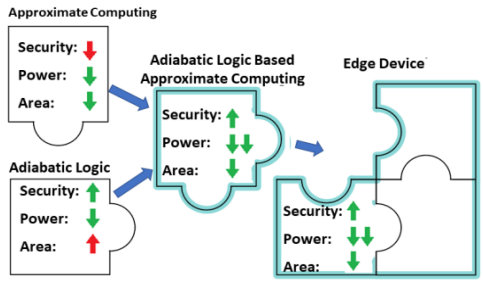


Fig1: By combining adiabatic logic and approximation computation

The load capacitor's energy can be reused by reusing it, adiabatic logic enables for more energy-efficient computing.

The majority of adiabatic logic families have two rails. As a result, in comparison to regular CMOS, the adiabatic architecture features more transistors. We will show in this article how to make by combining approximation computation with adiabatic logic, energy-efficient, low-power, and small-area circuits are created (Figure 1). We'll explain how approximation circuits can fend off side-channel attacks like Differential Power Analysis when implemented using adiabatic logic (DPA).

As illustrated in this article, In order to estimate the total or carry output, the complete adder can use adiabatic logic on two rails this will make it easier to design energy utilized, less power consumption as well as enhance the secure designs with lower number of Tran's resistor. In this article, the TSAA and TCAA are two designs of approximation full adders that are discussed.

The Carryout is approximated by TSAA using the exact Sum, whereas the Sum is approximated by TCAA using the precise Carryout. Positive Feedback that is both secure and energy-effective utilized adiabatic logic is used to design the two approximation proposed adders. The adders design according to simulation data, a TSAA design In comparison to the previous system, EE-SPFAL saves money, has less inaccuracy, and occupies less space. TSAA based on EE-SPFAL is likewise shown to be more secure than TCAA which is also on the same basis of EE-SPFAL.

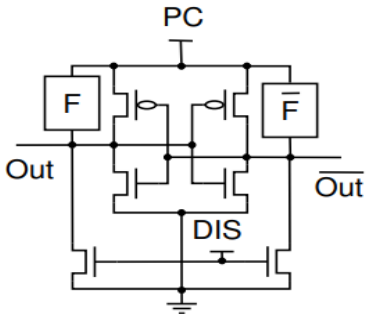


Fig2: EE-general SPFAL's schematic

With the rise of the Internet of Things, it is critical to Secure and energy efficient RFID and smart cards are examples of Internet-of-Things devices. The battery life improves as the security of these gadgets improves. Mobile gadgets that run on ultra-low power, battery life is a critical factor. Adiabatic logic is a new way for creating IoT devices that are both energy efficient and safe that does not sacrifice battery life. Adiabatic logic However, it has the disadvantage of being limited to a few MHz frequency range. Adiabatic logic, on the other hand, is a type of logic that is used to solve problems. Can be utilised to construct energy-efficient and safe low-frequency IoT devices like there are two sorts of smart cards: RFIDs and smart cards.

RFID tags, for example, use a 13.56 MHz frequency [5,] which is within the range of adiabatic logic's energy-efficient operation. Despite the fact despite the fact that adiabatic logic saves energy, Energy losses still exist (section II B). Quasi energy loss overcomes adiabatic power losses in limited circuits [10]. EESPFAL, an energy-efficient and safe adiabatic logic that avoids non-adiabatic waste of energy, is the goal of this research. EE-SPFAL, a proposed adiabatic logic, can enhance RFID and swipe card security without simultaneously prolonging battery capacity.

When compared to earlier the quasi power dissipation of EE-SPFAL related logic circuits is much less, leading to higher total energy effectiveness

of EE-SPFAL based circuits. Such circuit has been utilized to construct fundamental logic units such as buffers/inverters, AND/NAND, and XOR/XNOR gates, among others.

The proposed adiabatic logic family's security is ensured by a DPA attack on the S-box circuit, which was constructed using the EE-SPFAL gates. The secret of the DPA-resistant EE-SPFAL-based S-box circuit designs is revealed by a standard CMOS-based S-box circuit. When compared to SQAL and normal CMOS logic, SPICE simulations show that the EE-SPFAL-based S-box circuit saves up to 65 and 90 percent of energy at 12.5 MHz, respectively.

The energy dissipation of the EE-SPFAL based S-box circuit is compared to that of the SQAL based S-box circuit and the CMOS based S-box circuit to validate our results over a wide frequency range. We also constructed an Advanced Standard Encryption data channel of 8 bits, as mentioned in [6]. (AES) An on-the-fly key expansion mechanism is part of the architecture. We discovered that a single logic-based EE-SPFAL cycle can save you a significant amount of time. Processing may work with a variety of plain text inputs. The AES design uses the same amount of electricity all the time.

Adiabatic logic:

With the use of power clocks, adiabatic logic recycles the charge in the load capacitor. Charge recycling has helped to reduce the loss of dynamic switching energy caused by adiabatic logic. Figure 1 shows how load capacitors are charged and discharged adiabatically. In an adiabatic circuit, the energy wasted is computed as follows when A continuous current source provides the charge,

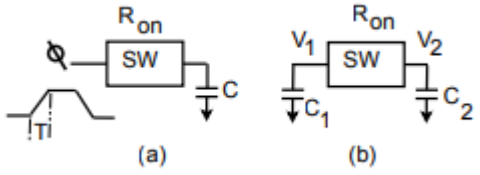


Figure-3: The model type of switch a) loss due to adiabatic cooling b) loss that is not adiabatic

$$E_{diss} = \frac{RC}{T} CV_{dd}^2$$

T represents the capacitor's charging and discharging period. The load capacitor is C, and Vdd is the full swing of the power clock. If T 2RC is used as a time constant, the adiabatic circuit consumes less energy than a standard CMOS circuit. Even though adiabatic circuits lessen they still suffer from various sorts of energy losses due to dynamic switching.

In adiabatic logic, there are losses:

In adiabatic circuits, there are two types of non-leakage energy losses: adiabatic and non-adiabatic.

1) Figure 1 illustrates the adiabatic loss. (a) To replicate adiabatic loss, a switch model was utilised. When the switch (SW) is turned on, it displays the adiabatic loss.

$$E_{adiabatic} = \frac{R_{on} C_L}{T} CV_{dd}^2$$

The switch's ON-resistance is Ron, and its transition time is T, and the load capacitance is CL. The adiabatic loss vanishes as the transition period (T) approaches infinity. In practise, it's impossible to get T is the amount of time it takes for something to undergo a change. As just a reason, adiabatic loss cannot be avoided.

2) Non-adiabatic loss: To demonstrate non-adiabatic loss, a switch model is employed shown in Figure 1(b). If there is a voltage differential between the two terminals when Non-adiabatic loss happens when the switch is turned on. It's a loss due to adiabatic cooling,

$$E_{non-adiabatic} = \frac{1}{2} \frac{C_1 C_2}{C_1 + C_2} (V_1 - V_2)^2$$

The supply just at two nodel junctions right even before device is switched on are V1 and V2, respectively, and the probable correlates are C1 and C2 of the pair of nodes linked to the switch, respectively. Quasi adiabatic degradation is much bigger than adiabatic loss in low-speed working circuits [10]. To avoid non-adiabatic loss, the transistor should not turn on when there is a potential difference between the drain and the source.

Previous research has been done on DPA-resistant adiabatic logic:

Only a few small reversible logic groups have ever been documented in the literature as being able to withstand the DPA attack: SAL, SyAL, and CSSAL [14] are all acronyms for the same thing. Among the DPA-resistant adiabatic logic families proposed in the literature, Secured Quasi-Adiabatic Logic is the most cost-effective in terms of power consumption and overhead. During the examination of the outputs, however, SQAL suffers from non-adiabatic energy loss.

Energy Recovery Principle:

In current CMOS technology, the power supply supplies CL, CLV 2 dd to charge a capacitance output node. A transistor channel route wastes the other half of the CLV 2 dd energy, while CL stores half of it. Energy recovery circuits, unlike typical CMOS circuits, use the adiabatic switching principle to gradually charge the capacitance and recycle there is a charge at the conclusion of each cycle.

Side-Channel Attacks Using Power Analysis:

By utilising data collected from cryptographic equipment, side-channel attacks can expose the secret key. Attacks on the side channel include attacks on power, timing, and electromagnetics, to name a few. The three attacks utilised in power analysis are SPA, DPA, and CPA. SPA: To determine the cryptographic approach a gadget employs, an attacker examines its power consumption. DPA: A side-channel attack that uses statistical analysis of the correlation between processed data and power traces to uncover the secret key of a cryptographic device. To discover the correct key, CPA as like as DPA it upgrades and calculates the statistical correlation coefficient between both the energy trace as well as readings of the key guess's intermediate result. In order to identify the hidden key, these attacks are supplemented using speculative power models.

II. EARLIER WORK

In approximation edge computing, the use of adiabatic logic could assist reduce energy while also improving security against attacks from the side Two approximation adders based on adiabatic logic are presented as a case study to demonstrate the benefits of approximation computation in combination with adiabatic logic. To shrink the overall size and usage of energy, the dual-rail feature of adiabatic logic is utilised in the proposed approximation adders. In comparison to a CMOS-based AMA, TSAA and TCAA Use fewer transistors while using adiabatic logic. At some MHz operating frequency and 45 nm technology node, the adiabatic TSAA and TCAA showed significant power and energy savings over the conventional CMOS AMA. Both proposed architectures are also more resistant to DPA assaults, as demonstrated.

Adiabatic logic and approximation computation are two new techniques for creating low-power circuits. Accuracy is a trade-off in approximate computing to save space. It appears to be promising for IoT edge device error-tolerant programmes. Cyber security solutions, on the other hand, have not yet been adequately addressed [3, 4]. According to [3,] an approximation the adder's output and power consumption have a positive relationship that increases as the mistake rate increases. Non-approximation circuits, such as cryptography, run at lower frequencies and supply voltages than approximate circuits, making reverse engineering easier [4]. In order to attack the approximation circuits, adversaries could employ techniques like as side-channel attack and reverse engineering.

The sum or carry output of a complete adder can be approximated using this article demonstrates dual-rail logic. This would enable us to create designs with lower number of transistors which are energy-efficient, low-power, and secure. TSAA and TCAA are two approximate full adder designs discussed in this article produce Output and Output, respectively. TSAA uses the precise Sum to approximate the Carryout, whereas TCAA uses the precise Carryout to approximate the Sum.

Positive Feedback that is both energy-efficient and secure the two approximation adders are implemented using adiabatic logic [7]. (EE-SPFAL). According to the simulation results, Compared to a TSAA based on EESPFAL, A TCAA developed on the basis of EE-SPFAL it reduces the expenditure, is more consistent, and is smaller. A TSAA based on EE-SPFAL, according to our findings is also more secure than a TCAA.

EE-SPFAL (Adiabatic Logic with Energy-Efficient Safe Positive Feedback) [7] [Adiabatic Logic with Energy-Efficient Safe Positive Feedback] [Energy-Efficient Safe Positive Feedback Adiabatic is a low-power, safe adiabatic logic family. EE-SPFAL uses a consistent amount of power and is resistant to DPA assaults. Figure 2 shows how Blocks F and $\bar{F}$ The EE-SPFAL architecture is used to create the results and the results a more thorough discussion of adiabatic logic can be found in a recent study [6]. The AAA comes in two flavours, both based on EE-SPFAL.

F and Fbar, respectively, create output and output (Fig. 2). As a result, the two recommended adders use complementary outputs to mimic to reduce overall size, power, and energy consumption, combine or carry-out outputs. As a consequence, two approximated adders were developed using equations 1 and 2: TCAA and TSAA are two different forms of approximation adders.

F = Sum

$$\bar{F} = \overline{Sum} = C_{out} \quad \text{---} \quad (1)$$

F = Cout

$$\bar{F} = \overline{C_{out}} = Sum \quad \text{---} \quad (2)$$

Approximate True Sum Adder:

Cout is known as Sumbar complement in the TSAA scheme, which is based on the EE-SPFAL. Using the dual-rail capability of adiabatic logic, Cout was created as a supplement to Sum (Equation 3). As a result, there is no longer a requirement Cout and Coutbar are calculated separately in a separate circuit.

SumT SAA = A ⊕ B ⊕ C

Cout T SAA = SumTSAAbar ---------- (3)

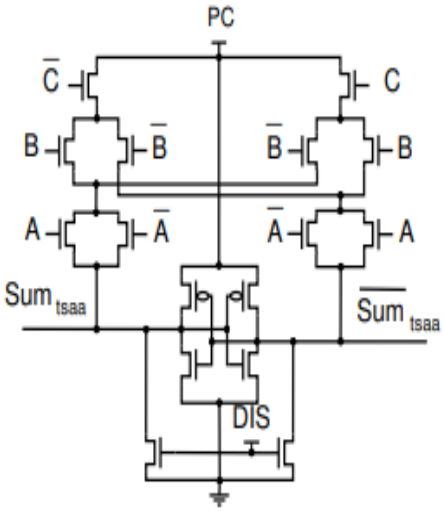


Fig 4: Proposed design of EE-SPFAL-based TSAA.

True Carry Out Approximate Adder:

The TCAA schematic is based on the EE-SPFAL standard, is shown in Figure 5. Cout $\overline{TCAA}$ is how Sum TSAA is calculated in TCAA (Equation 4). As a result, a separate circuit for the Sum output is no longer needed.

Cout TCAA = B.C + A.C + A.B

SumT CAA = Cout$\overline{TCAA}$ ---------- (4)

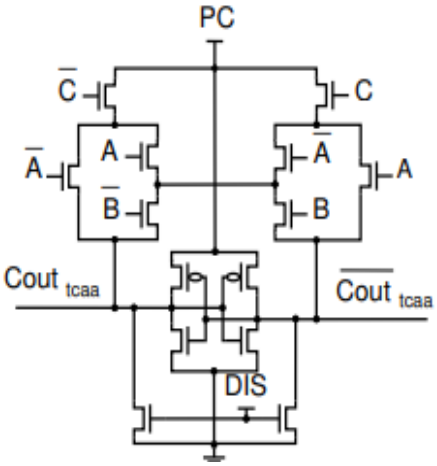


Fig 5: Proposed design of on TCAA based on EESPFAL

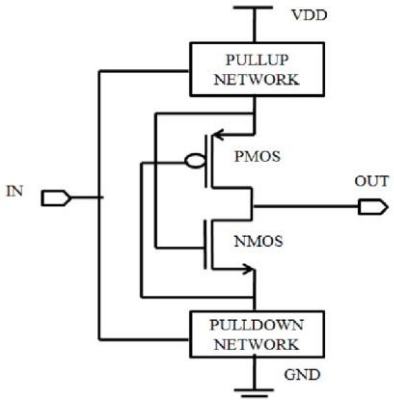
III.PROPOSED WORK

By reusing the energy Adiabatic logic, which is stored in the load capacitor, allows for energy-efficient computing [6]. Families of adiabatic logic predominantly dual-rail in nature. As a result, in comparison to regular CMOS, the adiabatic architecture features more transistors. We will show in

this article how to make by combining approximation computation with adiabatic logic, energy-efficient, low-power, and small-area circuits are created (Figure 1). We'll explain how approximation circuits can fend off side-channel attacks like Differential Power Analysis when implemented using adiabatic logic (DPA).

Basic Lector Approach:

The key concept underlying our technique for decreasing leakage power is the appropriate stacking of transistors in the circuit connecting supply voltage through grounding. A supply voltage to grounded pathway with more than one transistor switched off is significantly less leaky than that for a supply voltage - ground route with only one transistor shut out. Each CMOS gate has two leakage control transistors (LCTs), one of which is near the cutoff zone, as part of our plan.



Fig, 6: Lector Approach

This article demonstrates how a complete adder can approximate employing for the sum or carry output, Arithmetic logic using two rails Creating energy-efficient, low-power, and secure circuits will be easier with fewer transistors. In this post, we'll look at two approximate full adder designs: the TCAA and TSAA are two different types of approximate adders.

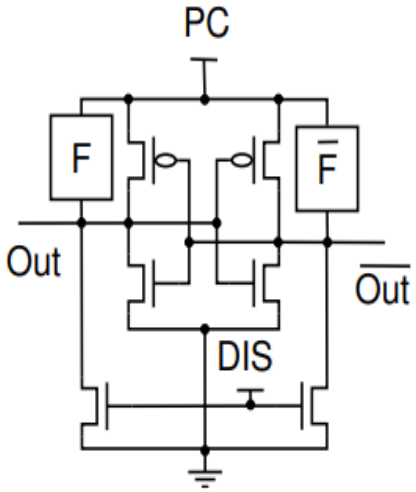


Fig 7: EE-SPFAL schematic in general

With the rise of the Internet of Things, it is critical to create secure and energy efficient IoT devices include RFID tags and smart cards. The battery life of these devices improves as the security of these devices improves. Mobile devices with ultralow power consumption, battery life is critical. Adiabatic circuitry is a new technology for making Iot technologies that are really power efficient as well as secured even while preserving battery performance. The frequency the adiabatic logic range is limited to a few MHz, which is a drawback. However, adiabatic logic can be utilised to design energy-efficient and secure low-frequency IoT devices such as RFIDs and smart cards. RFID tags, for example, operate at 13.56 MHz [5,] which is within the range of adiabatic logic's energy-efficient operation. Despite the fact despite the fact that adiabatic logic saves energy, it still has loss of energy (section II B). In low-speed circuits [10], The energy loss caused by non-adiabatic processes is greater than the energy loss caused by adiabatic processes. The goal of this report is to build EESPFAL, an energy-efficient and safe adiabatic logic that can improve energy efficiency by eliminating non-adiabatic energy loss. EE-SPFAL is a proposed adiabatic logic that can improve RFID and smart card security while simultaneously improving battery life.

True Sum Approximate Adder:

Cout is the Sum complement in the TSAA scheme, which is based on the EE-SPFAL. Using the dual-rail

capability of adiabatic logic, Cout was created as a supplement to Sum (Equation 3). As a result, calculating Cout and Coutbar no longer necessitates the use of a separate circuit.

$$\text{SumT SAA} = A \oplus B \oplus C$$

$$C_{out}\ \text{T SAA} = \text{Sum}\overline{TSAA} \text{ ---------- (3)}$$

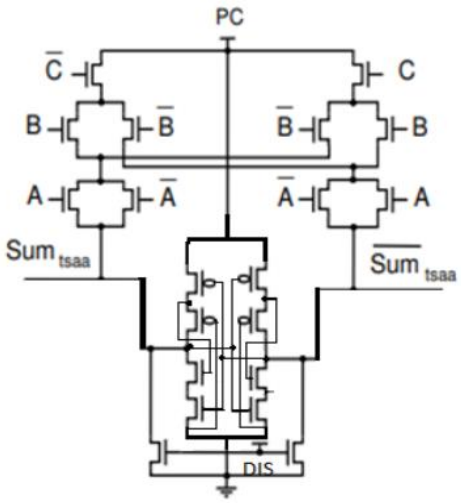


Fig 8: TSAA based on the EE-SPFAL.

Approximate Adder True Carry Out (TCAA):

The TCAA scheme based on EE-SPFAL is shown in Figure 4. SumTSAA is calculated in TCAA as CoutTCAAbar (Equation 4). As a result, the Sum output no longer requires a separate circuit.

$$C_{out}\ \text{TCAA} = B.C + A.C + A.B$$

$$\text{Sum TCAA} = C_{out}\overline{TCAA} \text{ ---------- (4)}$$

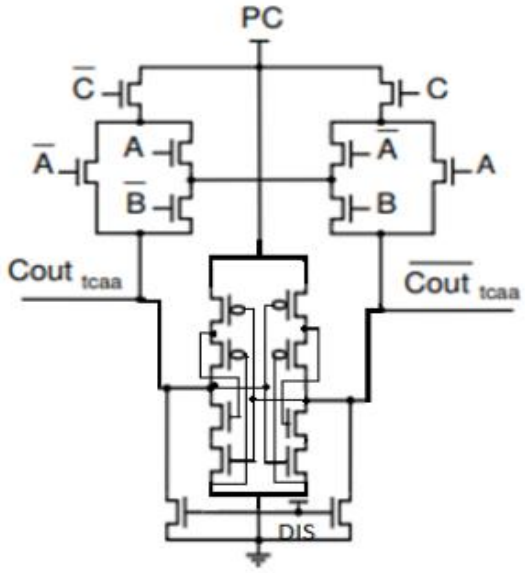


Fig 9: The EE-SPFAL is used to create a TCAA

III. EXPERIMENTAL RESULTS

The comparison of the proposed design is done for the design of TSAA and TCAA with newly proposed design of lector approach based TSAA & TCAA by using the EE-SPFAL.So this section uses EESPFAL used for the purposes of comparison, we employed TSAA and TCAA, CMOS-related AMA [8], and CMOS-used approximation mirror adders (AMA) [9]. The power, energy, area, and security from DPA hacks of these produced designs are all compared. The 45 nm approach was used to run the simulations. PMOS has a width of two times that of NMOS for CMOS simulation, whereas NMOS has a width of 250 nm. PMOS has a width of twice in nm in the EE-SPFAL simulation, but NMOS has a width of 180 nm.

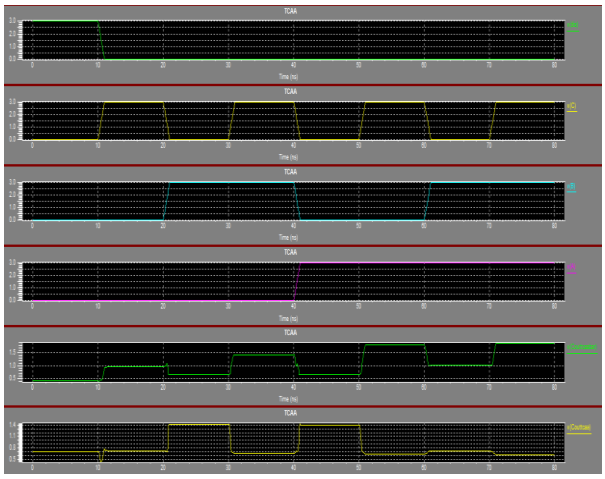


Fig 10: TCAA output waveforms using EE-SPFAL.

Comparison Tables simulated results:

Parameters of TSAA	Existing	proposed
Average Power	1.961415e-001 watts	1.856635e-001 watts
Total Area	22	26
Delay	3.5505e-010	5.0791e-010

Parameters of TCAA	Existing	proposed
Average Power	1.954872e-001 watts	1.85621e-001 watts
Total Area	20	24
Delay	1.0405e-008	1.0029e-008

IV. CONCLUSION

We established the feasibility of low-power, secure edge computing devices by integrating approximation computing and adiabatic logic with the lector approach. Two novel adiabatic approximation adders are proposed in this study, both based on adiabatic logic with two rails when adiabatic logic-based approximation adders are compared to traditional CMOS architecture, the findings show significant power and energy savings. They are unaffected by the DPA. The adiabatic TCAA employs fewer transistors and consumes less energy than the conventional TCAA. The adiabatic True Sum Approximate Adder is less effective against DPA assaults.

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Key Factors Employers Look for In Hiring Construction Managers for Public and Private Construction Projects

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ABSTRACT

The construction industry is one of the world's most important economic activities, and research in this area has found a positive correlation between project management skills and construction project success. However, it is becoming more evident that success in the role of a construction manager cannot be attained with a technical skill set alone. Excellent soft skills are also necessary requisites for success. The aim of the paper is to discuss the benefits of project management skills and what skills employers of labour expected when hiring construction managers in the construction industries. In recent years, several construction projects have steadily failed due to engaging incompetent construction managers with no technical and soft skills. This failure has affected the rate of productivity in the construction industry. Several companies have closed due to the poor performance of their construction managers. Despite the construction industry's significant contribution to economic growth in developed and developing countries, there are still great hindrances in construction project productivity due to the poor performance of construction managers. However, this gap significantly delays much-needed productivity gains, as it is difficult to fully overcome the associated disruptions and choose the best remedy to minimize their impacts on every Nation's Economic Development. Therefore, this investigation is required to close these gaps. This study employed a qualitative research methodology. A combination of primary and secondary sources was used to achieve the main research objectives. Interviews were conducted with 8 vibrant employers in the construction industry. The interview question was made open to enable the employers to air their views on the skills they expected construction managers to possess before engaging them to manage a construction business. The interviews were done face-to-face. Each employer was interviewed separately to avoid copied responses. The outcomes of the interview were noted and listed. However, the benefits of possessing those skills demanded by employers were explained. These benefits were discovered through a systematic literature review. The findings from this study will not

only benefit all employers of construction managers in the construction industry but will also be beneficial to all other employees in a company who seek career growth and better job opportunities in the future. It will help eliminate the issue of unnecessary company closure and disputes among the project team due to project failure. Both professionals and future college and university graduates, whose intentions are to proceed to the working field after graduation, will also benefit from the findings. The construction industry is still doomed unless it addresses the issues of construction managers' attributes. The value of teamwork in the workplace is obvious, and it is frequently directly influenced by effective construction managers' attributes. Effective construction managers help to save money and boost their company's reputation. Using a technology-knowledgeable construction manager can greatly help improve the project delivery and a good team working environment saves money and time on projects.

Keywords: Employer, Construction Manager, Construction Projects, Management Skills, Hiring, Benefits

I. INTRODUCTION

An employer is an individual or organization in the public, private, not-for-profit, or commercial sectors that hires people and pays them for their work. The employer, as the authority of the organization, determines the working conditions of the employees and provides the agreed terms, such as wages. Although the construction manager's role is critical to project success, little consideration has been given in the literature to construction manager management skills as a key indicator of project success. Kakar (2019) defined a construction manager as someone engaged in overseeing a project with their own best interests in mind. In other words, a construction manager is hired to handle human resource management, costs, scheduling, supplier relationships, etc. on behalf of an employer. A construction manager essentially plans for the success of a project and undertakes the task of completion in traditional or agile project management. While many construction managers have a strategic mindset that focuses on customer needs and business outcomes during project planning and execution, some construction managers are more focused on achieving project budgets and goals. However, the literature shows that construction projects are recurring challenges and uncertainties that test the capabilities of construction managers. Each project is unique in many ways and constrained by a variety of frequently changing requirements during the project lifecycle. Every construction manager has his or her own way of making construction project activities successful. The construction industry is also naturally fragmented and has a long supply chain. Within a project, many stakeholders may affect the project or its results, including customers, consultants, contractors, government officials, communities, workers, and project team members. As a result, construction managers must work with a large and diverse group of people, many of whom are not under their direct control. Research suggests the essential skills of successful construction managers and finds that good construction managers are often flexible, entrepreneurial, communicative, and proactive. As a construction manager, it is important not only to acquire new skills but also to constantly develop them.

However, being a construction manager requires a lot of skills and traits as the role comes with significant responsibilities. As construction projects become larger and more complex, contractors need to find a construction manager who fits the role. Ekwuno (2022) found that communication skills are essential for project success. The quality and failure of projects are also affected by the quality of communication. The author also point out that the construction manager is responsible for the success or failure of the project. It was found that construction managers spend most of their time communicating. A construction manager is involved in planning, organizing, executing, managing, monitoring, and completing a project and the common element of all the above activities is communication. According to McDowell (2019), communication is essential for any type of business, but when managers can't communicate effectively with their employees, it becomes much harder to get things done. Construction projects require precision, so it's important for construction managers to clearly communicate what needs to be done and when. Negotiation is one of the key factors to consider when hiring construction managers in construction businesses. Hogan (2020) defines good negotiation skills as the ability to say yes or no when necessary. The author also believed that negotiation is a dialogue between parties to achieve the desired outcome on one or more issues of a dispute. Therefore, a good construction manager must be able to negotiate well in every endeavor. Research in this area has shown a favorable correlation between applied management abilities and the performance of construction projects, as reported by Oliveros and Vaz-Serra (2018). A well-trained and experienced construction manager can significantly alter the outcome of a project. It should also be noted that the roles of project manager and construction manager need to be understood as two different professions. The role of a construction manager is focused on the whole project and does not require specific construction skills; however, the role of the construction manager requires interpersonal skills such as leading, communicating, negotiating, and problem-solving within the construction industry, and specific technical expertise in construction across the entire project – from design development to project close. The construction manager needs to manage risk, maintain sensitivity and responsiveness to environmental and community concerns as well as manage cultural differences, and national and international rules and codes PMI (2016) indicated.

II. LITERATURE REVIEW

Burger (2015) discovered that a construction manager owns a construction project from the beginning to the end, making him or her in charge of ensuring the project is feasible. The author revealed that to be a good construction manager, construction managers are expected to possess good project management skills, effective communication skills, technical skills that will enable the ability to interpret technical drawings, and the ability to use management software. The study indicated that a construction manager should be analytical in nature to be able to deal with the issues of unexpected delays and manage materials, and timelines. Ahmed (2013) believed that the role of the construction manager is significant to project success and that it depends upon the qualities of the construction manager to ensure proper planning, implementation, and completion of the project. The study uncovered that leadership is one of the effective tools to be used by construction managers which moderately influences project outcome, otherwise, lack of leadership skills is directly associated with project failure. The author states that it is the construction manager's responsibility to ensure that all team members understand that their duties are important and have a direct impact on project execution. The study also showed that to be effective construction managers, construction managers must be quality-focused, honest, team-players, people-oriented, and problem-solvers. A study conducted by McDowell (2019) found that construction managers had better opportunities in the field of work by being

team-players, having effective organizational and communication skills, delegating skills, and being less pressured and must be able to work under pressure. The study found that flexibility and problem-solving abilities should be part of the hallmark of construction managers. The author felt that prioritization of work was also an important metric.

Hogan (2020) examined the 10 skills it takes to be a successful construction manager, and found that flexibility and industry experience, and knowledge are key factors for a construction manager to run a successful construction project. The author further stressed that hiring construction managers in developing countries requires good communication and organizational skills. This study considered risk management and negotiation skills as some of the attributes to consider when hiring construction managers. However, the study argues that financial control, openness to feedback, and avoidance of micromanagement should not be ruled out. Hogan (2020) also argues that construction managers must be able to understand that construction projects always involve risk, and that construction managers and their team members should be able to use mitigation strategies at the start of a project to reduce potential risks. It emphasizes the need to be able to identify significant risks. . Derrick (2022) reports that leadership qualities should be considered when hiring construction managers. This study showed that an effective leader is also a good communicator, team builder, and motivator. The report emphasizes that good leaders must be able to lead by example, make tough decisions, be knowledgeable, recognize the performance levels of their team members, and earn respect. This study identified the benefits of goal setting and highlighted that good goal-setting skills benefit organizations. However, employers should consider construction managers who can set goals and work towards achieving them. The author believed that openness to feedback is one of the key qualities of a good construction manager and that all employers should consider openness to feedback as one of their criteria for hiring construction managers.

A report by Kakar (2019) emphasizes that a good construction manager should be a patient-centred manager. The study found that construction work is not a career for people who can't handle inconvenience, frustration, and the unexpected. Building design and construction require the management of many variables, and the problem is part of it. Throwing tantrums or focusing your attention on easier tasks every time something goes wrong is a poor way to do your job. In addition, subordinates will notice your attitude and will not perform at their best (Kakar 2019). As such, employers need to watch closely for their ability to be patient when things go wrong. Kakar (2019) also believed that an action-oriented mindset should be the criteria for hiring construction managers. The report shows that construction managers need to work with numbers and be able to understand their client's goals and the areas they are willing to yield to.

Construction management is not an easy job, groaned Landau (2021). Managing construction projects, according to the author, necessitates hard skills, also known as technical skills, soft skills, and personality attributes. According to the survey, soft skills are any skills that cannot be acquired through formal schooling or training. Some of these skills are innate traits or ones that people develop over time. Hard skills are those technical talents that can be learned through formal education and training, according to the research. The author argued that while personality qualities are not talents, they are useful for the position of construction manager. However, it was noted that these abilities are an essential component of project management and should be taken into consideration when employing a construction manager.

10 qualities that effective construction managers have, according to Netscher (2018) are being conscientious,

hardworking, adaptable, able to communicate, willing to learn, able to deal with others, resilient, logical, decisive, and perceptive. The capacity for a construction manager to identify when something is going right on a project and when something is well-done on a project was characterized by the study as being observant. However, the report revealed that a competent construction manager will recognize when things start to go wrong right away. According to the report, the most important factors to consider when hiring a construction manager in developed and developing nations are their capacity to adapt to any setting and their willingness to learn new things. The author also held the view that every construction project should prioritize safety and that a construction manager should be able to address possible issues before anyone is wounded. Strong observational abilities and a readiness to be present are required, Netscher (2018) advised.

Zulch* (2014) explored leadership skill as a tool for good project management. The report showed that a manager's personality and the needs of the environment determine how effective a manager will be on a construction project. The study also emphasizes that good managers should be good leaders, and effective leaders must be able to adapt to any environment on board. Zulch* (2014) further found that construction managers are the connecting medium for organizing projects and that the success or failure of a project is influenced by the appointment of construction managers. Therefore, employers should focus on managers with good leadership and management skills. The author also pointed out that good communication skill should be considered an important indicator for hiring construction managers.

Sunindijo (2015) found that construction projects present recurring challenges and uncertainties that test the capabilities of construction managers. The study identified three basic managerial skills that could be developed: (1) technical skills, (2) human skills, and (3) conceptual skills. The report further defines technical competence as subject matter knowledge, analytical skills within that subject area, and the ability to use the tools and techniques of a particular area. Human skills are the ability to work effectively within a group and build collaboration within a team. However, the author defined conceptual skill as the ability to see an organization, how different functions depend on each other, and how changes in one part affect all others. The report says all three skills should be considered when hiring construction managers. The construction manager's interpersonal skills and flexibility also contribute significantly to the success of the project. Therefore, their importance should not be overlooked when hiring a construction manager.

According to Dr. Pakselesht Asgari (2012), a construction manager must have the commitment, team motivation, technical skills, and work plan to successfully complete a project. Therefore, to be successful in recruitment, construction managers are expected to possess motivational skills, technical skills, the ability to program activities, and the ability to demonstrate complete commitment to their duties. However, employers should consider these skills when hiring a construction manager, as these are the skills necessary for a successful project. The study further found that project success factors are factors that enter into an organization's management system and directly or indirectly lead to project success.

Amoah, Berbegal-Mirabent, and Marimon (2021) define a construction project as an effort to construct a building or other structure. The authors also point out that project procurement contracts should be merit-based and awarded through defensible systems such as public tenders to attract qualified contractors and agents. The report stressed the importance of completing the project on time. The study found that a successfully managed construction project should be able to safely achieve project objectives within schedule, cost and quality. It was also discovered that

the success of a construction project depends on how the project is managed and controlled. In summary, it is believed that when hiring construction managers, employers should consider their qualifications and knowledge, and their ability to respond openly to organizational issues.

Al Kazaz and Dr. Shibani (2016) state that construction projects are unique products delivered with the help of different disciplines. The report states that projects can only succeed when they are completed on time, on budget, and on quality. Research has shown that a construction manager's responsibilities begin with ensuring that a client's project goals are met, ensuring fairness among the members of the team, and putting the client at the centre. The study also highlights the importance of construction manager expertise, communication, and interpersonal skills to successfully complete a project. It also became clear that a site manager in an administrative context should be someone who knows what needs to be implemented and implemented successfully. The study further argued that construction managers should be able to inspire, motivate and share the organization's vision. The construction manager should also be able to train workers and delegate tasks to the right worker at the right time. In essence, it is imperative that employers focus on the construction manager's ability to guide, train, motivate, inspire, and share the organization's vision. Employers also need to address issues of communication and interpersonal skills, knowledge, customer focus and maintaining fairness among team members.

Borg and Scott-Young (2020) examine what it means to talk about work motivation, empathic communication, passion, and design knowledge. The report emphasized the need for construction managers to consider the feelings and needs of other stakeholders. The study warns that communication is only effective if all team members understand themselves and what they need to do. , meant not only the ability to speak and write but also the willingness to work. The ability of construction managers to approach people should not be excluded. However, when hiring site managers in the construction industry, employers have a duty to look for passion, work ethic, empathetic communication, and construction knowledge in construction managers. These skills are necessary to successfully complete a construction project.

According to Mouchi, Rotimi, and Ramachandra (2011), few projects have been able to meet the unique characteristics required for construction projects. The report found that the results of construction processes usually differed from each other. The study also revealed that successful construction project management depends on the creativity and ingenuity of construction managers. The authors pointed out that the knowledge level of construction managers is very important in any construction project. The study also notes that construction projects require construction managers who are open-minded and have good thinking skills. Creativity, persuasiveness, bargaining power, personality skills, good knowledge of human nature, leadership qualities, reliability, and initiative are also among the characteristics of a good construction manager. However, employers are expected to recognize the managerial, creative, negotiating, open-minded, and thinking skills of construction managers and to take initiative when problems arise.

Ijaola and Ogunsanmi (2018) revealed that the primary concern of all stakeholders in the construction industry is the ability to successfully deliver projects. We know that an organization's profitability and competitive advantage depend on the success of quality projects. The authors warn that construction manager's skills affect project performance. It was also clear that these features would impact project performance in terms of cost overruns and schedules. The study also found that

a construction manager's interpersonal skills, integrity, knowledge, technical skills, managerial skills, legal skills, and ability to understand labor laws have a significant impact on project success. In other words, when hiring a construction manager, employers should consider the construction manager's ability to manage project resources, technical competence, integrity, expertise, interpersonal skills, and ability to understand construction law, the authors indicated.

Wang and Cheng (2022) believed that project success was highly related to the knowledge of sustainable construction of construction managers and their ability to identify project health and safety requirements. The study showed that good knowledge of construction processes and quality control significantly improves the quality of project delivery. The ability to understand and apply technical skills improves and speeds up project delivery. Pre-contract planning and risk management skills also contribute to project success. The ability to handle conflict is a key indicator of project success. However, the authors suggest that employers, therefore, in hiring construction managers, focus on the construction manager's ability to manage risks, resolve conflicts, plan projects, and apply technical skills in the work environment.

Birt (2020) found that project management skills are necessary attributes for successful projects. The study points out that these metrics enable the successful and efficient implementation of projects. The report warns that failure to improve project management skills will undermine a project team's ability to successfully complete a particular task. The author argued that good communication skills, leadership skills, problem-solving skills, team management, time management, negotiation, and motivation are key project management skills that drive project success. Therefore, employers need to hire construction managers who can communicate, motivate, guide team members, manage time, and negotiate effectively to successfully complete a project.

Joubert (2019) showed that effective communication at the beginning of a project is necessary for successful completion. The author warned that poor communication can lead to inefficient project execution. The report also argued that the ability to negotiate work attracts financial improvement for an organization. Effective project planning and time management are important skills to consider when executing a project. The author uncovered that planning failure was the most influential factor causing project failure. However, leadership skills, technical knowledge, critical thinking, and problem-solving skills are essential to project management skills. In other words, the research shows that leadership qualities, technical knowledge, critical thinking, and problem-solving skills are the top factors employers should consider when hiring construction managers.

RESEARCH OBJECTIVE(S)

This research tends to address the following objectives:

a. Diagnose the project management skills which employers normally look for when recruiting construction managers.

b. Discuss the benefits of project management skills in the workplace.

RESEARCH QUESTION(S)

This study will treat the following questions:

a. What are those skills employers normally look for when hiring construction managers?

b. Explain the benefits of project management skills in the workplace?

III. MATERIALS AND METHODS

A research method is a strategy, procedure, or technique for analyzing data or evidence to discover new, legitimate, and reliable information that meets the goals and objectives of the research. This study used a qualitative research method to gather the key factors that employers look for when hiring supervisors in the

construction industry. The study looked at only 8 viable employers in the construction sector. Qualitative data were collected based on ideas for potential construction projects. Literature reviews have examined the benefits of project management skills in the workplace. A literature review was used to gather existing information on the subject, while the information gathered through the interviews confirmed the content of the existing literature on the essential project management skills needed by employers in the workforce. 8 active employers were interviewed to collect information related to key figures. The interview was a face-to-face interview. All participants were interviewed separately to avoid duplication. The clear opinions of the participants were collected through an open question. No participant names, contact details, or biographical details were recorded. However, this study did not allow for participant cost effects. The interview was conducted according to the participants. To maintain quality, this study mostly only considered peer-reviewed books, journals, and articles published within 10 years. This is because the sooner the better; otherwise observations may become stale. The latest research allows researchers to track new developments, arguments, and emerging trends and identify new authors in this field of research. However, the study considered employers of labour in both public and private construction projects.

IV. BENEFITS OF PROJECT MANAGEMENT SKILLS IN THE WORKPLACE.

1. Effective Communication Skills

Communication is essential for any kind of business, but when managers can't communicate effectively with their employees, it becomes difficult to get things done. Construction projects require precision, so it's important for construction managers to be able to effectively communicate what needs to be done, how it should be done, and when it should be done. Communication skills should include both oral and written. The construction manager can interact with many stakeholders using her verbal and written communication skills. It is the construction project manager's responsibility to talk to these people, update them on the status of the project, and ensure that tasks are assigned and completed. The success of a project often depends on the collaboration of all parties involved. Therefore, as project team leaders, construction managers need effective communication skills to ensure that they have the right documentation and that everyone understands the project schedule. All of these skills must be mastered before becoming a construction manager, but they will continue to improve as project activity progresses.

2. Problem-Solving Skills

Problem-solving is an essential skill for dealing with problems that construction project managers encounter on a daily basis. Problem-solving refers to the ability to successfully deal with complex and unexpected situations and find solutions. It is inevitable that problems will arise during the course of a project. What you need is a construction project manager who can identify problems and respond quickly. When failures occur, managers must be able to quickly find and implement solutions without compromising the integrity and specificity of the project. Finding solutions quickly can save a lot of time and money on your projects. Avoiding as many delays as possible is key, and solving problems quickly is just one way to reduce extra time spent on the same project. Good problem-solving managers possess a combination of analytical and creative thinking and a high level of attention to detail. You have no problem making decisions and are confident enough to face challenges at work. These skills help field managers quickly identify problems as they arise and find the most effective solutions. The skill also help you to identifies the factors and forces that may have caused the problem and initiates changes to mitigate future challenges. Problem-solving skills enable employers to find field managers with the cognitive ability to handle whatever their job throws at them. Problem solvers

can observe, assess, and act quickly when problems arise, even if they are unavoidable. Moreover, they are not afraid of the unknown. This is invaluable to employers who rely on their employees to identify and resolve problems.

3. Ability to Prioritize Skills

Pettit (2020) defines prioritization as the activity of ranking items or activities in order of their relative importance. In other words, prioritization is the act or process of determining the relative importance or urgency of construction work. When managers learn how to prioritize the most important work activities, it becomes easier to improve construction productivity and performance. Developing effective prioritization techniques can help you become more efficient, manage your time better, and focus on the work activities that matter most. The best way to complete important tasks is to set priorities properly. Workload prioritization is an important skill to develop if managers are to improve the prioritization of construction activities. The benefits of prioritizing your workload include reducing stress and anxiety, avoiding procrastination, improving time management, and increasing productivity. Prioritizing helps you focus on your work and feel more confident and effective. Prioritization helps manage construction time and ensure delivery dates are met. Prioritization also helps to better control construction time, eliminate distractions, and improve the work-life balance. Prioritizing skills help construction managers seize the greatest opportunities and achieve the results that matter most.

4. Team Player Skills

Team management is the ability of an individual or organization to manage and coordinate groups of people to accomplish tasks. Team management includes teamwork, communication, goal setting, and performance appraisal. Furthermore, team management is the ability to identify problems and resolve conflicts within a team. A construction manager can use team management skills to ensure effective collaboration between the members of a project's team. Construction managers can also use these skills to help their teams work toward common goals. It is important that construction managers use team management skills to resolve issues in a collaborative, professional, and timely manner. Like a leadership role in a company, a construction manager must lead a team well. The ability to bring a group together on the same page, and set a mission for the team plays an important role in being an effective team manager. Teams face new challenges every day and project success depends on these skills. It is imperative that you master the assignments in a timely and professional manner. Middleton (2022) believed that teamwork creates a forum for better problem-solving. People can draw on each other's skills and knowledge to create practical and useful solutions. It was understood that two fingers are better than one and that a person achieves more when heads are put together. Through teamwork, there is an opportunity to increase the potential for innovation. Most managers believe that success comes from being surrounded by people like them, but true success and ground-breaking innovation are fraught with uncertainty. Discomfort promotes growth. Here different experiences, opinions, and perspectives are leveraged to solve the problem. Diversity is a well-documented way to discover new opportunities, meet new challenges, and gain new insights. Teamwork makes team members happy. Having happy employees is a desirable goal, but it also benefits the company. Teamwork promotes personal growth. Being part of a team helps you grow. By sharing information and training each other, all team members can grow. New concepts can be discovered by colleagues with different experiences. Team members can learn from the mistakes of others and help prevent future mistakes. Team members often understand the demands and stresses of getting the job done better than their managers, so they can support each other emotionally. Collaboration at work creates opportunities for growth. According to Middleton

(2022), when team members use their unique skills to excel in their respective roles, an environment based on mutual respect and collaboration is created that benefits the group. The report also shows that teamwork can improve productivity. Teamwork fosters creativity and reduces mistakes. Be aware that responsibility can make it difficult for you to work on an equal footing with the rest of your team. However, it is important that the construction project manager can be involved in larger projects when the team needs assistance. A social, employee-friendly construction manager will try to keep employees happy. Morale in the field can also be difficult to maintain. When bosses are team players, they can keep everyone happy and create an environment that encourages open communication.

5. Organizational Skills

Chron (2020) states that organization is keeping things in the right order. In any construction project, the organization plays a key role in achieving project goals. Practicing effective organizational skills can help you personally and professionally. Good organizational skills are reflected in meeting all responsibilities. One of the main benefits of being organized is a sense of control that can increase your productivity. An organized professional spends less time fixing errors, finding information, and cleaning up clutter. Saving more time means spending more time doing more productive things. Besides having a positive impact on time management, organizational skills make it easier for employees to share information with each other and work better as a team. Organizational strength helps you track your company's progress. If enough time is spent putting together and recording your finances, it's very easy to tell if your business is going. It's easy to think that just seeing money coming in is a good enough sign of success. But if you spend a lot of money advertising and publicizing your company without keeping records, a lot of money can be lost due to a lack of organization. Organizational strength creates better opportunities and capabilities for running a business. To lead others, we need to know how to prioritize and prioritize according to each individual's skills and abilities. A well-organized construction manager can easily do this while instilling confidence and control in the organization and creating a productive environment for all employees. A construction manager's organizational skills are also directed toward specific tasks such as set project deadlines and conducting performance reviews. All these contribute to a more efficient working system. Organizational skills bring confidence and professionalism to the workplace. An organized manager conveys an image of reliability and control. This makes it easier to earn the trust of customers and employees. Good organizational skills also help reduce stress. A well-organized office creates a more relaxed work environment. This contrasts with a cluttered and unorganized office where employees are constantly searching for items or dodging piles of paper.

6. Delegation Skills

Grossman (2020) indicated that delegation is the transfer of authority to perform a particular activity to another person. That is the process of dividing work and delegating it to others. According to the report, delegation discourages managers from delegating too much responsibility to their heads. Managers and executives are driven by success, and for this reason, they often take on more projects than they can handle on their own. Fear of failure drives us to avoid delegating for fear that someone else will not do the job properly. When managers adjust priorities at the same time, they are more likely to make mistakes. In this case, it is important to delegate the task to the right person. This allows managers and leaders to focus on planning and organizing. Delegation helps build trust, open communication, and commitment among the members of the team. Inadequately delegated leadership employees are often afraid to take the initiative or suggest new ideas. Construction managers who delegate tasks will help build trust. And that trust is further enhanced when managers maintain a

communicative and listening attitude. When employees truly feel their skills and talents are put to good use, they are more engaged and happier overall. Delegation fosters creativity and develops team skills. A team leader who gives his or her members the freedom to work on their delegated work in their own way empowers the team and gives them a creative license. These employees are driven to succeed not only for themselves and their own futures but also for the futures of their employers. Additionally, this personal initiative can lead to creative breakthroughs that everyone involved can benefit from, helping team members build specific skills. Carmack (2016) added that delegation improves team efficiency and increases team flexibility. As a result, the team as a whole can get more done. Teams are more flexible and everyone can improve their skills. This is great for the company.

7. Ability to Work under Pressure

The ability to work under pressure refers to how a person responds when pressured. In the context of work, pressure can be defined as the stress or urgency of an issue requiring attention, the strain of physical or mental distress, and the limitations of a situation. The ability to work under pressure involves dealing with constraints that are often out of your control. These constraints include resource and time constraints, task difficulty, lack of knowledge required to complete the task, and unexpected changes or problems. Effective planning and time management to mitigate or account for unforeseen issues can reduce the likelihood of some form of pressure, but cannot eliminate them entirely. Construction can be a stressful job, and being a manager adds to that stress. Construction managers need to stay calm and focused when something stressful happens. Understanding that challenges arise is only part of the equation. Knowing how to deal with these issues determines the success of a construction manager.

8. Flexibility skills

Not everything goes 100% according to plan. Construction managers must be able to adapt quickly to any situation. Small changes can easily become big ones. As projects with different changes pile up, construction managers have to deal with different changes at the same time. Construction managers must then be able to communicate changes to the team to avoid project delays and errors. If the construction manager is not flexible, the team may start expressing confusion about what needs to be worked on. As a construction manager, it's important to be able to be flexible and adapt to unforeseen changes and plan accordingly. Understanding your project and the factors that can affect your project schedule and overall planning will help you make quick and informed decisions. Also, when making these project changes, it's important that the entire team understands the need for these changes and how the decisions came about. A good construction manager knows that planning doesn't end in the pre-construction stage and that plans must continue to be revised and created until the project is finished. For this reason, most construction managers rely on Gantt charts to track all moving parts of their projects.

9. Industry knowledge

Ekwuno (2022) studied the project delay causes in the South African construction industry and discovered that lack of industry knowledge affects project success. However, industry knowledge is defined as a term that describes the accumulation of knowledge and awareness of the complexities of what is happening in a particular industry of interest. Knowing the industry from a stakeholder perspective can never be overemphasized. Industry knowledge leads to increased company revenues, increased employment opportunities for job seekers, increased opportunities for employee advancement, and sound industry guidelines for regulators. The construction industry is dynamic, with new materials and construction techniques being researched and developed every day.

Construction managers are aware of the innovative strategies and methodologies that can be employed to achieve goals while laying a foundation for managing construction projects. In a nutshell, construction managers love to learn and do their best to stay up to date with the latest industry knowledge. Possessing and accumulating a company's industry knowledge is usually pursued to gain or create a competitive advantage that ultimately leads to the company's growth. To gain industry knowledge, businesses need to stay up to date on the latest news and current trends in the industry. Investments in industrial education and research are therefore essential for growing companies. Outputs include industry dynamics such as size, products, customers, pricing, finances, recruitment, technology, suppliers, facilities, markets, marketing, manufacturing, security, regulations, and best practices. For construction managers, it is important to stay up to date with the latest building materials and techniques. Knowing this information, you can apply innovative strategies and processes to meet your construction goals and run efficient construction projects successfully.

10. Risk Management Skills

However, within the world of project management, risks are not always a bad thing but simply something different than what was originally planned. This can range from anything like an unexpected change in the scope of work or reaching a milestone sooner than anticipated. Construction managers can plan their projects, create backup plans, and come up with swift fixes for issues by using their risk management expertise. For example, if there's a chance that construction materials may not arrive on time for a project, a construction manager could identify solutions to this problem before the project begins. A construction manager will have to master the skill of managing risk, as construction can be one of the most volatile industries in the business world. Ritchie (2014) adds that having risk management skills will enable construction managers to identify risks that may not be obvious. Board members provide insight and support to the Board as it may be difficult to identify risks outside their areas of expertise and experience. Many regulators have policies that allow companies under investigation to have compliance or risk prevention programs in place. While it is impossible to avoid the risk or materialization of risks in a potential problem, regulators should ensure that the event is not the result of a system crash and that companies are taking appropriate leadership, training, certification, and other measures. Risk management skills help construction managers reduce corporate liability. Regulators and shareholders are increasingly viewing litigation risk as corporate liability. By proactively mitigating litigation risk, companies become more attractive investments. Even Six (2017) states that construction managers with risk management skills have access to better quality data to make better decisions in the real world of projects. The report argues that good risk management sparks conversations. This creates a talking point between the project team and key high-level stakeholders, encouraging them to discuss difficult issues and address potential sources of conflict. Suppliers are also included in the discussion, as risk reactions inevitably affect their activities. Participating in risk management discussions can help you develop more positive working relationships with key employees. It was observed that construction managers' success is tied to the success of the project and that they are willing to work together as a team to do something. Budgets also rely less on guesswork and the expectation of success is set. The team members will remain focused in a well risk-managed environment.

11. Negotiation Skills

Negotiation is the process by which two or more parties with different needs and goals discuss a problem to find a mutually acceptable solution. In construction, negotiation skills are important both in informal day-to-day interactions and formal transactions such as negotiating sales, rentals, services, and other legal

contracts. Good negotiations contribute significantly to business success as they help build better relationships and deliver lasting, quality solutions. It helps avoid future problems and conflicts rather than inadequate short-term solutions that don't meet the needs of both parties. Negotiations require giving and taking. Construction managers should aim to create a win-win, courteous, and constructive dialogue. Ideally, a successful negotiation involves making concessions that mean little to you and giving others that mean a lot. Their approach should promote goodwill regardless of the differing interests of the parties. A great negotiation clears out each party fulfilled and prepared to trade with each other once more. Construction managers often have strong negotiation skills that help them communicate effectively with stakeholders. For example, they may need to negotiate budget allocations, create staff schedules, and change orders. Knowing how to negotiate well can help make agreements that positively affect the projects and the employees. Construction managers need to be able to say no to unfeasible client expectations, disagree with suggestions that they think will negatively impact the project, and compromise if needed. Negotiation skills help construction managers to build respect. The significance of regard in trade is something that can't be exaggerated. If you want your employees or team members to be productive, it's essential that they respect you as their manager. The same applies to other external agents such as vendors, business partners, suppliers, and customers. Dealing with them also means they need to develop respect for you and your company. Negotiation also helps construction managers avoid problems. Problems are resolved by negotiation. From everyday disagreements to serious interpersonal or professional disputes, businesses face a variety of issues every day. Negotiation skills are valuable because they can adapt to many of the challenges facing managers and prevent serious problems from arising. If an agreement is reached before construction starts, disputes between the parties can be avoided.

12. Financial Management Skills

Mismamore (2019) showed that a construction project cannot start without proper budget planning. Managing project finances is one of the construction manager's greatest responsibilities. Even small changes can push a project over budget. Construction managers should be able to track project expenses, make forecasts, and even explore other funding opportunities. Financial management skills contribute significantly to our overall well-being and quality of life. These skills help construction managers manage company funds, save for emergencies, and invest to secure the company's future. Regardless of your profession, having good money management skills is important. An understanding of finance gives you the tools you need to measure how well your company is performing on its own and as part of the larger organization. It helps determine the answers to questions such as: Is your department performing well? Who should your department be compared to? What measures and indicators should be used to assess and monitor departmental performance? Many companies use the same metric for each department, choosing the wrong metric to measure and monitor performance, or overlooking the unique ways each department contributes to the company's bottom line. For example, a company that measures performance solely in terms of increased revenue targets may underestimate or completely overlook the costs of increasing those targets, even if they exceed revenue increases. Once managers understand the metrics that matter most to their company and properly measure their contribution to the company's finances, they can easily develop a plan to monitor them. Leveraging this data will allow us to measure the company’s contribution and identify areas for continuous improvement more accurately. Developing financial skills helps managers understand how the work they do specifically contributes to the company's financial health. However, construction managers can use their financial management skills to create budget plans, create financial forecasts, and track project costs for

construction projects. They can also use this feature to find other funding opportunities for the project. Overall, good financial management skills will help you use project resources more efficiently.

13. Technology Knowledge Skills

A deep understanding of technology helps construction managers identify and use the latest technologies in their projects. The right technology can help improve communication between team members and improve project efficiency and overall quality. As construction technology continues to evolve, it can be important to identify technologies that can add value to the project. The construction industry is still one of the least digitized industries, but it is slowly but surely catching up with the latest technology trends. Therefore, construction managers should be familiar with the latest innovations that help improve efficiency, collaboration, and success rates.

14. Openness to Feedback

Construction managers believed that being open to feedback means accepting constructive criticism. Good construction managers are not only steadfast and assertive, but they also listen to their opinions and opinions of others. Being open to corrections from clients and colleagues is important in this role. This means letting them know that they are free to share their observations with you. After providing feedback, let them know that you take their feedback seriously and thank them. Instead of waiting for feedback, construction managers can hear directly what their colleagues and customers have to say about the project. This may indicate that managers like to receive feedback and implement recommendations. Note that just because a person has achieved the rank of manager, it does not necessarily mean that the person knows everything and does not need further promotion. Most powerful construction managers are always open to feedback and suggestions from both their superiors within the organization and those who lead them. Construction managers should always be open to breaking new ground and doing what ultimately helps the company to succeed. A good construction manager may have solid industry knowledge, but that doesn't make feedback unnecessary. A veteran field worker can go unnoticed by even the best construction manager. For this reason, a construction manager must be open to feedback not only from clients and superiors but also from colleagues and team members.

15. Leadership Skills

Leadership is defined as the ability of a person, group, or organization to lead, influence, or direct other people, teams, or an entire organization. A construction manager with good leadership skills has a clear idea of what the company can achieve. The leader provides a roadmap outlining the steps and resources necessary for the organization to achieve its desired goals. With this skill, construction managers will be able to better connect and communicate the company's vision and message to their employees. Such communication helps identify roles better suited to their skills and experience, and clear communication motivates employees to work towards their goals. Great leaders have the decision-making skills and inspiration to help them make the best decisions for their company in every situation. A leader is an expert in making the right decisions based on prevailing circumstances and weighing the strengths and weaknesses of an organization to ensure that decisions work in their favour now and in the future. Active leadership encourages others to share the company's goals and gives everyone a strong reason to stay true to their responsibilities. They have an obligation to do their best. They stay focused on the company's long-term goals and are not discouraged by temporary setbacks. In the face of setbacks, great leaders motivate their teams and help them look beyond the issues that are holding them back from achieving their shared goals. The best leaders create an environment in which others can thrive. They are open to new ideas and ways to get results and are flexible enough to admit their mistakes. Successful leaders encourage their employees

to contribute to improving work processes and reward excellence. Team members need to feel that their leader can communicate with them. Good leaders learn from their mistakes. Mistakes can affect a leader's character. Learn from your wrong moves and use them to build confidence in your decision-making abilities next time. Leaders who share their mistakes with their team usually deserve more respect than those who try to hide them. Construction managers with strong leadership skills can work collaboratively with team members. A good leader does not do things alone. The best leaders ask their teams to join them when they take on the toughest jobs. Trusting your colleagues will give you engaged employees who are more invested in their work overall. Rosser (2021) added that construction managers with good leadership skills can train other good leaders. The only thing worse than training and firing employees is not letting them stay untrained. Great leaders are great mentors and coaches, love to see others succeed, and love to share their skills and knowledge. They are also good role models and inspire others to do their best. Construction managers with effective leadership skills increase the company's sales. Effective leadership leads to a well-run business, happy and productive employees, and increased productivity.

16. Construction Planning and Monitoring Skills

Starting work without a clear goal is disastrous for any construction project. Experienced construction managers know how to set clear goals. They also understand how to achieve them in the most logical and profitable way. The implementation of pre-construction planning by the construction managers ensures that the key stakeholders involved in the project work in harmony toward the success of the project. Everyone has a clear idea of what needs to be achieved. More importantly, they know exactly how to perform their part in the plan. Pre-construction planning helps determine project deadlines. Also, create a schedule to ensure all tasks are completed on time. A pre-determined schedule increases the chances that important project milestones will be achieved on time. With clearly defined goals, timelines, cost estimates, and your design, a project should run smoothly and successfully. However, if unexpected events or issues arise, it is important to consider those risks and issues during the pre-construction phase. Recognizing potential roadblocks and setbacks helps everyone on the team move forward with quick and effective solutions. Project costs are estimated during the pre-construction planning stage. An experienced construction manager will provide an accurate estimate for the subsequent work. More importantly, they stick to these estimates throughout the project. Pre-construction planning helps ensure that all factors in project cost are considered. It also prevents unwanted surprises along the way. No project goes perfectly according to plan, but a well-designed monitoring and evaluation plan can help projects stay on track and function well. A plan and oversight plan helps define the scope of the project, determine interventions when problems arise, and let everyone know how those interventions will affect the rest of the project. When a problem arises that cannot be resolved, a quick and effective solution can be implemented. Every project needs resources. The amount of money available determines things like the number of people working on the project, the scope of the project, and the solutions available if things get out of hand. Without planning and controlling, it's not clear which areas need to be prioritized. Resources can easily be wasted in areas that are not at the root of the problem. Monitoring and evaluation help avoid this waste. Mistakes and failures are part of every organization. Monitoring and evaluation provide a detailed blueprint of everything that worked and didn't work during the project. In-depth monitoring and assessment documentation and templates help organizations identify specific errors as well as deduce the cause of problems. Organizations often learn more from failure than from success. It takes many organizations time to develop a good monitoring and evaluation plan. This process is very useful for the

organization. There is also a need to develop methods for collecting, distributing, and analyzing information. Developing monitoring and evaluation plan also requires an organization to determine the desired outcomes, how to measure success, and how to adapt the overall project to achieve those outcomes. Good organizational skills are useful in all areas of an organization. Each team member provides an important perspective on how a project or program is performing. By cultivating diversity of thought and exploring new ways to gather feedback, the benefits of monitoring and evaluation increase. Monitoring and evaluation tools like surveys are only truly useful when they include a wide range of people and responses. All voices matter in a good monitoring and evaluation plan.

17. Time Management Skills

Effective time management is about using your time productively to get everything you set out to do. It organizes and schedules your time between the tasks you need to complete. This can include homework, projects, study groups, or extracurricular activities. Good time management requires that you focus activities on results. Being busy doesn't mean you're efficient. With good time management, you can complete your tasks with minimal effort and make the most of your time by working smarter, not harder. Good time management helps to construction managers reach their goals faster. Good time management makes managers more effective. Instead of multitasking, focus on one activity at a time over a period. This way, construction managers give the best of themselves, so they can reach their goals faster. With good time management, construction managers can set aside time to work on their projects. Construction managers can easily get stressed out when they have a long list of things to do and they don't have enough time to do them. Good time management allows them to prioritize tasks and tackle them first. This way they know exactly what they need to do and how much time they need for each task. It reduces their anxiety and overall stress because they have plenty of time to do everything. Procrastination is a slippery slope that leads to stress, frustration, and bad grades. Setting aside time for a task gives construction managers the motivation they need to complete it. It helps them overcome laziness, which often contributes to procrastination. Good time management also allows managers to allocate enough time and get help to tackle the task. However, by managing your time well, you can get your job done on time. This instills a sense of confidence and accomplishment in your abilities. Going through a long to-do list can also trigger these feelings and can act as a motivator to improve your time management skills. Learning good time management skills can help you outside of school as well. When you are hired, it can help you become a reliable employee who delivers high-quality, dedicated work on time. This enhances your value as a manager, improves your professional reputation, and opens more opportunities to advance your career.

18. Research Skills

Research skills can be described as the ability to provide in-depth information, detailed analysis, and meaningful advice on a specific topic after extensive research into that topic. This includes articulating the problem, citing good sources, and explaining findings and results in report form. Research skills help people identify a problem; gather information to help solve the problem, evaluate the quality and importance of these resources, and find an effective solution to the problem. According to Birt (2020), research skills are the ability to find an answer to a question or a solution to a problem. These include your ability to gather information about a topic, view data, and analyze and interpret details to find a solution. Research skills are essential to advancing your career because they are directly related to your ability to gain insight and inspire action in yourself and others. With the help of research skills, the construction manager can fill in known gaps that will help him or her complete the

project more efficiently or successfully. These skills not only help people write better research papers, but also teach them all the problem-solving skills they need to solve problems in the workplace.

19. Interpersonal Skills

Interpersonal skills are important in personal and professional life when interacting and working with groups and individuals. People with strong communication skills tend to build good relationships and work well with others. They understand family, friends, colleagues, and customers very well. Interpersonal skills are skills and talents that help you communicate and interact with other people. There are very few jobs where someone works 100% alone; even roles you might think are mostly solo affairs require human interaction and teamwork. Simply put, interpersonal skills are the tools you use to get along with other people. Think back to your childhood on the playground: remember what happened to the kids who didn't play nice, didn't share, and acted like all kinds of gremlins? Other children refused to interact with them. A similar dynamic can occur in the workplace if you lack good communication skills. An inability to work and interact positively with others can destroy your career. No one will put your name up for that promotion or think of you when they discover an opportunity that you would otherwise be perfect for. You can be a great software engineer, art director, or marketing manager, or construction manager; but ultimately, if the work is unpleasant and burdensome, the value of these technical skills is limited. The negative consequences of poor interpersonal skills can damage more than an individual's career; Organizations that employ people without these skills also suffer. A lack of interpersonal skills leads to ineffective coordination - difficulty coordinating interactions between co-workers. Time is simply wasted waiting for responses to inquiries. This causes unwanted messages such as low-priority calls and emails. It also creates barriers to collaboration - factors that directly hinder communication between employees. Interpersonal abilities incorporate self-confidence, relationship administration, and collaboration aptitudes. The ability to work well together as part of a team allows the team to work together more productively and execute the project more efficiently. Relationship management skills are also important because they enable the construction manager to develop and maintain relationships with customers, vendors, and team members. The right level of trust can also improve team confidence, boost morale and enable better results.

20. Human Resources Management Skills

Human resource management is an umbrella term that includes activities that help you manage your employees. This starts from the moment recruitment and hiring begins and includes performance management, employee development, and effective communication. This continues with the establishment of proper protocols for firing employees and continues beyond that. With human resources management skills, construction managers can secure top talent. Attracting the industry's leading talent requires a lot of commitment. It takes time, energy, and money. By defining your company culture based on your mission, vision, and values, you attract strategic talent. You gain access to industry expertise and knowledge that enables you to make informed decisions more effectively. Staff retention improves when construction managers have good human resources management skills. Real-time feedback can uncover hidden problems, find solutions to problems, and ensure your employees feel valued. Using proven performance management tools, you can turn your employees into productive and efficient teams. Team building can help your employees reach their full potential, which can lead to increased business productivity and profits. An important part of personnel also ensures the safety of employees during their work. By using on-site risk management programs and industry-specific assessments, you can reduce the likelihood of workplace accidents. Good

human resources management skills can help reduce compliance issues. One of the things that make it difficult for human resources management is relying on back-office resources to get things done. By partnering with an external professional employer organization (PEO), you get access to a complete human resources management software platform with self-service and mobile tools that allow you to manage your resources in real-time. This way you can save time and energy and get instant access to the information you need to make the right decisions. Your employees or team members will also benefit from the human resources technology platform. This technology integration gives you access to the human resources information you need anytime, anywhere

21. Knowledge of Stakeholders' Needs

All companies have stakeholders. Stakeholders can be anyone your business interacts with. It could be the local community around you, the government around you, your employees, customers, competitors, or anyone who interacts with you and your business. Stakeholders are very important for companies to optimize marketing and communication strategies. By identifying your stakeholders, you will learn who is connected and interested in your business, what financial or emotional investment they provide to your business, and what your company's reputation is. In this way, companies can promote, communicate and sell their products/services to the right people who actively need them. Why do we need to identify the needs of all stakeholders? It is important to identify the groups that are most important to know your target market. The relationships identified in your list of key stakeholders allow your business to build positive networks, develop credibility, understand where gaps exist, and tell you what has made your business successful. Lyon (2020) found that if you don't know your stakeholders, you're not only wasting your time and money, but you're also wasting the time of someone who doesn't need the product or service. This can lead to annoying potential future customers and weaken your business brand. To identify stakeholders, you need to conduct a stakeholder analysis that guides and prioritizes the most important stakeholders for your business. You will learn which communication channels and strategies will effectively reach your stakeholders, and you will successfully communicate your key messages clearly. You know which posts on your social media platforms or website will keep your target market engaged. You have the power to adjust your strategies to attract people who will positively affect your business. This saves your organization time and money and increases engagement with your audience. This is why this skill is imperative when hiring a construction manager.

22. Understand Project Objectives

A clear project goal will help you know where you are going with your project. Without a project goal, you have no easy way to know whether your project succeeded or failed—and you can't plan improvements for the next project. If team members do not have a clear understanding of how their work fits into the larger projects and company goals, they will be less motivated and less engaged. Note that project goals are not company goals; they are an intermediate step that connects individual work to project work with your company goals. So when you have clearly defined project goals, your team members can constantly evaluate their work and focus on the goals when they drift. Construction managers need to think of their goals as a compass that helps their team continue in the right direction.

23. People Skills

People skills are transferable and evergreen. Unlike technical skills, which may only be relevant to one company or industry, or even only for a certain period of time, people skills have lifelong value. The ability to communicate well and collaborate with others will never lose its importance, regardless of the coming and going trends of the industry or the strategic direction of your company. on a personal level, because people skills are generally useful, they can help you move more smoothly into new industries or even a new career. People's aptitudes can enhance their capacity to memorize other abilities. Learning a new skill requires listening, asking questions, clarifying understanding, and often reinforcing new skills by practicing with others. The better you are at actively listening, asking thoughtful questions of others, communicating clearly, and collaborating with team members, the more likely you are to learn faster and remember more. Human skills can bridge generational gaps. If you want to bridge generational gaps, give people the common tools and frameworks they need to communicate more effectively with each other. People skills can resolve philosophical or personal differences. People who work together don't always agree with or like each other. But disagreements can be overcome, or at least respectfully productive if people have the active listening skills and communication tools needed to respond to colleagues' concerns or comments without getting defensive. People skills can reduce the pain of change. While you can never eliminate it, you can manage it with clear and targeted communication. People skills can improve performance. Poor communication costs companies a lot of money, time, and resources.

24. Critical Thinking

Critical thinking is the analysis of available facts, evidence, observations, and arguments to make a decision. The subject is complex; there are several different definitions, which usually include a rational, sceptical, and unbiased analysis or evaluation of factual evidence. Crockett (2019) believed that critical thinking skills promote curiosity. Curiosity helps us gain a deeper understanding not only of the world around us but also of the things that matter in our experience of that world. This applies to the subjects we teach at school and the subjects we consider important in our daily lives. Effective critical thinkers are still interested in many topics and usually have broad interests. They maintain a curiosity about the world and people, and an understanding and appreciation of the cultures, beliefs, and perspectives that are common to our humanity. Because critical thinkers are curious by nature, opportunities to apply critical thinking skills are around them all the time. The desire to think critically about even simple things and tasks, show a desire for constructive results. Effective critics also don't take anything at face value. They never stop asking questions and enjoy exploring all sides and deeper facts of a problem with all kinds of data. It increases creativity. Critical thinkers are also the most creative thinkers. Creativity has unquestionably established itself as an important skill in the modern collaborative workforce. Critical thinking largely depends on a person's ability to be creative. When companies are creative with their products and their advertising, they succeed in the global market. The change in valuing creativity and its ability to increase turnover by increasing product value can be seen in all market segments. Critical thinking also strengthens the ability to solve problems. Those who think critically are usually instinctive problem solvers. The hallmarks of a true critical thinker are patience and dedication to truly understand a problem. This is the main reason why strong critical thinking skills are essential to being an effective problem solver.

Developing strong critical thinking skills prepares us to face complex problems that matter to the world. Critical thinking is known to span many disciplines and a wide range of cognitive skills. Indeed, one could say that it is an interdisciplinary activity of the mind, and the mind needs to be trained to stay healthy just like a muscle. Critical thinking promotes independence. Independent thinking skills are at the forefront of learning to be not only a great thinker but also a great leader. Such skills teach us to understand the world based on personal experience and observation and similarly make critically informed decisions. As such, they gain confidence and the ability to learn from mistakes as they build a successful and productive life.

25. Systems Thinking Skills

Companies are constantly trying to grow and solve problems in their organization with the help of different systems. An organizational system can have several elements or subsystems, each of which has its own cause-and-effect relationships. Systems thinking approaches can help you understand these relationships and use that knowledge to adjust the system until it achieves the desired results. You can achieve this by analyzing the elements of the system and how they can affect each other in the workplace. Elements of a workplace system can include personnel, technology, and information. System thinking typically involves examining the relationships between these elements and how they affect each other. Systems thinking can help you find new ways to improve efficiency and resource efficiency. Studying the interactions between an organization's system and its elements can help develop new ideas and innovations. It also allows you to quickly identify problems and test new solutions to those problems. Mistakes can happen if you make decisions without proper research or systematic analysis. System thinking helps you anticipate the consequences of decision errors and minimize their impact on the system. Before making management decisions, it is important to thoroughly analyze the system. Understanding the relationships between system elements can help you make realistic plans. Construction managers can set achievable goals for the organization based on their information system and the interaction of its elements. Based on this, construction managers can even create a strategy for the future of the wider company that will help motivate them and their colleagues. Systems thinking can fix broken models. Construction managers can integrate the goals of different departments and projects into the new system design. If they find that the operation of one system can positively affect the operation of another system, they can change the future to emphasize this cooperation. Construction managers can also use a similar process to reformat a broken system.

26. Business Management skills

The business plan is a guide for companies. It performs the following main functions such as providing a logical and structured overview of the company, and highlighting the main activities carried out at different stages. It provides guidance for benchmarking ongoing progress. It determines the key resources (manpower, machinery, time, etc.) needed at different stages of the company's growth. This contributes to participative management because all employees are aware of upcoming activities. It also provides an authentic document to communicate aspects of the company with financiers, the board, and other stakeholders.

27. Discipline Skills

Thakur (2019) defined discipline as the ability to give up immediate gratification or pleasure in favor of some greater good or more satisfying result, even if it requires effort and time. This ability leads to self-confidence, self-esteem, and inner strength, and thus happiness and contentment. On the other hand, a lack of self-discipline can lead to failures, losses, health and relationship problems, obesity, and other problems. Self-discipline gives you the strength to stick to your decisions and implement them without changing your mind and is therefore one of the important

prerequisites for achieving your goals. It is a very useful and necessary skill in everyone's life, and although most people understand its importance, few do anything to develop and strengthen it. Self-discipline allows you to choose and persist in actions, thoughts, and behaviours that lead to healing and success. It also gives strength and inner strength to overcome addictions, procrastination, and laziness and overcome whatever you do. It is a very useful and necessary skill in everyone's life, and although most people understand its importance, few do anything to develop and strengthen it. Often, life brings challenges and problems to success and achievement. To overcome this, you have to act persistently, which requires self-discipline. Discipline also helps heal and overcome eating disorders, addictions, smoking, drinking, and other negative habits. Self-discipline is critical to overcoming eating disorders, addictions, smoking, drinking, and other negative habits. It is also an important prerequisite for studying and learning, developing any skill, and the success of self-improvement, spiritual growth, and meditation. Developing this skill helps to avoid impulsive actions; to continue working on the project even after the initial enthusiasm has faded; go to the gym, walk or swim if you just want to lie down or sit and watch TV. Learn to wake up and wake up early. Give up the habit of watching too much TV; meditate regularly; overcomes laziness and procrastination; Keep your promises to yourself and others. Discipline skills make it easier to learn the value of time. Time waits for no one. Discipline is not just about embodying good and bad or following a morally correct way of life. It also becomes one of the ways to control and control your feelings. When you are faced with a confusing and stormy situation, you must stay away from your anxiety, fear, and all the negativity that you can summon into your mind. Letting your emotions takeover would leave you exhausted and overwhelmed. Making choices is one of the most powerful and exhausting powers humans have been given. You can make a good choice and choose a better one today and tomorrow or make a bad one and walk away. Adopting a disciplined self would help you distinguish between what is right and what is against the nature, law, and rules of civil society. Discipline helps to become active. When you choose the lines of discipline, you realize that life is not about sitting and waiting for a knock on the door. The awareness that sitting and thinking for hours, days, weeks and months will not help. Then you become active and take responsibility for your life. You, in turn, will become a better and improved version of yourself if you shed the lingering laziness that has prevented you from taking a step toward your dream for a long time. Discipline helps achieve success in both academics and careers. It will also help you become the best version of yourself. Success only comes when you earn it. We cannot deal with our current personalities. So we need corrections every day. To succeed in life, we must become the best version of ourselves. Self-discipline helps us improve ourselves every day. However, self-discipline is essential for success and growth in life.

28. Self-driven Skills

Eatough (2022) found that self-motivation, or self-management, is an internal pull that leads to action to achieve a goal. It keeps us going even when we don't want it to. Successful people did not become successful by being indifferent to their goals. They achieve their goals and keep setting new goals because of their own motivation. Self-motivated skills help to learn to present our best self in every task; become more flexible, because achieving goals requires time and effort. We have a passion to succeed because passion drives people; help seek feedback as a learning opportunity and take initiative to improve time management. When you're self-motivated, you do more than just give yourself a chance to check off a to-do list. Self-motivation also means having enough self-awareness to know what works for you and what doesn't. Instead of relying on others to give you a reason to act, your motivation comes from within. Your desire stems from your interests, values, and

passions, not from someone else's control. As the name suggests, self-motivation works through you, internally. It does not depend on others. When you motivate yourself, you push yourself to achieve your personal goals through hard work and passion. You are the one who looks for new opportunities and does the inner work necessary to make long-term changes. It requires constant effort, self-discipline, and true self-confidence. It affects both your work and your personal life. You can struggle without it. However, self-motivation is the secret weapon that helps construction managers for achieve goals.

29. Forecasting Skills

Business forecasting consists of tools and techniques used to predict changes in business such as sales, costs, profits, and losses. The purpose of business forecasting is to develop better strategies based on these informed predictions; helping to eliminate potential breakdowns or losses before they occur. Forecasting is valuable to businesses because it enables them to make informed business decisions and develop informed strategies. Financial and operational decisions are made based on current market conditions and future forecasts. Past data is aggregated and analyzed to find patterns that are used to predict future trends and changes. Forecasting allows your business to be proactive instead of reactive. Forecasting can help you set goals and plans. Forecasting allows companies to set reasonable and measurable goals based on current and historical data. Analyzing accurate data and statistics helps companies decide how much change, growth, or improvement is considered a success. Achieving these goals helps assess progress and adjust business processes if necessary to continue on the desired path. Forecasting skills can be used to build a budget. Visibility into potential trends and changes helps companies know where to allocate their budget and time to specific offerings such as products, and services or internal areas such as recruitment and onboarding strategy. Forecasting skills can help anticipate changes in the market. In addition to current knowledge, predictions about what will happen in the future help companies change their business strategy and change their current actions to change results. Forecasting helps businesses to be proactive rather than reactive. If there is a trend that predicts a market takeover, or if the data shows changes in consumer behaviour, it is important to adapt to the general market and optimize resources to differentiate yourself from the competition.

30. Safety knowledge Skills

The impact of casualties cannot be measured. They can also have serious consequences for workers and their families and friends. Therefore, occupational safety and health measures are necessary. They are essential to the well-being of both employers and employees. The sense of security that comes from knowing you will return home safely from work is more important than anything else. Occupational safety and health risks exist in every company. Factors affecting occupational safety include hazardous working conditions, environmental hazards, drug abuse, and workplace violence. To combat safety risks, employers must create strategies that ensure and promote occupational safety. Construction managers also need to learn the safety and security aspects their employees want. This helps increase productivity and quality. There is strong evidence that doing good work is good for mental and physical health and well-being. Proper occupational health and safety can bring many benefits to people and organizations. This helps construction managers protect workers. The purpose of following occupational health and safety guidelines is primarily to protect employers and their employees from injury, illness, or other harm in the workplace. One of the main benefits of following health and safety practices is the prevention of common occupational injuries such as back pain, falls from height, asthma, slip and trip injuries, and asbestos-related diseases. Absenteeism could be reduced with a good and safe work environment. Therefore, following occupational health and safety guidelines and maintaining a safe workplace reduces the risk of work-related illnesses

and accidents, and thus employee absences. Employers also save money to cover the immediate costs of absence from work, such as paying wages. Better safety means better health. Healthier employees perform tasks more efficiently and are generally happier. Productivity improves when job security is improved. When team members can work in a safe environment, it improves morale and overall productivity. By maintaining occupational health and safety practices, thereby reducing absenteeism and improving productivity, more money can be saved by retaining employees. The money spent on absenteeism and recruitment processes decreases and the business income increases. A safer environment promotes productivity. Productive employees are an asset to all businesses. When construction managers are concerned about the safety of their workers, workers tend to be more confident and comfortable.

31. Quality Management Skills

According to the literature, using ISO 9001 can help ensure that your customers receive consistent, high-quality products and services. This, in turn, can lead to new business activities as well as: better efficiency and less waste; better and consistent control of core business processes; better understanding of customer needs; regulation of successful practices; improved risk management; increased customer satisfaction; improved employee involvement, better internal communication; better consistency in product and service quality; distinguish the company from competitors; increased profits; reducing costly errors; exploit new markets; more effective management of economic growth; and embedded quality culture. However, a construction manager who is thoroughly familiar with quality management procedures can guide the company and lead it to success. Quality management systems have been found to enable companies in highly regulated industries to consistently implement quality processes to produce products that meet customer expectations and regulatory requirements. The enemy of quality management is inconsistent performance. Without standardized operations, your organization cannot consistently ensure product quality or improve efficiency. Operational continuity is an important part of quality management systems. Implementing a quality management system requires companies to define and describe best practices in all business responsibilities, from quality control to management reviews. Establishing standard operating procedures (SOPs) and established checks and balances minimizes the risk of deviations and maximizes organizational efficiency. Implementing a QMS helps companies achieve stability in project activities and directs efforts to produce high-quality products that meet customer expectations. A consistent approach can save money. Operational consistency can provide other measurable benefits, such as shorter processes, fewer customer complaints, and greater predictability. Continuous improvement is one of the basic principles of ISO 9001 and other quality systems. Continuous improvement should be the primary goal of every employee to embrace the principles of incremental improvement and breakthrough improvement. An effective quality management system should create standardization where standardized processes add value and promote flexibility when necessary to achieve quality goals or for continuous improvement. One area where a quality management system should encourage flexibility is in making evidence-based decisions based on real-time monitoring of systems and data. Evidence-based decision-making can benefit an organization by removing subjectivity from management. Real-time use of information can drive continuous improvement toward strategic goals. However, a competent construction manager must understand that management systems can improve efficiency by preventing problems during the product life cycle, providing the means to identify problems before they lead to rework, waste or deviations.

32. Ability to Learn

Rodriguez (2022) revealed that construction managers and team members must have the ability to learn new things because learning new things ensures safety. Getting to know each other keeps your mind busy and your body busy. With it, you get fresh insightful views of the world around you. It helps you learn new knowledge, trains your brain to deal with various obstacles, and keeps your neural pathways working. All these factors keep you healthy. Learning is also exciting and rewarding and can be therapeutic for a troubled mind. It helps you discover your unknown potential, so with one career, you stop beating yourself up for failure. Developing your skills will help you realize how useful you are to people, and it will make you happy and mentally healthy. Learning new things opens up many opportunities for growth. You have an excellent opportunity for promotion while you study the program. No matter what new skills you learn, there is always a new opportunity. New revenue streams are very important, especially now that most of the world's economies are facing financial difficulties. The ability to learn improves your ability to adapt to any situation. Many employees struggle at work when a new Chief Executive Officer arrives, or drastic changes occur in their daily work. . For example, if you take a time management course, you will have more flexibility and space to adapt to change. Time management training will also help you adopt new ways of working for optimal performance. Also, note that the ability to learn new skills builds confidence and promotes a growth mindset. It will help you grow as a professional and as an individual. Learning new things keeps you informed. As a professional, you must keep up with technological developments; otherwise, you will be replaced as soon as possible. Note that the job market is constantly evolving, the economy is changing, and technological advances are spreading to all industries. It would be impossible for you to achieve your career goals without retraining and flexing your professional muscles. You can't stay ahead of your competitors without knowing something they don't know. When you learn new skills, you can adapt to any situation. It gives you a sense of accomplishment. Know your worth and the work that can be done with you. Your new opportunities are created; it makes you feel important and motivated. It is also interesting that not only in professional life but also as a person. You can grow by acquiring new skills. You can improve yourself. It also gives access to new and different opportunities. You can develop yourself and that is growth. Learning new skills means you can do more work or invest in many jobs. From now on, you can earn more than you deserve. It facilitates your income in your workplace. When you learn a new skill, you feel like you've accomplished a lot. And you are also interested in learning new skills from others, as you know, acquiring new skills is very beneficial for you. Skills give you success. You get creative and new ideas by learning new skills. You can solve any tedious work with your creative ideas. You can achieve new goals and set new goals as well. Learning new skills gives a new feeling. With your new skills, you can invest in any unknown. Life is about learning new things. In addition, success in professional life also depends on learning new skills. Adapting new skills to your professional life gives you a sense of accomplishment. Know your worth and the work that can be done with you. However, a construction manager with new skills can attract co-workers and this can lead to promotion, job security, good job offers, increased knowledge, and confidence.

33. Ability to Seek Advice

Garvin and Margolis (2015) believed that asking for and giving advice is central to effective leadership and decision-making. But managers rarely think of them as practical skills they can learn and improve. Receiving instructions is often seen as passive consumption of wisdom. And counselling is usually seen as a skill of good judgment—you either have it or you don't—rather than a skill to be acquired. Those who are truly open to guidance (not just looking for confirmation) develop better solutions to problems than they can alone. They add nuance and texture to their thinking

— and research shows they can overcome cognitive biases, self-serving reasoning, and other logical flaws. Those who advise effectively exert gentle influence—shaping important decisions and empowering others to act. As engaged listeners, they can also learn a lot from the problems people present. And the rule of reciprocity is a strong binding force. Expert advice often creates an implicit debt that the recipients want to repay. However, advisers and counselees must overcome important obstacles, such as a deep-rooted tendency to favor their own opinions, regardless of their merits, and the fact that careful listening is difficult and time-consuming work. All communication is a subtle and complex art. It requires emotional intelligence, self-awareness, restraint, diplomacy, and patience on both sides. The process can fall apart in a number of ways, and distorting it can have harmful consequences - misunderstandings and frustrations, decision blocks, poor quality solutions, broken relationships, and personal development - at significant costs to individuals and their organizations. When you ask for support, you maintain focus and energy when the task is shared with others. You create more flow, which makes the journey fun and easy. When you ask for support, you create an opportunity for others to share their gifts and talents. You let others shine and learn more about others' strengths and passions. When you ask for support, you let others experience the joy of giving. When we give or receive a gift, oxytocin is released, a powerful hormone that stimulates bonding. When you ask for support, you trust others, which builds trust between you and your supporters. When you ask for support, you are telling them that you are imperfect, just like everyone else, and that others can see you. No one is idealized and everybody has room to develop.. However, strength lies in being vulnerable, in being human. We are designed to create life-changing experiences together.

34. Full Commitment Skills

According to Krajcsák and Iren (2013), Work commitment, or job commitment, is defined as the enthusiasm of an employee for the tasks given at the workplace. It is the sense of responsibility that a person has to the goals, mission and vision of the organization he joins. Asserting your loyalty to your specific industry and workplace is an important step in advancing your career. Commitment and initiative in the workplace strengthen working relationships and can lead to better overall performance. Showing a commitment to success at work earns the trust and respect of management and can position you for potential leadership positions and career opportunities. Engagement at work is important because employers are often looking for people who can help a company or organization succeed and take an active role in ensuring the company's success through their professional development and engagement. A balanced workforce with low turnover allows the company to invest in employees, offering high-quality professional development opportunities and creating a positive company culture. Your enthusiasm for your work and workplace helps secure your role in the company and makes you a reliable employee who supports the company's long-term vision, mission and goals. The credibility you gain when you're engaged at work makes you a valuable employee, highlights your strengths, and can alert your manager to promotions at your company. You can also use your honed skills to demonstrate your commitment to the job on your resume as evidence of transferable skills that will help you make a career change. Use your skills to develop your career. Engaged employees bring added value to the organization through their determination, proactive support, relatively high productivity, and quality awareness. Dedicated employees are also less likely to get sick or leave the organization. Disengaged employees can work against the organization and slow down the organization's success.

V. RESULTS AND DISCUSSION

Findings from the 8 vibrant employers of labour revealed the key construction project management skills that are necessary when engaging construction managers in projects of significant value. These project management skills are indicated as follows:

EMPLOYER A

Employer A indicated that the most interesting skills to look for are communication skills, negotiation skills, delegation, flexibility, industry knowledge, and risk management skills.

EMPLOYER B

Employer B indicated that the most imperative skills to look for are construction planning, human management, understanding project timelines, stakeholder needs, project purpose, community involvement, and reporting timeously.

EMPLOYER C

Employer C indicated that the most crucial skills to look for are project management, critical thinking, systems thinking, people skills, business management, construction management, and cost management.

EMPLOYER D

Employer D was of the view that the most important skills to look for are communication skills, leadership skills, problem-solving, money management skills, construction knowledge, and people management skills

EMPLOYER E

Employer E indicated that discipline and self-driven, forecasting, ability to execute proper planning, overseeing the project, good communication skills, tracking and monitoring projects, safety complaints, being within the budget, and quality control should be considered when hiring a construction manager.

EMPLOYER F

Employer F was of the opinion that the most key skills to look for are communication skills, leadership, team building, delegation, the ability to work under pressure, interpersonal, and problem-solving skills.

EMPLOYER G

Employer G specified that the most significant skills to look for are, can do, will do, will learn, ask for advice, and ability to apply known technologies in strategies in new ways.

EMPLOYER H

Employer H indicated that commitment, risk management, organizational skills, exceptional communication skills, and good leadership skills are the key indicators to consider when engaging a construction manager.

FIGURES AND TABLES

Table 1. SUMMARY OF FINDINGS

		EMPLOYER	A	B	C	D	E	F	G	H
	SKILLS									
1	Communication		✔	✔		✔	✔	✔		✔
2	Delegation		✔					✔		
3	Negotiation		✔							
4	Industry Knowledge		✔							
5	Risk Management		✔							✔
6	Flexibility		✔							
7	Construction Planning & Monitoring			✔	✔		✔			
8	Human Resources Management			✔						
9	Understand Project Timelines,			✔			✔			
10	Understand Project Purpose			✔						
11	Understand Stakeholder Needs			✔						
12	Critical Thinking				✔					

13	Systems Thinking				✔					
14	People Skills				✔	✔				
15	Financial Management				✔	✔				
16	Business Management				✔					
17	Leadership Skills					✔		✔		✔
18	Problem-solving					✔	✔			
19	Industry knowledge					✔			✔	
20	Discipline						✔			
21	Self-driven						✔			
22	Forecasting						✔			
23	Safety Knowledge						✔			
24	Quality Control						✔			
25	Team Player							✔		
26	Ability to Work under Pressure							✔		
27	Interpersonal Skills							✔		
28	Technology Knowledge								✔	
29	Seek for Advice								✔	
30	Ready to Learn								✔	
31	Full Commitment									✔
32	Organizational Skills									✔

The research showed that 6 out of 8 vibrant employers of labor are very concerned with the ability to communicate effectively before they will engage any construction manager in the construction business. This means that construction managers who lack effective communication skills may likely have less chance to secure a management role in the construction environment where effective communication skill is highly needed. 2 out of 8 employers believe that delegation skill will play an imperative role in the recruitment process. Perhaps, many employers of labor do not normally agree with the construction manager delegating responsibility due to fear of project failure. 5 out of 8 employers considered negotiation skills, industry knowledge, and flexibility skills as key indicators when recruiting construction managers for projects of great value. However, it is clearly understood that these 3 critical skills contribute much toward the project's success. Also, 2 out of 8 employers noted risk management skills, understanding project timelines, people skills, financial management skills, problem-solving skills, and industry knowledge skills as imperative factors to consider when hiring construction managers. This indicates that any construction manager with little or no attributes mentioned above may have little to contribute toward the successful delivery of a construction project. Therefore such construction managers may have little or no opportunity to be hired in the construction business. The report in Table 1 above indicated that the issue of human resources management skills, understanding stakeholders' needs, critical thinking ability, business management skills, discipline & self-driven, forecasting attributes, safety knowledge skills, quality control ability, team player attributes, ability to work under pressure, interpersonal skill, technology knowledge, ability to seek advice, ready to learn new things, full commitment, and organizational skills need to be addressed because the employers of labor in the construction industry have considered them as critical indicators that can influence the chances of construction managers being hired in the construction business. However, 3 out of 8 employers believed that

construction planning & monitoring skills, and leadership skills should be considered as a major selection criterion when engaging a construction manager in construction projects of exclusive value. 32 imperative management skills were revealed by the employers as shown in Table 1 above. The literature also discovered research skills and openness to feedback as added advantages. It is clear from the findings that every employer has his or her own special skills in mind when recruiting any construction manager in the construction business.

VI. CONCLUSION

This study provided insight into project management skills employers of labour normally look for when recruiting construction managers in the construction business. The value of project management skills in the construction industry should not be neglected. These skills posed a major challenge that can lead to project failure and low productivity in the construction industry. The study identified 34 critical skills employers of labour may consider when hiring construction managers. The success of any construction project is determined by the capability of the construction manager on board. Experienced construction manager helps the company to save money and enhance the company's reputation in the business. Productivity in the construction business can be improved by using project management software. If construction managers involve everyone on the same page, then, everyone's chances are better coordinated for a successful project. A good communication and teamwork environment reduces the cost and wasted time of sending and receiving messages between team members during different phases of the project. Knowing project management skills is of great value to successful project delivery. Construction managers should be involved in project management skills refresher training to function well. It is also quite interesting to note that no matter how skilled the construction manager is, if the employer (as the major stakeholder) is not communicative and proactive in responding to notifications, the construction manager will still not deliver. However, all stakeholders are needed as a team to achieve greater success in the construction industry.

VII. RECOMMENDATION(S)

Further studies are required to identify how project management skills could be developed.

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CONFLICT OF INTEREST

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Area and Power Efficient Multipliers Using Approximate Compressors and Full Adders for DSP Applications

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ABSTRACT

In this project, a new approximate full adder is proposed and applied in the reduction stages of multiplier. Using the current approximate 4-2 compressors as well as proposed approximate full adder designs are used for developing an 8-bit multiplier. For applications that are error robust, approximate computing can lessen design complexity while boosting performance and power efficiency. We can learn a lot from marginally inaccurate outputs in the majority of multimedia apps. Consequently, we are not required to create precise outcomes. In order to benefit from the relaxation of numerical exactness, this brief discusses a new technique to gate level logic modification for full adder approximation. The sum term of the conventional full adder is altered to reduce an area complexity. The effectiveness of the proposed method is synthesized and simulated using Xilinx Vivado.

Keywords :- Approximate full adder, inaccurate multiplier, and approximate compressor.

I. INTRODUCTION

An emerging strategy in digital design is approximation computing, which aims to provide considerable performance increase in design parameters. For embedded and mobile systems, which are defined by stringent energy and speed limits, this strategy is becoming more and more crucial.

Approximate computing may be used in a variety of error-tolerant applications. Examples include machine learning, data mining, and multimedia processing. Multipliers are crucial parts of microprocessors, digital signal processors, and embedded systems, with applications ranging from filtering to convolutional neural networks. Multipliers are one of the most power consuming digital blocks, but they are also distinguished by complicated logic architecture. As a result, the design of approximate multipliers has drawn significant study attention recently.

Partially producing products, partially reducing produced products, and carrying out carry-propagate addition are the three fundamental building components of a multiplier. Any of these building blocks may include approximations. This approach avoids the formation of partial products and, by using the proper correction functions, minimizes truncation error.

Energy-efficiency has become the paramount concern in design of computing systems. At the same time, as the computing systems become increasingly embedded and mobile, computational tasks include a growing set of applications that involve media processing (audio, video, graphics, and image), recognition, and data mining.

A common characteristic of the above class of applications is that often a perfect result is not necessary and an approximate or less-than-optimal result is sufficient. It is a familiar feature of image processing. Such applications are imprecision-tolerant. The primary purpose of this paper is to review the recent developments in the area of approximate computing (AC). The common underlying thread in these disparate efforts is the search for solutions that allow computing systems to trade energy for quality of the computed result. In this paper we focus on the solutions that involve rethinking of how hardware needs to be designed.

A developing method in digital design called approximation computing relaxes the need for precise calculation in order to greatly improve performance in terms of power, speed, and area.

A new development in digital design is approximate computing, which compromises accuracy for increased performance in terms of speed and power. In the paper they proposed a novel approximate compressors and 8 bit and 16 bit multiplier designs to evaluate the performance of the proposed compressors.

This article's goal is to present a thorough analysis and a comparative assessment of recently created approximate arithmetic circuits. Applications of these circuits in the field of image processing and deep neural networks show that the circuits with lower error rates or error biases perform better in straightforward calculations like the sum of products. A higher approximation can be accepted in multipliers than in adders since such complex computations are more susceptible to addition errors than multiplication errors. Along with benefits for performance and power consumption, the usage of approximate arithmetic circuits can enhance the quality of deep learning and image processing.

II. EARLIER WORK

The previous or existing method involves Dadda multiplier using exact multipliers. These exact multipliers uses 5 inputs and produces three outputs.

The major emphasis of the field's research was the construction of parallel digital multiplier circuits, which were significantly less optimised than adder circuits.

Dadda's work reduces the amount of additions and optimizes their arrangement to shorten propagation latency. Comparing this solution to earlier ones, especially the Wallace one that comes just before it, the Wallace parallel multiplier method dramatically reduces the count of logic gates used.

In compared to the techniques that were in use at the time, the idea behind the Dadda multiplier methodology, which includes delaying and spreading the carry propagation. The two recognized designs for such a fundamental arithmetic circuit type are the Wallace design and the Dadda approach for parallel multipliers, formerly known as the Dadda tree.

Since then, one of the two often used parallel multiplier systems taught in university courses on computer arithmetic is the Wallace trees, commonly referred to as Dadda trees. Compressing the partial products more quickly is a function of the 4-2 compressors used.

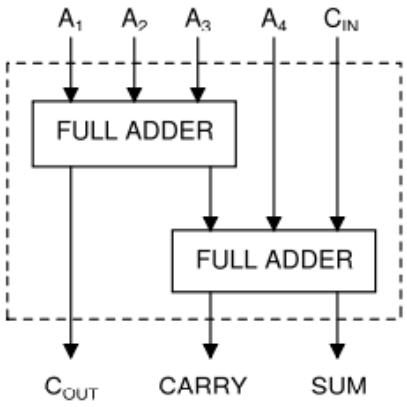


Fig.1: Exact compressor

There are five inputs overall, two linked full adders, and three total outputs. A1, A2, A3, A4, and CIN are the inputs of the exact 4:2 compressor. Its outputs are: COUT, CARRY, and SUM. It is stated that COUT, CARRY, and SUM

$$C_{OUT} = A_3(A_1 \oplus A_2) + A_1(\overline{A_1 \oplus A_2}) \quad (1)$$

$$CARRY = C_{IN}(A_1 \oplus A_2 \oplus A_3 \oplus A_4) + A_4(\overline{A_1 \oplus A_2 \oplus A_3 \oplus A_4}) \quad (2)$$

$$SUM = C_{IN} \oplus A_1 \oplus A_2 \oplus A_3 \oplus A_4 \quad (3)$$

Figure 2 illustrates a compressor chain. The lower significant bits of the previous 4: 2 compressor's input carry are represented by CIN. The order 1 outputs with more importance than the input CIN are CARRY and COUT.S

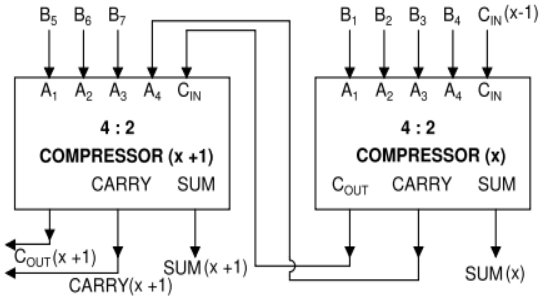


Fig.2: compressor chain

A_1	A_2	A_3	A_4	C_{IN}	C_{OUT}	$CARRY$	SUM
0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	1
0	0	0	1	0	0	0	1
0	0	0	1	1	0	1	0
0	0	1	0	0	0	0	1
0	0	1	0	1	0	1	0
0	0	1	1	0	0	1	0
0	0	1	1	1	0	1	1
0	1	0	0	0	0	0	1
0	1	0	0	1	0	1	0
0	1	0	1	0	0	1	0
0	1	0	1	1	0	1	1
0	1	1	0	0	1	0	0
0	1	1	0	1	1	0	1
0	1	1	1	0	1	0	1
0	1	1	1	1	1	1	0
1	0	0	0	0	0	0	1
1	0	0	0	1	0	1	0
1	0	0	1	0	0	1	0
1	0	0	1	1	0	1	1
1	0	1	0	0	1	0	0
1	0	1	0	1	1	0	1
1	0	1	1	0	1	0	1
1	0	1	1	1	1	1	0
1	1	0	0	0	1	0	0
1	1	0	0	1	1	0	1
1	1	0	1	0	1	0	1
1	1	0	1	1	1	1	0
1	1	1	0	0	1	0	1
1	1	1	0	1	1	1	0
1	1	1	1	0	1	1	0
1	1	1	1	1	1	1	1

Fig.3: Truth table of exact compressor

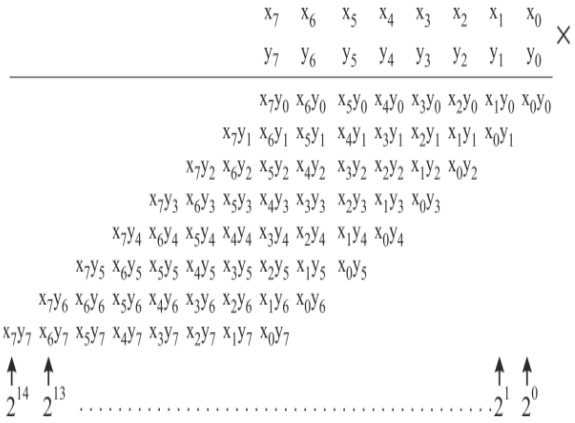


Fig.4: Partial product matrix of an 8 × 8 bit Multiplier.

The partial products of this column's arithmetic sum, S, are denoted as follows:

$$S = \sum \{p_0, p_1, p_2, \ldots p_{j-1}\}$$

The arithmetic total in (2) is computed by a compressor, who then encodes the findings in binary form. The most popular compressor uses a full-adder with three inputs and two outputs: sum and carry.

A 4/2 compressor have five inputs, one of which is a carry from a column to the right, and encodes the result on three outputs: sum, carry1, and carry2.

The total, carry1, carry2, carry3, and two carries from a column to the right are the four outputs that the 5/2 compressor uses to encode the result. Two of the seven inputs to the 5/2 compressor are carry (having double weight).

The ability to do arithmetic operations requires multipliers in both microprocessors and digital signal processors. The performance characteristics of either DSPs or microprocessors would be improved by implementing the efficient and effective multiplication algorithm. The basic building elements of digital systems are multipliers.

Multipliers have an impact on both the computational efficiency and power used by the digital system. Therefore, it is essential for a digital system to have high speed multipliers with low power dissipation. As a result, it can make digital systems more effective.

compression of columns Due to their rapid computation, multipliers have grown in favor.

Column compression multipliers by Wallace and Dadda are widely known. In 1964, Chris Wallace, an Australian computer scientist, put up the idea for the Wallace Multiplier.

Italian computer engineer Luigi Dadda developed the Wallace Multiplier before suggesting an improvement with the Dadda Multiplier. Dadda and Wallace multipliers both rely on reduction to operate. A [3, 2] counter and a [2, 2] counter are used to compress the columns to reduce their size. Wallace and Dadda Multipliers use the same three phases in their respective processes.

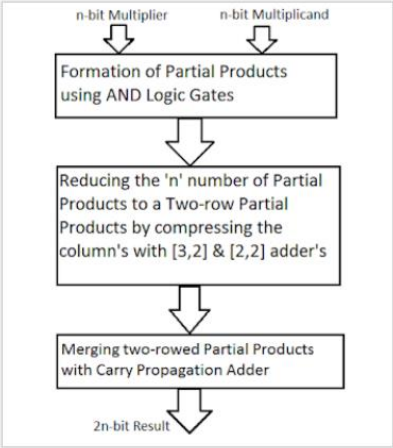


Fig. 5 Flowchart of Multiplication process

Dadda proposed a reduction method that, in the fewest number of reduction stages, yields the reduced two-rowed Partial products. Dadda managed to do this by placing the [3, 2] and [2, 2] counters in the best possible positions on the maximum Critical path.

For an N-bit multiplier and N-bit multiplicand, a partial product of N by N is generated. They are organised into what resembles a grid. Dadda reduced this Matrix height to a two-row matrix by employing a number of reduction methods.

Algorithm:

1. Assume that the ultimate height of the two-row matrix, d1, is 2, and that subsequent matrix heights, $d_{j+1} = 1.5 * d_j$, where j = 1, 2, 3, 4, etc., are obtained from dj depending on d1. In this matrix height, the fraction needs to be rounded to the nearest whole number.

In this manner, the matrix heights will be 2, 3, 4, 6, 9, 13, 19 and 28. So that the resulting matrix height doesn't surpass the total height of the matrix, the greatest dj should then be determined.

2. The column compression in the first reduction step should be made with the help of [3, 2] and [2, 2] counters in a way that ensures the height of the reduced matrix produced does not exceed dj.

3. The carry must be transferred to the next column and the total should pass to the same column in the subsequent reduction step during the compression.

4. Repeat steps 2 and 3 until a final reduced matrix with two rows is created.

Three approximately 4-to-2 compressors are shown in this study, together with an ECM (error-correcting module). The careful compensatory element of the building served as the foundation for the three 4-2 compressors. An array of approximation compressors' combined error performance is taken into account rather than just one approximate compressor's performance alone. We cleverly reduce the compressor's outputs—which ordinarily have four—to just one.

In this part, three approximately 4-to-2 compressors (UCAC1, UCAC2, and UCAC3) that are currently used in the technique are recommended. The inaccurate compensation in this instance is subsequently corrected using the ECM, which is also utilised to recognise input patterns with a high degree of probability. 8-bit multipliers based on the Dadda tree are also included in the proposed designs. Compressing incomplete items might be compared to making several additions. Additionally, the ability of the positive and negative words to cancel one another out is a crucial aspect of addition. The ED is produced by each approximation compressor in multipliers.

A chain of compressors known as a compressor chain is created by a series of cascading approximation compressors (CC).

Each compressor creates its own ED and takes up a binary bit in a CC. As a result, it is possible to think of the ED of CC as a huge binary number. To balance

out the negative ED of CC, a positive ED must be introduced to the computing circuit in cases when the approximation blocks produce a negative ED. The best case scenario takes place when this block has a correction bit added to it and the compressor's ED value is -1. A this scenario an array of -1 EDs in the LSB can be efficiently balanced by a +1 in the subsequent bit of the CC's most important bit (MSB).

For the three compressors that have been discussed, TABLE I shows the truth tables. The description of UCAC1's logical purpose is provided in (6).

$$sum = y_1y_2 + (y_1 + y_2)(y_3 + y_4) + y_3y_4 \qquad (6)$$

Based on how many logic 1s there are in each of the 16 input patterns, each of the five situations is divided into 16 input patterns. Additionally, they are designated as examples zero, one, two, three, and four, respectively. A and B are symbols.

One may estimate that 1/4 of the partial products will be logic 1 since the AND gate array was employed to build them.

Notably, the bulk of the total instances in TABLE I are represented by cases 0, 1, and 20. The ED of UCAC1 is 0 or -1 in these three situations. The ED is bigger than -1 in examples three and four. The chance of these two scenarios, however, is just 13/256. By omitting the first and last terms in (6) and applying the expression of (12), we get second design, UCAC2.

$$sum = (y_1 + y_2)(y_2 + y_3) \qquad (12)$$

y_1	y_2	y_3	y_4	*UCAC1*		*UCAC2*		*UCAC3*		*pro*
				sum	*ED*	*sum*	*ED*	*sum*	*ED*	
0	0	0	0	0	0	0	0	0	0	81/256
0	0	0	1	0	-1	0	-1	1	0	27/256
0	0	1	0	0	-1	0	-1	0	-1	27/256
0	0	1	1	1	-1	0	-2	1	-1	9/256
0	1	0	0	0	-1	0	-1	1	0	27/256
0	1	0	1	1	-1	1	-1	1	-1	9/256
0	1	1	0	1	-1	1	-1	1	-1	9/256
0	1	1	1	1	-2	1	-2	1	-2	3/256
1	0	0	0	0	-1	0	-1	0	-1	27/256
1	0	0	1	1	-1	1	-1	1	-1	9/256
1	0	1	0	1	-1	1	-1	0	-2	9/256
1	0	1	1	1	-2	1	-2	1	-2	3/256
1	1	0	0	1	-1	0	-2	1	-1	9/256
1	1	0	1	1	-2	1	-2	1	-2	3/256
1	1	1	0	1	-2	1	-2	1	-2	3/256
1	1	1	1	1	-3	1	-3	1	-3	1/256

Fig. 6: THE TRUTH TABLE OF THE PROPOSED COMPRESSORS

One more riskier way to get the total of the UCAC3 is to change two words in the UCAC1's K-map from '0' to '1', which only utilises an OR gate.

$$sum = y_2 + y_4 \qquad (13)$$

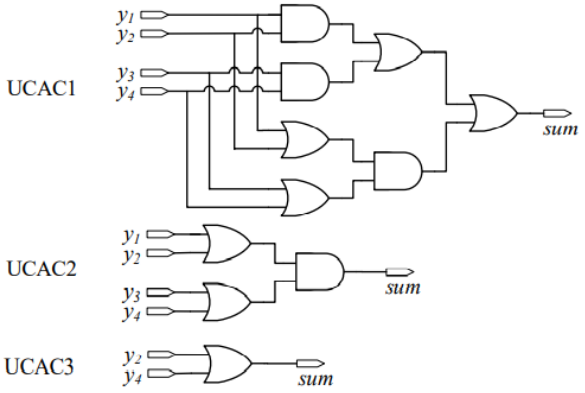
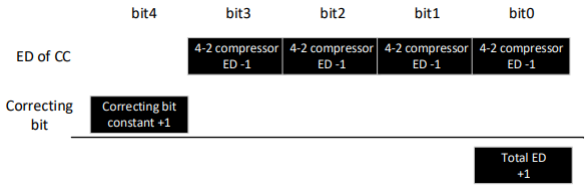


Fig. 7: (a) UCAC1 (b) UCAC2 (c) UCAC3

These suggested designs, notably the UCAC2 and UCAC3, have incredibly straightforward architectures, as seen in the Fig. above. But these compressors result in a large ED when there are more than two logic 1 inputs. They all also maintain high ERs.

In order to produce a positive error, the suggested compressors are incorporated into the multipliers, as seen in the picture below. This is done by adding a constant logic '1' to the next bit of the CC's MSB.



$$\Pr(0o) = \Pr(a_i \cdot b_j)^4 = 81/256 \qquad (7)$$

The 0 scenario has a non-negligible probability of 81/256, according to Eqn. (7), which also shows this. The suggested compressors produce the right output, nevertheless, when the 0o situation occurs. In this scenario, the correcting bit's introduction of a positive error is not countered by any negative error. In addition, the correcting bit above has a significant binary bit weight, as seen in Fig., which results in a significant total ED.

In order to change the correcting bit from logic 1 to 0 in this instance, an ECM is supplied to identify this input pattern. In spite of the fact that they cover a bigger proportion of occurrences, the compressors cause a negative error in the other circumstances, which may be sufficient to balance the correcting non-zero bit. The approximation compressor at the MSB of the CC has the same inputs that the ECM does. Only when the 0o situation occurs in the circuit's inputs does it produce logic 0.

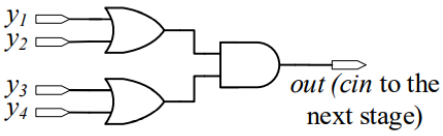


Fig. 8: Carry generation

III. PROPOSED WORK

The proposed approximate full adder's proposed approximate compressors, existing approximate compressors, and ECM's designs are used to design and assess four 8-bit multipliers, which are intended to streamline and accelerate the compression process. MUL1 stands for UCAC1 multiplier with constant correcting bit; MUL2 for UCAC1 multiplier and ECM; MUL3 for UCAC2 multiplier and ECM; and MUL4 for UCAC2 multiplier and ECM. UCAC3 multiplier and ECM; Although approximation compressors may replace any classic 4-2 compressors, the error performance suffers [5]. As a result, for N-1 less important bits in the suggested multipliers, approximate compressors are employed. The figure below shows the compression tree as well.

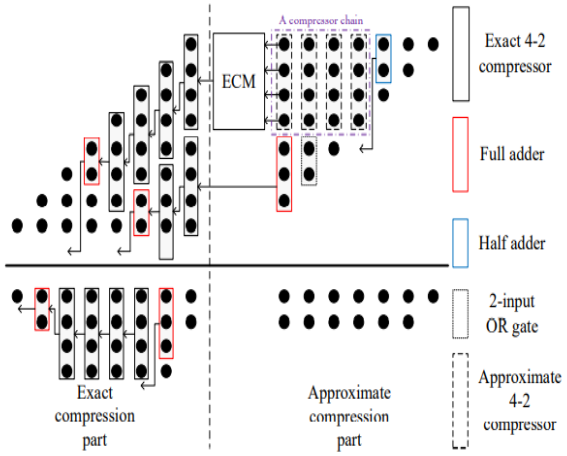


Fig. 9: proposed multiplier

As seen in this picture, the rectangles with solid or dashed lines in Figure 5 stand in for various digital circuits. The output of the precise 4-2 compressor is routed into the cin signal of the nearby ECM. The constant logic 1 in MUL1 takes thess role of the ECM. By compressing the partial products using an OR gate, which has the benefit of only requiring one compression stage to be set up in the approximation portion, the high compression ratio is effectively used. Only two numbers are added using half adder. The full adder was created next to tackle this issue. A, B, and carry C are all 1-bit binary values which gets added using the full adder. The hardware requirement in terms of full adder (FA) and the length of final adder (FAL) for different size of array multipliers is obtained in the manner given in below fig

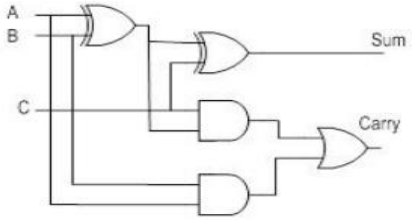


Fig. 10: Full adder

Three inputs are added by a full adder, which generates two outputs. The first two inputs are A and B, while the third input is a carry that is designated as C. The suffix SUM designates the output that is considered normal, whereas the suffix CARRY designates the output carry.

Inputs			Outputs	
A	B	C_{in}	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Fig. 11 Truth Table of full adder

In the above table,

- The literals A and B are the two input variables. Two important bits will be added, which are represented by these variables.
- The carry is represented by the third input, Cin. The carry bit is retrieved from the most recent lower significant position.
- The 'Sum' and 'Carry' are the output variables that define the output values.
- The eight rows under the input variable designate all possible combinations of 0 and 1 that can occur in these variables.

In our approximation, one XOR gate, two AND gates and one OR gates are replaced with single OR gate and AND gate for carry calculation. Sum term is calculated by inverting carry term by using an inverter. This results in error in the four cases out of sixteen cases both in sum and carry terms. This provides more simplification, while maintaining the difference between original and approximate value as similar one for more cases. The truth table of approximate full-adder can be observed from Table I.

Inputs			Accurate outputs		Approximated outputs		
A	B	C	Sum	Carry	Sum 1	Carry 1	ED
0	0	0	0	0	1	0	1
0	0	1	1	0	0	1	2
0	1	0	1	0	1	0	0
0	1	1	0	1	0	1	0
1	0	0	1	0	1	0	0
1	0	1	0	1	0	1	0
1	1	0	0	1	0	1	0
1	1	1	1	1	0	1	1

Fig. 12: Truth table for both exact and approximate full adder

Proposed approximate full adder:

As shown in Figure below One AND gate, one OR gate, and one inverter gate are used to produce it. The Boolean expressions are

$$Carry = (b \,\&\, c) + a \quad (1)$$

$$Sum = \tilde{}Carry \quad (2)$$

In this case, there is one error in Carry and 3 errors in Sum with total error distance(ED) of 3 as shown in Table I.

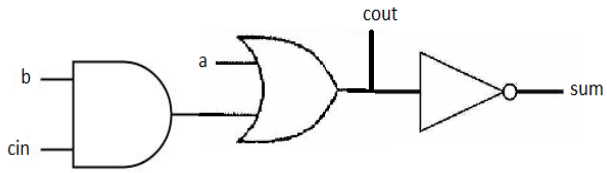


Fig. 13: approximate full adder

Based on tradeoff variables including latency, area, and power usage, the performance is compared. For low area, low power applications, the suggested approximation adder in this article can be employed. The proposed adder results in reduction of area and power cost metrics in comparison with conventional full adder.

IV. EXPERIMENTAL RESULTS

After synthesizing the Verilog code for the proposed work we can get the schematics which are RTL schematic and technology systematic shown in the fig. 14&15 respectively.

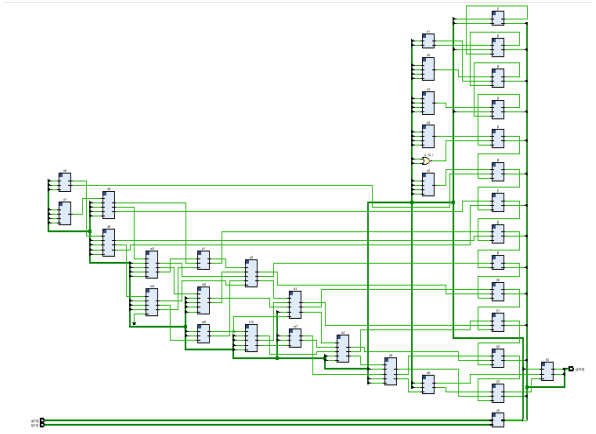


Fig.14: RTL schematic

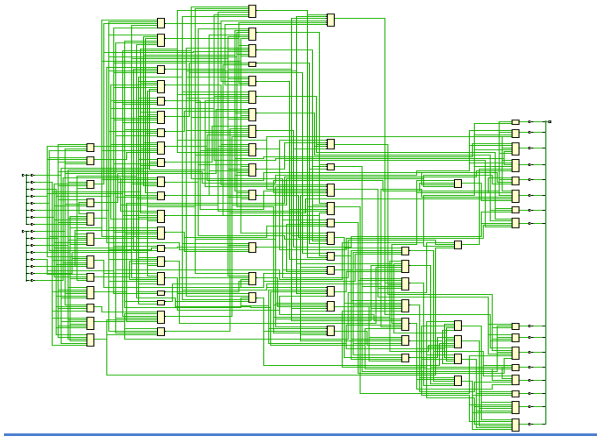


Fig.15: Technology schematic

Fig.16: Simulation results

Figure 16 shows the simulation results for the proposed.

Evaluation report:

	Area (LUT's)	Delay (ns)	Power(W)
Existing design 1 [13]	79	10.684	12.953
Proposed design 1	60	9.675	12.097
Existing design 2 [13]	70	9.675	12.712
Proposed design 2	63	9.689	11.613
Existing design 3 [13]	69	9.681	12.326
Proposed design 3	64	9.779	11.924
Existing design 4 [13]	69	10.450	11.267
Proposed design 4	64	9.786	11.353

From the evaluation table it can be clearly seen that all of the design parameters are enhanced for the proposed designs when compared with the existing design.

V. CONCLUSION

In this project, we have proposed an approximate full adder to be utilized in the multiplier to reduce the area and optimize delay and power. The existing 3 approximate compressors are also considered and based on these all we have implemented 4 different types of multipliers for 8 bit. According to the simulation analysis, the proposed designs significantly increase the performance of multipliers. In addition, with the exception of error in output, the proposed multipliers maintain a tolerable error with increased performance. Additionally, they function effectively when image multiplication is used. As the findings reveal, the multipliers integrated with our approximate full adder good tradeoff between parameters and error.

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Face Gender Recognition Based on Neural Networks and Open CV

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ABSTRACT

Automatic gender recognition has now pertinent to an extension of its usage in various software and hardware, particularly because of the growth of online social networking websites and social media. However, the performance of already exist system with the physical world face pictures, images are somewhat not excellent, particularly in comparison with the result of task

related to face recognition. Within this paper, we have explored that by doing learn and classification method and with the utilization of Convolutional Neural Networks (CNN) technique, a satisfied growth in performance can be achieved on such gender classification. The tasks that is a reason why we decided to propose an efficient convolutional network architecture which can be used in extreme case when the amount of training data used to learn CNN architecture. We examine our related work on the current unfiltered image of the face for gender recognizing and display it to dramatics outplay current advance updated methods. In this application we successfully proved CNN gives better results.

Keywords: Computer Vision, CNN, Classification, Unfiltered images, Gender recognition

I. INTRODUCTION

There has been rising interest in the problem of gender classification of text, especially in the social media and marketing domains. Much of this is due to the growing sources of user information, ranging from short tweets and comments to longer blog post and online novels. Existing systems mainly use features such as words, word classes, and POS (part-of-speech) n-grams for classification learning. However, none use deep learning, nor extend their models to a variety of sources, for example from the blogging to the media sphere. Our effort represents two contributions. First, we apply deep learning to datasets spanning several media (e.g. blogs and literature from several centuries). In this approach, our model directly learns to predict gender based on the surrounding context of words. This technique was proposed by Lai et al for a wide variety of text classifications, and we extend their previous work to the topic of gender classification. Second, we develop a model based on the RCNN developed for gender classification. Our model obtains an accuracy score

comparable to the state-of-the-art models without much fine-tuning.

In this paper, we have used Convolution Neural Network (CNN) for gender recognition so in order to improvise the previously used method and to obtain much accurate result. Depicts how to process face image through CNN and find the pattern, extract feature to recognize gender from image accurately. The advantage of using CNN is it automatically extract the feature from an image and give output, we don't require to use feature descriptors like Histogram Oriented Gradient (HOG) and Support vector machine (SVM), eigenvector to extract the feature from image manually so as to do further recognition task or classification task. Gender Recognition was started with the problem in psychophysical studies to classify gender from human face; it concentrates on the efforts of perceiving human visual processing and recognizing relevant features that can be used to distinguish between female and male individuals. Exploration has proved that the discrepancy between a female face and male face can be used effectively to improvise the result of face recognition software in bio-metrics devices. With following recognition of trait-like gender, age, human expression, facial disease etc.

With this human-computer intercommunication, supervision, vigilance device, and digital vision system and much more that will work on whole human presence. Nevertheless, in a physical world scenario, the challenge is how to do work with the face image which influences various factors like illumination, pose facial expression, age estimation, occlusion, and background instruction data, and noise, error. It is a kind of motivation to do something new in the evolution of a boisterous face-based gen-der recognition application that has extreme detection accuracy. The Conventional Neural Network (CNN) technique used in face recognition, involving face dependent gender recognition, age-based recognition, comprises the phases of accepting the image as input and then transforming input images for further processing, dimension reduction, feature extraction, feature procurement, and classification, in this sequence.

Initial knowledge of these technique realms is needed to find out the finest extractor of feature for design. In extension to which, recognition method performance is highly vulnerable to the specified classifier used, which completely relies on the pattern retrieval technique applied to the method which we have used in the research work related to this paper. It is most difficult to find such a classifier that aggregate the finest among the chosen feature extractor so excellent recognition result can be obtained. The profound Convolutions neural system (CNN) is a neural system varies with the number about convolutional layers utilized to be compatible with sub-sampling layers and end with you quit offering on that one or additional completely joined layers (Fully connected layer) in the calibre multilayer perceptron. A convincing gain of the CNN over another traditional method in feature recognition technique is its capability to simultaneously perform following tasks like features extraction, reducing data dimension, and classification in the particular organize network structure. This kind of model is described and can speed up recognition process and provide the result with high accuracy and minimum cost.

The CNN performs both the work of feature classification and feature ex-traction and inside a single network structure through training a neural network on the collection of huge known data which is called training data normal face image dataset. The CNN has the capability of extraction of numerous different properties from an un-processed input image that requires either no or little pre-processing needed. The CNN gives halfway resistance and boosts to geometric transformations and deformation and 2-dimensional changes in shapes. Hence, the CNN is specially made to overcome, lacking the other existing feature extractor that is described by having static behaviour. The benefit obtains with the use of CNN is that they are comparatively easy to assist the network

layer (input, hidden, output) in learning parameter, weight, (loss through BPNN). They have less number of parameters in comparison to fully connected multiple layer perceptron neural networks with the similar count of hidden layers used between input and output layer. Therefore, the CNN has shown an excellent successful result in a huge range of applications such as tracking human in mob i.e., human tracking system (HTS), surveillance system that deals with object/article/human, traffic signal recognition (TSR), optical character recognition (OCR), face recognition (FR), and many others application of CNN and obviously computer vision numerous applications.

II. RELATED WORKS

Discriminating Gender on Twitter: Accurate prediction of demographic attributes from social media and other informal online content is valuable for marketing, personalization, and legal investigation. This paper describes the construction of a large, multilingual dataset labelled with gender, and investigates statistical models for determining the gender of uncharacterized Twitter users. We explore several different classifier types on this dataset. We show the degree to which classifier accuracy varies based on tweet volumes as well as when various kinds of profile metadata are included in the models. We also perform a large-scale human assessment using Amazon Mechanical Turk. Our methods significantly out-perform both baseline models and almost all humans on the same task.

Improving Gender Classification of Blog Authors: The problem of automatically classifying the gender of a blog author has important applications in many commercial domains. Existing systems mainly use features such as words, word classes, and POS (parts-of speech) n-grams, for classification learning. In this paper, we propose two new techniques to improve the current result. The first technique introduces a new class of features which are variable length POS sequence patterns mined from the training data using a sequence pattern mining algorithm. The second technique is a new feature selection method which is based on an ensemble of several feature selection criteria and approaches. Empirical evaluation using a real-life blog data set shows that these two techniques improve the classification accuracy of the current state-of the-art methods significantly.

Gender Attribution: Tracing Stylometric Evidence Beyond Topic and Genre: Sociolinguistic theories (e.g., Lakoff (1973)) postulate that women's language styles differ from that of men. In this paper, we explore statistical techniques that can learn to identify the gender of authors in modern English text, such as web blogs and scientific papers. Although recent work has shown the efficacy of statistical approaches to gender attribution, we conjecture that the reported performance might be overly optimistic due to non-stylistic factors such as topic bias in gender that can make the gender detection task easier. Our work is the first that consciously avoids gender bias in topics, thereby providing stronger evidence to gender-specific styles in language beyond topic. In addition, our comparative study provides new insights into robustness of various stylometric techniques across topic and genre.

Improving word representations via global context and multiple word prototypes: Unsupervised word representations are very useful in NLP tasks both as inputs to learning algorithms and as extra word features in NLP systems. However, most of these models are built with only local context and one representation per word. This is problematic because words are often polysemous and global context can also provide useful information for learning word meanings. We present a new neural network architecture which 1) learns word embedding's that better capture the semantics of words by incorporating both local and global document context, and 2) accounts for homonymy and polysemy by learning multiple embedding's per word. We introduce a new dataset with human judgments on

pairs of words in sentential context, and evaluate our model on it, showing that our model outperforms competitive baselines and other neural language models

Recurrent Convolutional Neural Networks for Text Classification: Text classification is a foundational task in many NLP applications. Traditional text classifiers often rely on many human-designed features, such as dictionaries, knowledge bases and special tree kernels. In contrast to traditional methods, we introduce a recurrent convolutional neural network for text classification without human-designed features. In our model, we apply a recurrent structure to capture contextual information as far as possible when learning word representations, which may introduce considerably less noise compared to traditional window-based neural networks. We also employ a max-pooling layer that automatically judges which words play key roles in text classification to capture the key components in texts. We conduct experiments on four commonly used datasets. The experimental results show that the proposed method outperforms the state-of-the-art methods on several datasets, particularly on document-level datasets.

A gender recognition system using shunting inhibitory convolutional neural networks: Automatic gender recognition has now pertinent to an extension of its usage in various software and hardware, particularly because of the growth of online social networking websites and social media. However, the performance of already exist system with the physical world face pictures, images are somewhat not excellent, particularly in comparison with the result of task related to face recognition. Within this paper, we have explored that by doing learn and classification method and with the utilization of Convolutional Neural Networks (CNN) technique, a satisfied growth in performance can be achieved on such gender classification tasks that is a reason why we decided to propose an efficient convolutional network architecture which can be used in extreme case when the amount of training data used to learn CNN architecture is limited. We examine our related work on the current unfiltered image of the face for gender recognition and display it to dramatics outplay current advance updated methods.

III. Methodology

In proposed system we use open computer vision and convolutional neural networks to overcome the difficulties obtained in the existing system. By using CNN, we can reduce the time and feature extraction process. By using Neural networks will automatically extracts the features from the images.

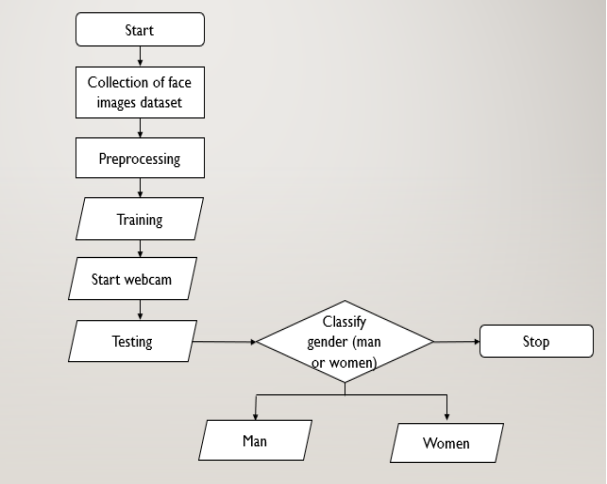


Figure 1 : Block diagram of proposed method

IV. Implementation

The project has implemented by using below listed algorithm.

Conventional Neural Network (CNN):

A convolutional neural network consists of an input layer, hidden layers and an output layer. In any feed-forward neural network, any middle layers are called hidden because their inputs and outputs are masked by the activation function and final convolution. In a convolutional neural network, the hidden layers include layers that perform convolutions. Typically this includes a layer that performs a dot product of the convolution kernel with the layer's input matrix. This

product is usually the Frobenius inner product, and its activation function is commonly ReLU. As the convolution kernel slides along the input matrix for the layer, the convolution operation generates a feature map, which in turn contributes to the input of the next layer. This is followed by other layers such as pooling layers, fully connected layers, and normalization layers.

Convolutional layers

In a CNN, the input is a tensor with a shape: (number of inputs) x (input height) x (input width) x (input channels). After passing through a convolutional layer, the image becomes abstracted to a feature map, also called an activation map, with shape: (number of inputs) x (feature map height) x (feature map width) x (feature map channels).

Convolutional layers convolve the input and pass its result to the next layer. This is similar to the response of a neuron in the visual cortex to a specific stimulus. Each convolutional neuron processes data only for its receptive field. Although fully connected feed forward neural networks can be used to learn features and classify data, this architecture is generally impractical for larger inputs such as high resolution images. It would require a very high number of neurons, even in a shallow architecture, due to the large input size of images, where each pixel is a relevant input feature. For instance, a fully connected layer for a (small) image of size 100 x 100 has 10,000 weights for each neuron in the second layer. Instead, convolution reduces the number of free parameters, allowing the network to be deeper. For example, regardless of image size, using a 5 x 5 tiling region, each with the same shared weights, requires only 25 learnable parameters. Using regularized weights over fewer parameters avoids the vanishing gradients and exploding gradients problems seen during back propagation in traditional neural networks. Furthermore, convolutional neural networks are ideal for data with a grid-like topology (such as images) as spatial relations between separate features are taken into account during convolution and/or pooling.

Pooling layers

Convolutional networks may include local and/or global pooling layers along with traditional convolutional layers. Pooling layers reduce the dimensions of data by combining the outputs of neuron clusters at one layer into a single neuron in the next layer. Local pooling combines small clusters, tiling sizes such as 2 x 2 are commonly used. Global pooling acts on all the neurons of the feature map. There are two common types of pooling in popular use: max and average. Max pooling uses the maximum value of each local cluster of neurons in the feature map, while average pooling takes the average value.

Fully connected layers

Fully connected layers connect every neuron in one layer to every neuron in another layer. It is the same as a traditional multi-layer perceptron neural network (MLP). The flattened matrix goes through a fully connected layer to classify the images.

Receptive field

In neural networks, each neuron receives input from some number of locations in the previous layer. In a convolutional layer, each neuron receives input from only a restricted area of the previous layer called the neuron's receptive field. Typically the area is a square (e.g. 5 by 5 neurons). Whereas, in a fully connected layer, the receptive field is the entire previous layer. Thus, in each convolutional layer, each neuron takes input from a larger area in the input than previous layers. This is due to applying the convolution over and over, which takes into account the value of a pixel, as well as its surrounding pixels. When using dilated layers, the number of pixels in the receptive field remains constant, but the field is more sparsely populated as its dimensions grow when combining the effect of several layers.

Weights

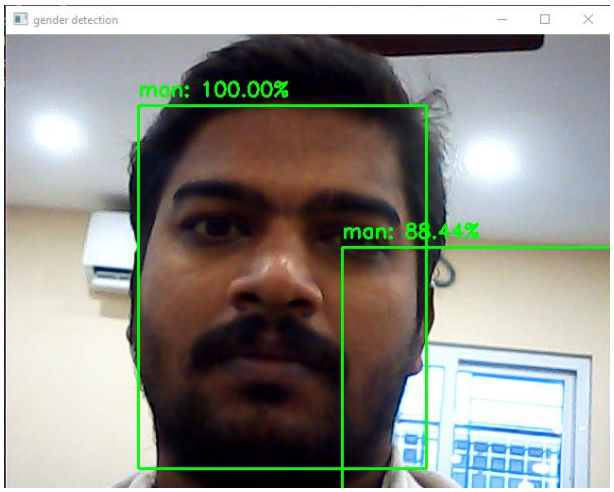
Each neuron in a neural network computes an output value by applying a specific function to the input values received from the receptive field in the previous layer. The function that is applied to the input values is determined by a vector of weights and a bias (typically real numbers). Learning consists of iteratively adjusting these biases and weights.

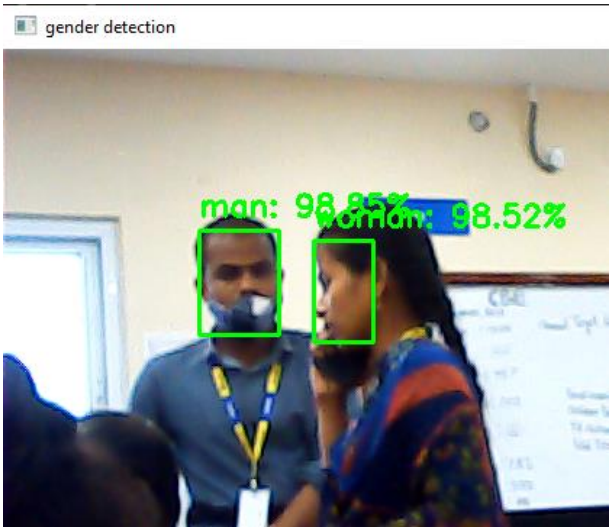
The vector of weights and the bias are called filters and represent particular features of the input (e.g., a particular shape). A distinguishing feature of CNNs is that many neurons can share the same filter. This reduces the memory footprint because a single bias and a single vector of weights are used across all receptive fields that share that filter, as opposed to each receptive field having its own bias and vector weighting.

V. Results and Discussion

The following images will visually depict the process of our project.

Here we can see the few images about identification of gender classification.





VI. Conclusion

In conclusion, we introduce the task of Visual Question Answering (VQA). Given an image and an open-ended, natural language question about the image, the task is to provide an accurate natural language answer. We provide a dataset containing over 250K images, 760K questions, and around 10M answers. We will set up an evaluation server and organize an annual challenge and an associated workshop to facilitate systematic progress. We demonstrate the wide variety of questions and answers in our dataset, as well as the diverse set of AI capabilities in computer vision, natural language processing, and common sense reasoning required to answer these questions accurately. The questions we solicited from our human subjects were open-ended and not task-specific. For some application domains, it would be useful to collect task-specific questions. For instance, questions may be gathered from subjects who are visually impaired, or the questions could focused on one specific domain (say sports). Bighametal. Created an application that allows the visually impaired to capture images and ask open-ended questions that are answered by human subjects. Interestingly, these questions can rarely be answered using generic captions. Training on task-specific datasets may help enable practical VQA applications.

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Proposing Competent Team Composition for T20 Cricket Through Data Processing Techniques

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ABSTRACT

In cricket, selecting the best playing XI is an important task to win the game. There are various factors such as venue, performance of batsman and bowler; and opposition that influence the team selection. This project predicts different parameters such as run-rate, strike rate, economy and wickets, and use them for construction of an ideal team; these predictions are done by using various machine learning algorithms namely K nearest neighbor, random forest and gradient boosting which uses the past data for prediction. Different roles require different skill-set from the players. This paper selects players based on the predicted values and suggests a suitable playing XI.

Keywords— Cricket, Twenty-Twenty (T20), Team Prediction, Data Processing, Sports Analytics

I. INTRODUCTION

The business of Sports or Sports market has been receiving increased attention with the enhancement in technologies to telecast sports events to every corner of the globe. From the conventional Olympics, World Cups, Continental Competitions, to the present day Premier Leagues, the sports market contributes heavily to the global economy. The initial origin of sports business could be traced to brand endorsements by leading sports personalities. The evolution and popularity of the Premier Leagues and the mass "fan following" commanded by teams have completely altered the Sports market scenario. Football clubs including Real Madrid and Manchester United are as popular in Asia and every other part of the world as they are in Europe. Cricket is also catching up with its own version of premier leagues and club franchisees. Brand endorsement by sports clubs of primarily sports merchandise is a good source of income for the clubs. This endorsement is fast catching up in soft drinks and fashion wear. Anand and Arjun [1] provide a detailed study of impact of fan behaviour on sales of branded sports merchandise. The digital broadcast technology associated with sports event telecast generates immense data, attractive for employing machine learning and data analytics techniques, providing scope for evolving the existing sports market into a larger Sports Industry [2]. An emerging allied sector is the ESports domain where technological interventions have already made big headway including assisting game participants evolve techniques, predict the winners [3].

Sporting events involving football and cricket dominate the sports market scenario at present. Both the games involve extensive decision making by the on-field referees or the umpires. The decisions heavily impact the flow of the game and a wrong decision could be hurting teams, fans and viewers. There is an indirect impact on the revenue generation component.

Cricket has three game formats, at international level including Test (Five day event), One Day Match and a shortened Twenty-Twenty (T20) format. This provides scope for more business avenues, as evinced by the success of the Premier League competitions involving the T20 format. Incorporating technological interventions to assist the umpires in cricket has been an upcoming field, with the advent of technologies including Hawk –eye, Snickometer, Hotspot. Academic research on technological interventions in sports has been steadily increasing in the last decade. Automated decision making for run outs employing the frames captured for telecast has been explored by Sabarish et al [4]. Established algorithms including Edge detection and Absolute difference were employed. In the same line, Ganesh et al [5] report automated decision making in cricket employing SVM and CNN techniques. Data mining and classifier techniques to predict the winner mid-way through the match has been reported by Tejinder et al [6]. The techniques mentioned could be classified as decision making employing "within-match" data.

Another set of techniques correspond to decision making employing "pre-match" data. Predicting a player's performance in future matches, based on his past performances has been explored in [7]. The prediction has been done for the One Day International format. In this paper, we propose novel techniques employing established data processing algorithms to propose a competent team or "Playing XI" as it is referred to in the sport domain, for the Twenty-Twenty (T20) format.

II. METHODOLOGY

A. Data set details

Previously available data is used to predict different parameters. This data is used to make decisions regarding a player. The first step is to collect the data. The data set is collected from [1] which consists of T20 International matches played by India from 2010-2020. There are a total of three data sets which are as follows.

1. Data set-1: India T20I, This data set consists of ball- to-ball details of 132 T20 International matches played by India from 2010-2020.
2. Data set-2: Match details – This data set contains the details of the match.
3. Data set-3: Player details – This data set contains the data of the entire Indian players till 2020.

B. *Machine learning algorithms employed*

1. K-Nearest Neighbor Regression
2. Random Forest Algorithm
3. Gradient Boosting Algorithm
4. Linear Regression
5. Decision Tree Algorithm

C. *Cricketing Parameters for data analysis*

1. Batting Average
2. Batsman Strike rate
3. Run rate of the team
4. Economy of the bowler
5. Bowling average
6. Wickets taken by a bowler

D. *Mathematical parameters*

1. Mean absolute error

Mean Absolute Error (MAE)is a measure of errors between paired observations expressing the same phenomenon.

2. Mean absolute percentage error

Mean Absolute Percentage Error (MAPE) is a statistical measure of how accurate a forecast system is.

3. Accuracy

One metric for assessing classification models is accuracy. Informally, accuracy refers to the percentage of correct predictions made by our model.

4. GINI

Gini Index, also known as Gini impurity, calculates the amount of probability of a specific feature that is classified incorrectly when selected randomly.

For the prediction of cricketing parameters, each algorithm undergoes a certain process which gives the predicted output. Every algorithm used in this project undergoes the same process.

Run rate of the team

For predicting run-rate of the team, the input parameters considered are opposition team, venue of the match and innings which the team is playing. Mean absolute percentage errors are calibrated after evaluating with different algorithms shown in **Table 1.** Since KNN regression yields the lowest error percentage, KNN regression performs well for this model.

To show the working of the algorithm let us assume the following:

Innings = 1, Opposition team = Australia, Venue = Seddon Park

KNN regression calculates the average run rate of all 5 nearest points (Here, the value of K=5) which is the predicted run rate of the input point i.e. 7.86 runs per over. In order to represent the run rate in the form of range, mean absolute error (0.61) is added and subtracted to the average and represented as [7.25,8.49].

Table 1: Error percentages of various algorithms for the parameter—run rate of the team.

Algorithm Name	Mean Absolute Percentage Error
KNN Regression	15.86%
Gradient Boosting	16.20%
Linear Regression	16.45%
Random Forest	18.58%
Decision Trees	26.21%

Economy of the bowler in respective over-type

From Table 2, as KNN regression produced the least error percentage from the selected algorithms, economy of the bowler in respective over-type was done using KNN regression. Criteria's considered are opposition team, Innings played, Venue, over-type and name of the bowler.

KNN regression uses the Euclidean distance formula to calculate the 5 nearest points from the input. Economy of the bowler in respective over-type for given criteria can be calculated as follows; let's assume the given criteria as follows:

Innings = 1, Opposition team = England, Venue = Kings mead, Over-type = Death, Bowler = JJ Bumrah

Applying the average formula, KNN regression calculates the average of economies of all the 5 nearest points which was found with the Euclidean distance formula which is 7.7. Mean absolute error is added and subtracted to the output to represent in the form of range i.e. [6.28, 9.12].

Table 2: Error percentages of various algorithms for the parameter – Economy of the bowler in respective over-type.

Algorithm Name	Mean Absolute Percentage Error
KNN Regression	48.82%
Gradient Boosting	58.48%
Linear Regression	61.90%
Random Forest	56.48%
Decision Trees	68.92%

Economy of the bowler in the whole match

Here, it is the economy of all the balls that the bowler has bowled throughout the match. The criterion considered for calibrating the economy are opposition team, venue and name of the bowler. KNN regression produces least mean absolute percentage error when compared to other algorithms listed in **Table 3**. Hence, KNN regression algorithm is used.

To illustrate the working of the algorithm, input parameters considered are as follows:

Opposition team = England, Venue = Seddon Park, Bowler

= Bhuvaneshwar Kumar

With the help of the Euclidean distance formula, 5 nearest indices are marked and the average of their economies is calculated and the output is 5.78 for this example.

Table 3 : Error percentages of various algorithms for the parameter – Economy of the bowler for the whole match.

Algorithm Name	Mean Absolute Percentage Error
KNN Regression	34.01%
Gradient Boosting	34.52%
Linear Regression	34.61%
Random Forest	36.83%
Decision Trees	47.99%

Wickets taken by a bowler in respective over-type

Classifier algorithms must be implemented instead of regression algorithms for this model as classifiers are good at handling integer values. Wickets taken by the bowler are integer values, hence the classifier algorithm is used. Parameters involved in predicting the wickets are name of the bowler, Opposition team, Innings, venue and over-type. From Table 4, we can see that KNN and gradient have high accuracies yet random forest is most preferred due to imbalance class behaviour. It is the phenomenon when there is a single value repeated more than half of the list length the algorithm gives the most repeated output without learning.

To explain the working of the algorithm, the sample inputs are as follows:

Innings = 1, Opposition team = Australia, Venue = Seddon Park, Over-type = Death, Bowler = JJ Bumrah

The algorithm forms a decision path as given below

[0, 977, 1998, 3035,3964,4909, 5880, 6799, 7820, 8771, 9760, 10737, 11698, 12629, 13584, 14597, 15658, 16639, 17570, 18515, 19464].

The algorithm starts from 0 and moves to the next location with its nearest values for 20 times as n_estimators=20. The average of all the outputs is calculated. In this criteria mentioned above, the number of wickets taken by JJ Bumrah in death overs is 0.

Table 4: Accuracies of different classifiers for wickets taken by the bowler at respective over-type

Algorithm Name	Accuracies
KNN Classifier	74.9%
Gradient Boosting Classifier	74.9%
Random Forest Classifier	71.1%
Decision Tree Classifier	63.5%

Strike rate of the batsman in respective over-type

It is the average runs scored per 100 balls faced by the batsman. The parameters contributing for the prediction are name of the batsman, Venue, innings, opposition team name and over-type.

The data associated with strike rate are trained with several algorithms listed in Table 5. It is found that gradient boosting has least mean absolute percentage error and hence this algorithm is used for this model. To explain the working of the algorithm, sample inputs are given as follows:

Innings = 1, Opposition team = Pakistan, Venue = Karachi, Batsman = RG Sharma, Over-type = Death
Gradient boosting algorithm takes the inputs and a decision tree is formed. The residual output is the input for the next decision tree for the next 100 decision trees.
Final predicted output : BV+
(LR*RP1)+(LR*RP2)+….(LR*Rpn)
Where, BV is base value, LR is the learning rate, RP is the residual of the nth decision tree and n=100. Now based on the residual values predicted, the strike rate for the above mentioned criteria is 110. In order to represent the run rate in the form of range, mean absolute error (17.63) is added and subtracted to the average and represented as [92.37,127.63].
Table 5 : Error percentages of various algorithms for the parameter – strike rate of the batsman in respective over-type

Algorithm	Mean absolute percentage error
KNN regression	51.72%
Gradient Boosting	46.32%
Linear Regression	47.10%
Random Forest	46.47%
Decision Trees	64.90%

III. RESULTS

Generally in any sport, each player will possess a different skill-set. Captain or team management need to assign different roles based on their skill-set which would result in balance of the team. A team is considered to be balanced when it is good at all aspects. To maintain the integrity and balance of the team, we split up the 11 players into 4 batsmen, 1 wicket-keeper, 2 all-rounders and 4 bowlers respectively.

The split-up that we mentioned was tentative. In case of weak performance or injuries, we should have other options to balance the team performance. For suppose, if a bowler has a bad day on the field, then the other bowling option will come into play. From the scenario considered above, this model is going to suggest the best playing XI using the above predicted parameters.

A. Batsmen categorization

Batting order is the order in which batsmen come to bat on the field with 2 batsmen on either side of the pitch i.e. strike and non-strike end. The order in which the eleven players bat is generally decided before the start of a cricket match and yet it can change over the course of the game.

The batting order is based upon several factors such as player abilities, degree of comfort, potential batting combinations and situation of the match. Hence, considering each factor, the batting order was classified into three categories in common parlance.

- Top Order (1-3 positions)
- Middle Order (4-7 positions)
- Upper Middle Order
- Lower Middle Order
- Lower Order (8-11 positions)

B. Bowler categorization

Bowling category consists of quick bowlers, whose primary weapon is pace, swing and groove bowlers, who aim to deviate the ball's path through the air are all examples of fast bowlers. A spin bowler throws the ball gently and spins it. When bouncing off the pitch, allowing it to turn at an angle. The spinners are generally categorized into two, finger spinners and wrist spinners.

C. Game Conditions

Several parameters are involved in predicting the most probable playing XI such as

- Opposition Team
- Venue
- Minimum experience required for a player (Number of matches a cricketer played).

Minimum experience shortlists the players who are eligible for the team. The shortlisted players will go through algorithms and specific conditions in order to give the most probable playing XI as the output.

D. Batsmen Selection

First step to predict the playing XI is selecting the top order. Top order includes three pure batsmen who score more runs quickly with consistency. To achieve this, a batsman with a high strike rate and good average are required. Using data scraping techniques, the data set is trimmed such that only top-order batsmen would iterate through a gradient **boosting algorithm** which predicts the strike rate of the batsmen at different stages of a match (Power play, Middle Over's and Death Overs). Average is computed of all three values and sorted accordingly and again batting average is taken into consideration and sorted again. First 3 players of the list are considered as top order batsmen.

A wicket keeper can always be a pure batsman or an all rounder. Our next step is to select a wicket keeper. There are mainly 2 aspects involved.

1. If there is a wicket-keeper in top order, then we need not include a wicket-keeper in the middle order.
2. If there is no wicket-keeper in top order, then we must include a wicket-keeper as one of the batsmen in the middle order.

For Middle order, again there are 2 categories, upper middle order and lower middle order. In this scenario, the average of the batsman is not considered because the main aspect for the middle order batsmen is the strike rate.

All the players in the upper middle order category are iterated through a gradient boosting algorithm which predicts the strike rate of the batsmen at different stages of the match. The average is computed and sorted in descending order.

If there are no all-rounders in top order or upper middle order, we need 2 all-rounders for balance of the team. Lower middle order batsmen are iterated through a gradient boosting algorithm which predicts the strike rate of the batsman at different stages of the match. Average is computed excluding the power play. Batsmen with the highest strike rate among them are chosen for the playing XI.

E. Bowlers *Selection*

Generally, a team plays with 2 spinners, if a spinner is available in all-rounders, we only need one spinner and the remaining 3 positions considered are fast bowlers. Economy of a bowler and bowling average are important aspects of a good bowler. Economy shows how effectively a bowler is restricting the batsmen to score runs. Average is all about taking wickets for less number of runs.

Average of the bowlers are extracted from the data set and sorted. The top 4 bowlers are iterated through KNN regression algorithm which predicts the economy of the bowler throughout the match. It is again sorted in descending order and considers the first three in the list. The same process is carried out for spin bowlers too.

Final Playing XI

As mentioned, we need input parameters such as opposition team, venue and ME. So to illustrate this model, sample inputs given are as follows:

Opposition Team = England, Venue = Lords, Minimum Experience = 15 T20I Matches

The data set goes through the process mentioned above and the final output is

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IV. CONCLUSION AND FUTURE SCOPE

Two data set files containing the data of all 132 matches played by team India cricket team are constructed. The first data set contains metadata such as Match ID (unique for each match), Team1 & Team 2 (India/opponent based on where the match has taken place), Venue, Team that won the toss, Decision of the team that won the toss, player of the match, and winner of the match. The second data set contains ball-by-ball data of all the balls bowled in those 132 matches, the fields of second data set are Match ID, Number of the innings, batsman at the striker end, batsman at the non-striker end, runs that came off the bat, Extras, and type of dismissal (if any batsman is out during that ball).

Several Machine Learning algorithms such as Linear regression, K nearest neighbor regression, Random Forest classifier, Gradient boosting algorithm, Decision trees were tested and the best algorithms were used to predict various cricket related parameters such as run rate of a team, strike rate of a batsman, economy of a bowler, number of wickets a bowler can take.

All the predicted parameters are taken into consideration to suggest a best available playing XI. The model is successful in suggesting a best playing XI, however there are a few drawbacks in the model such as not considering a new player for debut in the next to happen match while suggesting the playing XI and does not consider the consistency of the player while suggesting the playing XI.

Future Scope

The project can be extended to an advanced level, where prediction can be done ball-by-ball. In 1937, BBC became the first channel to broadcast a cricket match on the television. Since then, broadcasting technology has evolved to a new level. To give a complete watching in the stadium experience to the audience, multiple cameras have been used to capture the live. Hawk-eye technology, which is a computer vision system used to trace the trajectory of the ball. The system uses six (or sometimes seven) Full HD cameras captured at 25/30 fps, placed at different positions in the stadium.

The video feed from all the cameras is triangulated and combined to visualize the ball trajectory in a three-dimensional representation. The data of where the ball has pitched, where the ball has hit the bat, where the ball has landed after the impact will be very useful to predict the type of ball the bowler is going to bowl in the next ball, and how the batsman plays his shots against it. Such data can be algorithmically predicted, analyzed and used to characterize the batsman and bowler. Accuracy of prediction of parameters can be increased by using Hawk-eye data. If a team can guess the correct playing XI of the opponent team, a more sophisticated playing XI can be suggested based on the prediction of the match-ups such as a particular batsman VS a particular bowler, VS a type of bowling, or VS a length/line of the ball, or in a particular situation.

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What is the Economic Impact of Fast Fashion? - Economics Research Question

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ABSTRACT

'Fast Fashion' is a term used to define the sub-section of the clothing industry that produces cheap, low-quality, and trendy clothing (often, they are replicas of high-fashion items) in a very short amount of time, catering to the wants of the customer at the point of highest demand at a very low price. To quantify the increase in clothing purchases, in 1980, an average American bought 12 items of clothing annually, but today, the number is up to 68. This relatively new concept is taking the industry by storm financially with extraordinary growth rates. It is also impacting the environment negatively with a high and irresponsible consumption of natural resources in the economy. The labor conditions in the fashion world are also worsening with the need for faster production cycles stressing underpaid labor in developing countries. This paper discusses fast fashion, its origins, and the serious economic effect it is having today.

Keywords : Fast Fashion, Trendy Clothing, Smart Forecasting, Ecommerce

I. INTRODUCTION

'Fast Fashion' is a term used to define the sub-section of the clothing industry that produces cheap, low-quality, and trendy clothing (often, they are replicas of high-fashion items) in a very short amount of time, catering to the wants of the customer at the point of highest demand at a very low price. Effectively, fast fashion has changed how consumers think about clothing, the way they dress, and what they do with their garments. Even though they are buying a lot more clothes and have many they have never worn, they still look forward to buying more (Knošková, Ľ., & Garasová, P, 2019). To quantify the increase in clothing purchases, in 1980, an average American bought 12 items of clothing annually, but today, the number is up to 68 (Thomas, 2020, #).

Fast fashion brands also seem to enjoy popularity among the consumers. A study found out that 88% of all consumers in the US prefer fast fashion whereas the number in Italy is 49%, and in the rest of Europe, 46% show preference for fast fashion (Knošková, Ľ., & Garasová, P, 2019). This is proof that this industry is not going anywhere anytime soon.

This relatively new concept is impacting the industry and the global economy financially, socially and environmentally. Often, fast fashion is considered today's fashion and is held responsible for the growth of the market. Moreover, there are increased amounts of concern over the sustainability and excess resource consumption by the companies operating in this sector and their inappropriate treatment and remuneration of labor.

While there may be some gaps in the information presented, the following research paper is based off of a review of the existing literature on the matter including studies, research papers, statistics published by governments and established international organizations, and articles and videos by experts and fellow researchers. It aims to provide a thorough understanding of fast fashion and how it started while evaluating the impact it is having in the context of economics in three main areas: finance, environment, and employment.

Fast Fashion and its origins

Prior to the 19th century, cloth making was a very slow process - sourcing materials, preparing them, weaving the fabric, and making the clothes. With the industrial revolution and the introduction of machines for processes like weaving and sewing, production became faster, simpler, and cheaper. Dressmaking shops were also introduced around this time in the 20th century (Rauturier, 2022). In the 1990s and 2000s, with rising e-commerce making clothes easier to sell and the 60s' and 70s' "youthquake" (Lambert, 2014, 15-17) creating new trends and developing clothes into a form of expression, everyone caught onto the phenomenon of being able to quickly buy trendy clothes whenever they liked.

In fact, the term 'fast fashion' was coined by New York times to describe Zara as it was taking them only about 15 days to from making the design of an article to selling it in stores (Rauturier, 2022). While normal companies have about two to four cycles each year, fast fashion companies release new clothing every two to four weeks, which adds up to 13 to 26 cycles each year, significantly more than the legacy companies (Lambert, 2014, 15-17).

Fast fashion companies focus on manufacturing large amounts of products based on latest fads as fast and as cheaply as possible to sell at low prices for a quick inventory turnover. They also hope that as a result of trend anchoring, customers do not get bothered by the bad quality. Anchoring is a vital behavioral concept in understanding the success of fast fashion. It causes "induced obsolescence" of fashion items. Fast fashion brands are able to make profits by continuously changing, adapting, and eliminating trends using visible differences such as colors, patterns, fits etc. (Lambert, 2014, 15-17)

The target audience for fashion brands remain young people as they crave for a sense of acceptance yet uniqueness, which these companies are able to provide by creating a plethora of clothing with only very small variations between the clothes. This culture creation in society made it easier for these brands to cut their costs unethically without having any repercussions as the majority opinion and popularity was in their favor. In a sense, they are making profit off of people's willingness to wear stylish clothing at a cheap price. (Lambert, 2014, 15-17)

Fast fashion, by itself, has become a market with very unique players like H&M, Zara, UNIQLO, Bershka, and Fashion Nova among many others. Although these outlets may seem very different, they are playing the same game in the same segment of the fashion industry.

These brands focus on reducing their lead times. In essence, they want to minimize the amount of time it takes for them to make their clothes reach the market. For this, they use Quick Response Manufacturing (QRM). Coming up with original designs, sourcing the right raw materials, bulk manufacturing the products carefully, and then distributing the product takes an established brand about 21 months, which is about two years. On the other hand, fast fashion companies knock-off designs, keep fabrics and materials on hand, only manufacture more if there is more demand, and streamline their distribution, which means that their products reach the markets in only about four months and sometimes, in much shorter periods of time. (Patriot Act with Hasan Minhaj, 2019)

The main characteristics of QRM (Jacobs, 2020) in fast fashion are:

1) Fast turnaround - While making the garment takes the same amount of time, it is all about the pace of the processes that come before and after it. By speeding them, they are able to turn a sketched design into sellable articles in stores in a matter of a few weeks.
2) Inventory turnover - It is vital that their clothes do not stock up in stores. Fast fashion brands understand this and are able to sell out and restock their shelves about four to seven times in a year.
3) Test and repeat - This tactic involves the brands launching designs and understanding the level of their demand before mass producing the clothing item and ending with a huge amount of dead stock.
4) Smart forecasting - Fast fashion brands are also investing their resources to develop tools that can use qualitative and quantitative data to accurately predict the clothes that the consumers are likely to buy or the colors, patterns, fabrics, and styles that will become trendy.

Due to this relatively new segment of the fashion industry and its tactics, it often comes under the limelight for violation of intellectual property legislation, labor and consumer exploitation, and environmental damage. While these brands are copying designs, they are producing knock-offs, which do not replicate the exact designs, logos, or trademarks, unlike counterfeits. They only closely resemble the luxury goods counterparts, and that is usually okay. However, it is largely believed that workers in fast fashion are exploited as these brands aim to cut costs at every level to drive up the money they make. They are also not trying to cater to the poor by producing cheap clothing, but are attempting to manipulate customers to buy clothes they do not require. This introduction of cheap prices, new designs, and trendy clothing provides an ideal scenario for shoppers to constantly buy. (Lambert, 2014, 15-17) This increase in purchasing and the subsequent increase in disposal of these items is also having a massive impact on the environment and the incessant unnecessary consumption of valuable resources. All of the above factors are also leading to customers demanding increased transparency in the supply chain by these brands to ensure that all processes are ethical and sustainable. (Jacobs, 2020)

As a result, this research paper jumps deeper into the monetary, environmental, and labor-related impacts that this growing industry has.

Financial impacts

Global apparel and footwear sales were estimated to be 1.7 trillion USD in 2019 and are expected to grow to about 2.9 trillion USD by 2030 (Radonic, 2022). While sales may have definitely taken a hit and shrunk due to the pandemic, the industry recovered and shopping is said to have returned to about the pre-pandemic levels (once the lockdowns were lifted) (*Global Fashion Industry Statistics - International Apparel*, n.d.). The fast fashion market is said to have

also taken a dip due to Covid-19 of about 12% to hit 23 billion USD in 2020 but is said to fully recover by 2023, reaching 28 billion USD (Radonic, 2022). Other estimates suggest that the industry was worth about 30 billion USD in 2021 already and will reach 38 billion USD by 2025 (Eichler, 2022).

The fashion industry, of which fast fashion is a part, concerns the livelihoods of about 15% of the world's workforce. That is, 1 in 6 people employed globally has their income attached to fashion. This goes on to demonstrate the economic impact of the industry. However, with poor wages, the industry is tarnished with a reputation for poverty issues. (Radonic, 2022)

The textile and apparel industry also has a significant role in many countries' economies. Take, for example, China. According to Asia Garment Hub, China has over 10 million garment/textile workers, and the industry makes up for about 9% of the country's total exports. In Bangladesh, however, the industry employs 4.5 million people. There, textiles and garments exports alone make up for about 8% of the Gross Domestic Product (GDP) and 84% of all exports. (*Countries — Asia Garment Hub*, n.d.) Such a high concentration of a single good in a country's exports shows the dependence of the nation's economy on the industry. The same thing is true in Vietnam, where the 35 billion USD textile exports make up for about 12% of their GDP (*Countries — Asia Garment Hub*, n.d.).

Fast fashion retailers seem to be taking the industry by storm by being the driving forces of growth in the fashion world. This and their success can be proven by their extraordinarily high growth rates when compared to that of the whole industry. In fact, while the industry is growing at an annual rate of about 5%, the same number for some of the fast fashion giants is as follows: Inditex (parent company of Zara, Bershka, Pull&Bear, Massimo Dutti etc.)- 9.76%, H&M - 10.61%, ASOS - 34.59%, and Boohoo - 62.61% (Knošková, Ľ., & Garasová, P, 2019). Meanwhile, PVH (the parent company of Calvin Klein and Tommy Hlfiger), Levi's, and Gap are all showing much less growth compared to Zara and H&M in the same time frame (Patriot Act with Hasan Minhaj, 2019). Further highlighting the extent of fast fashion brands' growth is the fact that Inditex had 7,490 stores (Inditex, 2019), which means that since 2005, Indetix, on average, has been opening one new store everyday. The fashion world only seems to have more growth set for itself in the future as there is as expected rise of 400 percent in the world Gross Domestic Product by 2050 (Reichart et al., 2019).

Established brands like J.Crew, Ralph Lauren, Burberry, Hollister, among others have voiced their desire to pace up their production to mimic what fast fashion companies are doing (Patriot Act with Hasan Minhaj, 2019).

E-commerce is also bringing massive economic growth to the industry. Brands are able to cater to a much wider market, including consumers in countries where the brand does not have stores or consumers who cannot visit the stores. This makes it very easy for customers to be able to buy new clothes too. In 2018, fashion e-commerce was worth only about 481 billion USD, but in 2022, it is predicted to go over 700 billion USD. The expected average annual growth rate is about 10%. (Assoune, n.d.)

However, it is relieving to know that after the pandemic, people are willing to make better and more sustainable choices. A survey in McKinsey showed that post Covid-19, 65% intend to buy more durable clothing, 71% plan to keep their current clothing for longer, and 57% are willing to make their clothes last longer by repairing them. About 50% of the Gen-Zs and Millennials also plan to start making more second-hand clothing purchases. (Granskog et al., 2020) It is even predicted that the second-hand

market will grow to twice the size of the fast-fashion market by 2029 (*Fashion's Impact in Numbers*, n.d.).

While second hand clothing may seem attractive as clothes are being reused and the negative impact is being controlled, sometimes it has unintended consequences. Much of the donations of used clothes that are made in the west end up in developing countries. This apparel actually ruins the local market as artisans in the country cannot compete effectively with the very cheap prices of the donated, used, second-hand clothing. (Kozlowski, 2019)

As discussed earlier, fast fashion is causing a severe underutilisation of garments. Apparel is being used for an extremely short amount of time and is being thrown away, incinerated, or gathering up in landfills, and people are buying a lot more clothing. Not only customers, even companies are not recycling or donating their unsold clothing items. All of this is leading to the wastage of natural and financial resources and is estimated to be causing losses of over 500 billion USD.

With this, we are beginning to understand the economic impact of the fashion world on a customer, a worker, a country, and the global market, alongside the gains and losses it is causing.

Environmental impacts

While fast fashion has a significant financial impact, its environmental impact is also worth taking a note of. Multiple United Nations (UN) Organizations have created the UN Alliance for Sustainable Fashion during the UN Environment Assembly in March 2019 to counteract the grave negative effects of the fashion industry. The UN recognises the fashion industry to be the second most polluting industry with clothing and footwear production causing 8% of the world's greenhouse gas emissions. These carbon emissions account for more than those of maritime shipping and international flights put together. (Villemain, 2019)

A UN expert also went on to explain that as the production takes place majorly in Asia, hard coal and natural gas are often the main sources of energy for electricity. They also said that if no action were taken and businesses were to continue to function like they are functioning in the present, the greenhouse gas emission would rise by 50% by 2030. Even the United Nations recognises the dominant force of 'fast fashion' as one of the key reasons for the detrimental environmental impact caused by the frequent buying and discarding of garments. With a 60% increase in clothing purchase levels in the past 15 years and manufacturing doubling between 2000 and 2014, the fashion industry now uses 93 billion cubic meters of water and is responsible for the production of 20% of the world's wastewater. In addition, over 500 thousand tons of microfibre are dumped into water bodies annually, equal to about 3 million barrels of oil. (Villemain, 2019)

It is estimated that the average American discards about 80 lbs of clothes each year (about 80% of the total clothing consumed) (Wicker, 2016). To put it into a more global context, one garbage truck of clothes is burnt or ends up in landfills every second (Reichart et al., 2019). Not to forget 72% of our clothing is made up of synthetic fibers that can take up to 200 years to decompose, creating a huge waste problem (Charpail, 2017).

Another issue with the fashion world is the excessive use of energy and chemicals in fabric production. Making materials such as synthetic fibers out of plastic is an energy-intensive process that releases hydrogen chloride and volatile particulate matter (Maiti & Thomas, 2022). These processes also come with a heavy reliance on non-renewable energy sources with manufacturing plants that use petroleum and other fossil fuels to power the production of the

clothing. (Marsh, 2022) To quantify, polyester production alone uses 70 million oil barrels each year (Charpail, 2017). This has led to fashion becoming one of the industries with the highest greenhouse gas emissions. These gasses contribute to global warming as they raise the temperature of the earth. At this rate, the world is likely to experience instability in ecosystems with drought, agricultural challenges, and dire need of migration. (Marsh, 2022) Furthermore, cotton production is making use of 11% of the pesticides and 24% of the insecticides produced globally. This heavy use of chemicals is polluting the ocean, degrading the soil, and causing severe health problems including death among cotton farmers. In fact, 20,000 people lose their lives through cancer and miscarriages caused by the chemicals sparyed on cotton.

As environmental economics divulges deeper into the allocation of scarce natural resources, this excess consumption and waste can be better understood by looking at the amount and kind of resources that are used up in manufacturing these goods. For example, it is estimated that it takes 2,700 liters of water to make just one cotton shirt, which is 2.5 years worth of drinking water for one person (Reichart et al., 2019). On the other hand, a pair of jeans uses up 7,500 liters of water, which is seven years worth of drinking water for an average person (Rauturier, 2022). This creates a huge problem as it depletes the supply of safe drinking water while 884 million individuals lack access to it, suffering from dehydration and other adverse health effects (Marsh, 2022).

The wastewater from the industry such as those from tanneries in Bangladesh often ends up in streams and rivers, polluting them. The workers and those that live around those water bodies suffer the grave consequences of the toxins such as chromium, sulfur, and manganese that pollute the water sources. (Marsh, 2022) In fact, leather tanning is one of the most toxic processes in the industry as it uses hazardous materials that are not biodegradable and end up in the ocean (Maiti & Thomas, 2022).

On many occasions, brands in the industry are making use of synthetic fibers which are cheaper than cotton. One of these is polyester, which is made of plastic and whose production emits more carbon than that of cotton (Le, 2020). In addition, these materials contribute to microplastic pollution (Marsh, 2022). As we wash our synthetic garments in the washing washing machine, microfibres enter the wastewater, reaching the ocean through runoffs. As marine animals ingest these microplastics, they suffer from adverse health effects including neurological issues. By consuming the fish that have ingested such waste, these microplastics end up in our food chain, causing many health-related challenges for humans tootoo. (Marsh, 2022) It is estimated that 700,000 microfibers are released are released each time a piece of synthetic clothing is washed, and a study even claims that simply wearing a synthetic garment releases 300 million microfibers into the air annually (Charpail, 2017).

Furthermore, 33% of a fabric called viscose is produced using trees from ancient or threatened forests. It is estimated that 70% of the harvested wood for this material ends up getting wasted. Moreover, while developed as a cheaper alternative to cotton, it is responsible for more greenhouse gas emission than cotton and the carbon disulphide used in its production has proven deadly to the laborers (Le, 2020). The production of viscose, rayon, and modal are leading to mass destruction of forests. Annually, 70 million trees are cut down to produce clothes and 5% of the industry uses forest-based materials. Due to this deforestation, combined with excessive use of chemicals and overgrazing of pastures by goats and sheep used for cashmere and wool, used for procuring cashmere and wool the soil is degrading. We need healthy soil for growing food and absorbing carbon dioxide, but 30% of Patagonia suffers due to

desertification and 90% of Mongolia faces the threat of the same. It is estimated that food production will fall by 30% in the next 20-50 years as a result of soil degradation.

Using just some of the many instances of the negative ecological effect of the fashion industry, it is clear that there is a need for change in our ways.

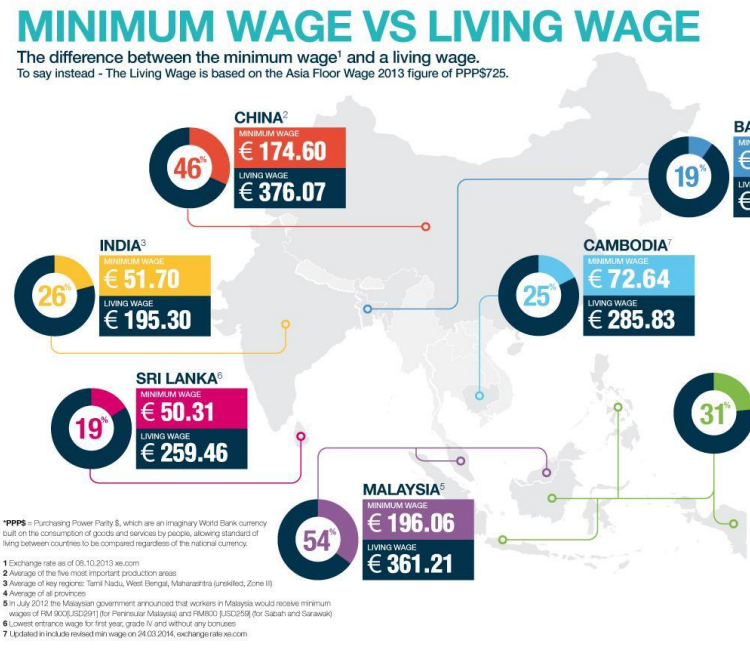
Labor economics

Another sector of fast fashion that concerns economics is the social impact, particularly in regard with labor economics. Estimates suggest that upwards of 75 million people work in the fashion world globally (Chaudhary, 2022). Research suggests that the majority of the workers are women, with certain studies showing that 80% of all apparel is made by young women aged 18 to 24 years (Maiti & Thomas, 2022). Garment production concerns the livelihood of all of these millions of workers. While the industry may be having a detrimental impact on the environment, the employment that it provides cannot be ignored. If people were to significantly decrease their clothing purchases, household incomes of all of these workers would be at risk.

With fast fashion bringing new trends into an already labor intensive industry, where each apparel is made by hand , fashion is increasingly becoming dependent on low-cost labor, making them relocate to low-income Asian countries. There, they are hiring mainly female workers as they are economically and socially vulnerable. Although fast fashion is providing these laborers some support, it is largely argued that they are underpaid and that their working conditions are dire. Fast fashion promotes smaller fashion cycles which stresses the production resources and causes human welfare to be compromised for the sake of more profit.

A minimum legal wage is the amount that the government mandates as the least sum of money that someone can be paid for their work. This differs from the living wage, which is the estimated amount of money that someone requires to be able to fulfill their basic needs. In many of the manufacturing countries, the minimum wage only represents half to a fifth of the living wage. As many companies boast about paying the minimum wage, it is the harsh reality that many others are not even receiving the bare minimum (despite it being far less than what they need to sustain themselves properly). (Charpail, 2017)

The following chart shows the difference in the living and minimum wages of the Asian countries where the majority of garment manufacturing is concentrated.



(Clean Clothes Campaign, n.d.)

Furthermore, an Oxfam Australia report found that in 2019, only 1% of garment workers in Vietnam earnt a living wage while in Bangladesh, the number was 0% (Chaudhary, 2022). Also, workers in the industry in Bangladesh make only $96 a month whereas the government suggested that such a worker needs 3.5 times this amount to be able to afford a 'decent life with basic facilities' (Reichart et al., 2019). These

numbers only begin to expose the poor remuneration of labor. Another research concluded that for a €29 shirt, only 0.6%, equal to 29 cents, went to the worker making the apparel (*Fashion's Impact in Numbers*, n.d.). It can be argued that these low salaries catch these workers in an awful cycle of having to constantly work in this industry. This is because they are never paid enough to be able to save and invest to have something to fall back on if they are fired or while they quit and look for another job.

Apart from the low salaries, the health and safety conditions in the production facilities are also extremely poor. Labor rights are heavily violated in these factories. It is very difficult for women to pull themselves out of poverty because they are not able to organize themselves into groups or speak up for their rights due to anti-union policies or cultural norms in the developing nations. Reportedly, women in Bangladesh experience bladder issues due to a lack of bathroom breaks and from being forced by their managers to use the contraceptive pill. The lack of a living wage also promotes issues like not providing maternity leave, improper sanitation, or experiencing sexual harassment. Sometimes, daughters are sent off to work at an age as young as ten. They also become vulnerable to sexual abuse, and this goes unreported because they cannot afford losing their income. In a survey by Oxfam, one in four women reported some type of abuse. (McCosker, 2021) Leaving out sexual abuse, all workers may also be subjected to verbal or physical abuse by being insulted, denied bathroom brink, or disallowed from drinking water because they failed to hit their targets.

The condition of the factories is also very dire and concerning. Labor often works in unsafe buildings with little to no ventilation. They are often subjected to breathing in toxic substances, fiber dust, and sand, causing health issues. (Charpail, 2017) To give an example, in 2013, Dhaka saw the worst garment-factory accident. Rana Plaza complex in the Savar district of Greater Dhaka collapsed, killing more than 1100 workers. The factory owners had been warned of the structural safety of the building. Cracks were appearing, and the building was made taller than it was meant to be. A bank in the same building had sent its employees home the previous day, but the garment factory, which supplied Primark and Matalan, continued to operate despite the warnings. Similar incidents have occured in other manufacturing hub countries. In September 2012, in Pakistan, fires set off in two different factories, with more than 300 people dying. The first factory, reportedly, had closed emergency exits and the windows had iron bars, making it extremely difficult for workers to escape as the boiler exploded. These are just two of the many instances where workers' lives have been endangered for the sake of cost-cutting, profit-making, and faster production of apparel. (Hobson, 2013, 317-319)

Moreover, garment workers have extreme working hours. Their normal work week consists of 96 hours. Sometimes, they have to work up until 2 or 3 AM to fulfill the high demand and meet peak season deadlines. Overtime may not even be optional, with workers being threatened of being fired. At times, despite the very low base wages, overtime is not even paid. (Charpail, 2017)

To add to this, the US Department of Labour in its "2020 List of Goods Produced by Child or Forced Labour' found that in many countries, including Bangladesh, Burma, Brazil, and India, garment industries make use of child or forced labour (*2020 List of Goods Produced by Child Labor or Forced Labor*, 2020). In fact, the Global Slavery Index estimates 40 million people are living in modern slavery. Today, fashion is identified as one of the five major industries with a significant prevalence of modern slavery. The conditions described above are similar to that of a modern slave. Despite such widespread knowledge of labor exploitation, G20 countries imported 127.7 billion USD worth of

garments which were identified as at-risk products of modern slavery. (Kozlowski, 2019) To give an example, until very recently. The government in Uzbekistan was forcing about a million people, including children who should have been in school, to harvest cotton. (Charpail, 2017)

These cases show how fast fashion is affecting, and practically harming, the workforce, a key resource in the global economy.

II. CONCLUSION

Fast fashion has surely had some positive effects in terms of fuelling the growth of the industry and increasing revenue from garments, especially for developing countries where the production is concentrated. It has also helped provide jobs and employment to millions of workers around the globe who now have some form of income, thanks to the rapidly growing world of fast fashion. This concept has also revolutionized manufacturing as knock-off and other designs are able to go from the ramp or a sketch to available to be bought and worn in a matter of a couple of weeks. Many people are now able to stay fashionable, feel luxurious, and stay on trends with the ease of access of a fast fashion brand (with stores and e-commerce) at a very low price.

While all this holds true, the garment industry, as a whole, has also proved to be detrimental socially and environmentally. Induced by fast fashion, the culture of regularly disposing and replacing clothes to stay fashionable has only worsened the effects of the industry as production, consumption, and improper disposal rises.

On the other hand, as the research demonstrates, the garment industry, as a whole, has proved to be detrimental socially and environmentally. Induced by fast fashion, the culture of regularly disposing and replacing clothes to stay fashionable has only worsened the effects of the industry as production, consumption, and improper disposal rises.

Fast fashion is also contributing to the stagnant or reducing market share/growth of traditional clothing brands. Furthermore, it is contributing to the increased use and wastage of energy and essential resources such as oil, wood, and water. Producing and disposing of these clothes is also releasing toxins and pollutants in the environment, which is causing the health of workers and of the people in the surroundings of the manufacturing plant and polluted areas and water bodies to be affected negatively. It has also become one of the industries with the largest amount of greenhouse gas emissions.

Moreover, with more people employed in factories producing garments, more workers are suffering in jobs with unsafe conditions, insufficient remuneration, and even forced and child labour. These are all questions of social and ethical relevance that concern the fast fashion market.

Although this research paper has attempted to shed light on the economic impact of fast fashion, a lot is still there to be studied and analyzed. A major concern that arises when speaking of this matter is intellectual property rights because much of this industry is based on producing knock-offs of expensive, famous, and luxury goods for those who want to hop on to the trends without having to spend a fortune. Even within the areas the papers considers, a lot more data is available and many more figures should be considered. In fact, this paper only conducts a literature review and secondary research while updated primary research and strict fact-checking can help better evaluate the condition of the industry. For the purpose of this research, only a literature review and secondary research were conducted, but a more recent, updated and focused primary research and a strict fact verification process will be able to solidify the research.

As these numbers will be discovered and discussed more and more, hopefully people will realize that there is a need for alternatives to fast fashion (as it is known today) and that something needs to be done to prevent things from going downhill and beyond fixing. In my opinion, a cultural and legislative change is required to overturn the way the industry operates but looking into the solutions that have been or can be implemented and that have been or can be implemented analyzing their effectiveness is another factor that can be considered further by researchers, companies, customers, policymakers, and other stakeholders but was not discussed in this paper as it did not fall under its scope.

Additional research can also focus on the potential growth and future of fast fashion and the transparency and traceability of apparel companies.

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Studies on some Mixed Ligand Complexes with Schiff base and 2,2'- Bipyridine

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ABSTRACT

Some new mixed ligandmetal complexes of transition metals were synthesized from a schiff base which is obtained by the condensation of isoniazid and pnitrobenzaldehyde as primary ligand and 2,2'-bipyridine as a secondary ligand. The ligand and their metal complexes were studied using various spectroscopic methods namely molar conductance, magnetic susceptibility measurement, IR data and UV /vis spectroscopic techniques. The mixed ligand complexes were found to have formulae $[M(L1)(L2)]X_2$ where M = Ni (II) and Cu (II) . The resultant data expose that the complexes have a geometry demonstrative electrolytic nature. Its new compounds and their biological potency were chemically analyzed against Escherichia coli and Bacillus Cereus showing the enriched activity of complexes against the species as compared to the free ligand

Keywords : Ligandmetal, Pnitrobenzaldehyde, Spectroscopic Techniques

I. INTRODUCTION

The co-ordination chemistry of various ligandswith transition metal ions inhanced by using advanced techniques in the field of inorganic chemistry and pharmaceutical industries[1]. Schiff base played an important role as chelating ligandsin main group with transition metal ions and gives stability under suitable conditions as oxidative and reductive . Amine group in this complexes behave like marginal between hard and soft Lewis bases[2-4].

Schiff base obtained from amino and carbonyl group that co-ordinate with metal ions through azomethine nitrogen [5].(CN) linkage of this derivatives imperative role for biological activity like antifungal, antibacterial ,anticancer ,antimalarial[6-8]activities. The interesting and significant properties of schiff base complexes to reversibility bind oxygen[9] ,catalytic and photochromicproperties [10].

Mixed ligand complexes played a vital role in environment area as biological catalyst. Schiff base originated from heterocyclic compound as p-nitrobenzaldehyde and furan -2carbaldehyde .This complexes are applied in treatment and prevention for phthisis. The bypyridine ligands are widely used in formation of metal complexes regarding its strong redox stability.

Experimental

All these chemicals are purchase commercially from chemical laboratories. By using suitable apparatus measured its melting point and products characterized by likeing of spectroscopic data(UV-visible and FT-IR) and melting points with selected samples. The absorbance wavelength are determined by UV-visible.A quartz cuvette and ethyl alcohol used as a reference. its magnetic susceptibility determined by a balance at room temperature.

General Procedure for Synthesis of N-(4 nitrobenzylidene) isonicotinohydrazone Schiff base Ligand as the Primary Ligand, L1

INH (1.37 g, 10.0 m mol) was mixed with absolute ethanol (15 mL) and the mixture brought to the boil, producing a slurry. Barely sufficient additional ethanol was then added to give a homogeneous solution at reflux. P-nitrobenzaldehyde(1.22 mL, 10 mmol) was added drop-wise over 5 minutes and washed with 5 mL of ethanol. The reaction mixture was refluxed for 4 hours then allowed to cool slowly and to stand overnight. Finally, it produces a white crystalline solid which was filtered off and dried.

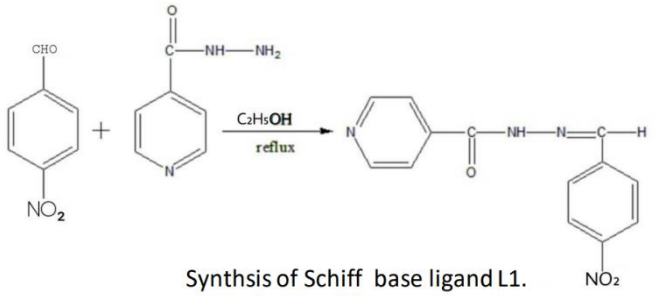
Cloud computing and cloud storage have become hot topics in recent decades. Both are changing the way we live and greatly improving production efficiency in some areas. At present, due to limited storage resources and the requirement for convenient access, we prefer to store all types of data in cloud servers, which is also a good option for companies and organizations to avoid the overhead of deploying and maintaining equipment when data are stored locally. The cloud server provides an open and convenient storage platform for individuals and organizations, ut it also introduces security problems. For instance, a cloud system may be subjected to attacks from both malicious users and cloud providers. In these scenarios, it is important to ensure the security of the stored data in the cloud. In [1], several schemes were proposed to preserve the privacy of the outsourced data. The above schemes only considered security problems of a single data owner. However, in some applications, multiple data owners would like to securely share their data in a group manner. Therefore, a protocol that supports secure group data sharing under cloud computing is needed. A key agreement protocol is used to generate a common conference key for multiple participants to ensure the security of their later communications, and this protocol can be applied in cloud computing to support secure and efficient data sharing. Since it was introduced by Diffie-Hellman in their seminal paper [4], the key agreement protocol has become one of the fundamental cryptographic primitives. The basic version of the Diffie-Hellman protocol provides an efficient solution to the problem of creating a common secret key between two participants. In cryptography, a key agreement protocol is a protocol in which two or more parties can agree on a key in such a way that both influence the outcome. By employing the key agreement protocol, the conferees can securely send and receive messages from each other using the common conference key that they agree upon in advance. Specifically, a secure key agreement protocol ensures that the adversary cannot obtain the generated key by implementing malicious attacks, such as eavesdropping. Thus, the key agreement protocol can be widely used in interactive communication environments with high security requirements (e.g., remote board meetings, teleconferences, collaborative workspaces, radio frequency identification [5], cloud computing and so on).

The Diffie-Hellman key agreement [4] provides a way to generate keys. However, it does not provide an authentication service, which makes it vulnerable to man-in-the-middle attacks. This situation can be addressed by adding some forms of authentication mechanisms to the protocol, as proposed by Law et al. in [6]. In addition, the Diffie-Hellman key agreement can only support two participants. Subsequently, to

solve the different key attacks from malicious conferees, who attempt to deliberately delay or destroy the conference, Yi proposed an identity-based fault-tolerant conference key agreement in [7]. Currently, many researches have been devoted to improving the security and communication efficiency of the key agreement protocol, which is covered in the literature [8] Note that in Chung and Bae's paper [12] and Lee et al.'s paper [13], block design is utilized in the design of an efficient load balance algorithm to maintain load balancing in a distributed system. Inspired by [12] and [13], we introduce the symmetric balanced incomplete block design (SBIBD) in designing the key agreement protocol to reduce the complexity of communication and computation. As far as we know, the work to design the key agreement protocol with respect to the SBIBD is novel and original.

Experimental procedure for synthesis of mixed ligand complexes

To the warm methanolicsolution (10 mL) of primary ligandL1 (0.255 g, 1 mmol), 10 mL warm methanolic solution (0.257 g, 1 mmol) of nitrate salt of metal Cu(II) and Ni(II) were added. After 30 minutes 5 mL warm methanolicsolution of 2,2′ - bipyridine (0.156 g, 1 mmol) was added drop-wise as a secondary ligand(L2) and the resulting mixture was refluxed for about 3-4 hours. The obtained precipitate was filtered, washed with methanol and dried under vacuum on anhydrous CaCl2



Synthsis of Schiff base ligand L1.

Experimental procedure for synthesis of mixed ligand complexes

To the warm methanolicsolution (10 mL) of primary ligandL1 (0.255 g, 1 mmol), 10 mL warm methanolic solution (0.257 g, 1 mmol) of nitrate salt of metal Cu(II) and Ni(II) were added. After 30 minutes 5 mL warm methanolicsolution of 2,2′ - bipyridine (0.156 g, 1 mmol) was added drop-wise as a secondary ligand(L2) and the resulting mixture was refluxed for about 3-4 hours. The obtained precipitate was filtered, washed with methanol and dried under vacuum on anhydrous CaCl2 .

Antimicrobial activity

The ligand(L1) and its mixed ligandcomplexes with (L2) were screened for in vitro antimicrobial activity in DMSO against gramnegative Escherichia coli and gram-positive Bacillus cereus strains by Kirby Bauer's disc diffusion technique. A uniform suspension of test organism of 24 hours old culture was prepared in a test tube containing the sterile saline solution. Sterile nutrient agar was then added in each of the Petri dishes. The dishes were related to ensuring the uniform mixing of the microorganism in the agar medium which was then allowed to solidify.

A Special type of filter paper discs are put in the various compound solution keep it on the labelled plates the DMSO are acts as solvent controller. A standard kanamycin compound are used for comparison . This sample put in the refrigerator for half an hour. the diffusion and incubated process maintain at 37ºC for 24 hours. A scale is used for measuring diameter of the inhabition zone around each dish and results recorded in millimeter. The experimental data of antibacterial activity of primary ligand (L1)mixed ligand complexes and graded drugs are shown in table.

Results and Discussion

By the reaction of Cu(II) and Ni(II) with ligand(L1)and 2,2′ - bipyridine(L2), complexes of the type $[M(bpy)(SB)]X_2$ were obtained. These complexes have a different colour, stable at room temperature,

insoluble in common polar solvent but soluble in DMSO and DMF, do not have the sharp melting point but decompose above 523K. The measurement of molar conductivity at 10-3 M concentration carried out in DMSO at room temperature. The molar conductivity values show that the nitrate complexes were 1:2 electrolytes . The analytical and physical data (colour, melting point, molar conductivity and magnetic moment) of the complex are observed . For the Cu(II) and Ni(II) complexes the magnetic moments were 1.83 BM and 0.22 BM indicating paramagnetic and diamagnetic in nature.

Table 1 Analytical and physical properties data of L1 and its mixed ligand complexes with L2.

Symbol of Compounds	Complexes	M.P or De (Decomposition Temp) / °C	Solubility			μ_{eff} in B.M
			Color	DMSO & DMF	Molar conductance ohm^{-1} cm^2mol^{-1}	
Ligand (L1)	$(C_{13}H_{10}N_4O_3)$	143	White	(+) ve	5	
$[Cu(L1)(L2)](NO_3)_2$	$[Cu(C_{13}H_{10}N_4O_3)(C_{10}H_8N_2)](NO_3)_2$	275 (De)	Brown	(+) ve	156	1.83
$[Ni(L1)(L2)](NO_3)_2$	$[Ni(C_{13}H_{10}O_3N_4)C_{10}H_8N_2)](NO_3)_2$	285 (De)	Yellow	(+) ve	149	Dia

Table 2 Key infrared bands (cm^{-1}) of L1 and its mixed ligand complexes with L2.

Symbol of Compound	Compound	ν (C=O)	ν (C=N)	ρ(Py) bending	ν (M-O)	ν (M- N)
Ligand (L1)	$(C_{13}H_{10}N_4O_3)$	1658.84	1598.69			
Ligand L2	$(C_{10}H_8N_2)$		1642 m	650		
$[Cu(L1)(L2)](NO_3)_2$	$[Cu(C_{13}H_{10}N_4O_3)(C_{10}H_8N_2)](NO_3)_2$	1636.35	1592.95	678.73	528.02	433.99
$[Ni(L1)(L2)](NO_3)_2$	$[Ni(C_{13}H_{10}N_4O_3)(C_{10}H_8N_2)](NO_3)_2$	1628.82	1571.41	681.68	534.71	426.92

Table 3 UV- Visible spectrum of the Ligand L1 and its mixed ligand complexes with L2.

Symbol of Compound	Compound	λ in nm	Assignment
Ligand (L1)	$(C_{13}H_{10}N_4O_3)$	283 333	π-π* n-π*
$[Cu(L1)(L2)](NO_3)_2$	$[Cu(C_{13}H_{10}N_4O_3)(C_{10}H_8N_2)](NO_3)_2$	270 367	π -π* C.T
$[Ni(L1)(L2)](NO_3)_2$	$NiC_{13}H_{10}N_4O_3)(C_{10}H_8N_2)](NO_3)_2$	269 370	π -π* C.T

Table 4 Antibacterial screening results of Ligand L1 and its mixed ligand complexes with L2.

Antibacterial Zone of Inhibition (in mm)		
Compounds	Gram Negative	Gram Positive
	Escherichia coli	*Bacillus cereus*
Kanamycin	32	35
Ligand (L1)	4	4
$[Cu(L1)(L2)](NO_3)_2$	20	22
$[Ni(L1)(L2)](NO_3)_2$	18	15

IR spectral studies

The IR spectrum of the primary ligand(L1) reveals characteristic bands at 1658.84.5 cm1 and 1598.69 cm-1 assigned to ν(C=O) and ν(C=N) .The band at 1658.84.5 cm-1 determinableto the ν(C=O) stretching vibration of the Schiff base ligandis shifted to another region 1628– 1637 cm-1 in the complexes of Cu(II) and Ni(II) reflecting coordination of the carbonyl oxygen to the metal ions .The presence of band at 528– 535 cm-1 in the IR spectra of complex is due to M–O stretching vibration.

The azomethine band at 1598.69 cm-1 of Schiff base was shifted to lower frequency range from 1571–1593 cm-1 in the spectra of the complexes, confirming the involving of the azomethine nitrogen atom in the coordination with the metal ion. In the IR spectra of this complex, the new bands which displayed in the 426– 434 cm-1 range are assigned to the ν(M–N) vibration . The strong sharp band observed at 1384 cm-1 in the complex can be assigned to uncoordinated nitrate ion . The band at 650 cm-1 is assigned to ν(C=N) of pyridine for secondary ligand, L2. This band is shifted to 671-682 cm-1 for mixed ligandcomplexes .All of these IR data confirm that ligandscoordinated in Cu(II) and Ni(II) metal complexes through their O and N atoms respectively.

UV- visible spectra

The UV-Visible spectra of the ligandL1 display two bands at 281 and 347 nm which are assigned to π- π* and n-π* transition respectively. The complexes reflect the charge transfer transitions which can assigned to charge transfer from the ligandto metal (LMCT) and vice -versa. The absorption bandsfor Complexes range from 367– 370 nm may be associated with L M → charge transfer and vice versa (M L →) . In the UV-region, the complexes reflect absorption band at 269–270 nm. which may be assigned to π π– * transition. All the spectral complexes reveals bands assigned to π π– * and M L → charge transfer. A square planar geometry prefer by the metals.

Antimicrobial screening result

The Schiff-base ligandL1 and its mixed ligandcomplexes with L2 noticed here were evaluated for antimicrobialactivity against Escherichia coli and Bacillus cereus. The values of zone inhibition were calculatedin mm. The antimicrobiaI data observed for ligandL1 and its mixed ligandcomplexes with L2 are tested.

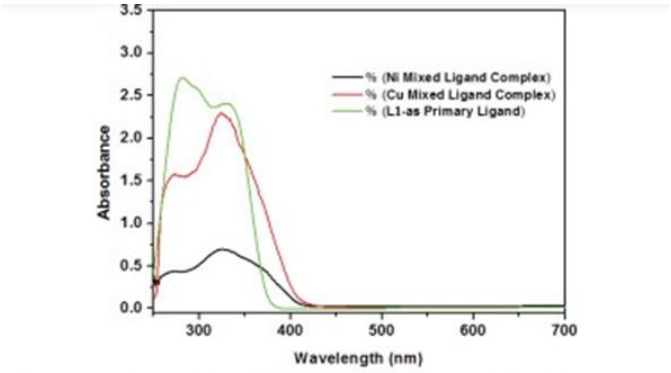


Figure 4 UV- Visible Spectrum of the L1 and its Mixed Ligand Complexes.

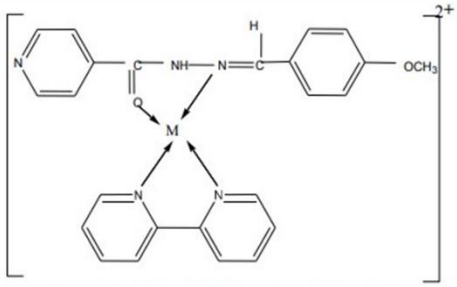


Figure 5 The proposed geometry of M- mixed ligand complexes for L1 and L2 (where, M= Cu(II) and Ni(II)).

The inhibitory zone data exhibits that the ligandL1, as well as its mixed ligand complexes with L2, reflect average antisepticaction. The anatomical area action of Schiff base ligandappear from the presence of imine group which imports in elucidating the mechanism of conversionreaction in biological arrangements.

Therefore antibacterial potency shown by this mixed ligand complexes with second ligand(L2) due to chelation of these metals with organic ligands enhancing its effect as a result. The DMSO control and not observed antimicrobial function against bacterial strains. But this processed sample found to be active.

Conclusions

The complexes as Schiff base ligand(L1) and copper (II) and Nickel(II) mixed ligand with

L2 were prepared and characterized by using different spectral and other techniques. Its IR spectral data shows Schiff base (L1) and bpy (L2) ligand coordinated with metal ions through Carbonyl Oxygen , Nitrogen of azomethine and pyridine. Similarly notice about their square planar geometry of the complexes. The various data indicating more

antibacterial potency of mixed ligand complexes than Schiff base ligand(L1). Therefore, tested complexes found to be moderately active.

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बिहार में वामपंथी विचारधारा का विकास

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ABSTRACT

भारत की कम्युनिस्ट पार्टी (भाकपा) की स्थापना के करीब चौदह वर्षों बाद 20 अक्टूबर, 1939 को मुंगेर में प्रान्तीय इकाई का गठन हुआ। उल्लेखनीय है कि कम्युनिस्ट पार्टी की प्रांतीय इकाई के गठन के लिए जो बैठक मुंगेर में आयोजित की गयी थी वह आहूत बैठक थी और इसे विजयादशमी के दिन आयोजित किया गया था। इस बैठक को विजयादशमी को ही आयोजित करने के पीछे भी बड़ा ही प्रमुख कारण रहा है। ये सर्वविदित है कि उस काल में अंग्रेजों का दमन चक्र जोरों पर था और अंग्रेजों को सर्वाधिक भय लाल भूत से था।[1] जाहिर सी बात है कि भारतीय कम्युनिस्ट पार्टी पर प्रतिबंध लगा हुआ था और पुलिस कम्युनिस्टों के प्रति बराबर चौकस रहती थी। इसलिए पुलिस की पैनी निगाह से बचकर बैठक करने का दुर्गा–पूजा ही सबसे अच्छा मौका था जिसका कम्युनिस्टों ने फायदा उठाया।

गुप्त रूप से हुई इसकी बैठक में मुख्य रूप से राहुल सांकृत्यायन, सुनील मुखर्जी, ज्ञान विकास मैत्र, विश्वनाथ माथुर (गया), अली अशरफ (पटना), विनोद बिहारी मुखर्जी बिहारी मुखर्जी, श्यामल किशोर झा (सहरसा), अनिल मैत्रा, शिव वचन सिंह (सारण), कृपा सिन्धु खुटिया (हजारीबाग), शरत पटनायक, बी.बी. मिश्रा, हबी बुर्रहमान, पृथ्वीराज, दयानन्द झा, नागेश्वर सिंह, चन्द्रमा सिंह, अजीत मित्रा, रतन रॉय ने भाग लिया।[2] इस बैठक में ऐसे ही देशभक्तों की टोली जुटी थी जो अँग्रेजी हुकूमत की जंजीरों को तोड़ डालने के लिए व्याकुल थी, जो बमों और पिस्तौलों से हुक्मरानों की नींद हराम की थी, जो जेल की कठिन यातना में तपकर खरा सोना बन चुकी थी, असहयोग आन्दोलन में सक्रिय हिस्सा ले चुकी थी और जो अब इस निष्कर्ष पर पहुँच चुकी थी कि शोषित, पीड़ित जनता की मुक्ति, मजदूर–किसानों के शोषण का खात्मा एवं देश की आजादी का एकमात्र रास्ता मार्क्सवाद, लेनिनवाद पर आधारित वैज्ञानिक समाजवाद है फिर भी बैठक में सभी को पूरी सदस्यता नहीं दी गयी। कुछ को उम्मीदवारी सदस्यता ही दी गयी जिसमें नागेश्वर सिंह एवं रतन रॉय थे। बैठक में पार्टी के केन्द्रीय नेतृत्व की ओर से पोलित ब्यूरो भाकपा के सदस्य श्री रूद्रदत्त भारद्वाज ने पर्यवेक्षक के रूप में भाग लिया। इसी बैठक में पाँच सदस्यों की एक प्रान्तीय संगठन समिति बनायी गयी जिसमें श्री सुनील मुखर्जी, पंडित राहुल सांकृत्यायन, ज्ञान विकास मैत्र, अली अशरफ एवं विश्वनाथ माथुर चुने गये और श्री सुनील मुखर्जी जो बंगाल के कम्युनिस्टों के सम्पर्क से जेल में ही कम्युनिस्ट बने थे, इसके सचिव बनाये गये।[3]

बिहार में 1939 के पूर्व भाकपा नहीं बनने के कारण :

यहाँ सवाल यह उठ खड़ा होता है कि पूरे भारत में जब भाकपा की स्थापना 1925 में ही हो चुकी थी, जिसके तुरंत बाद ही बंगाल, केरल, तमिलनाडु, महाराष्ट्र इत्यादि राज्यों में भाकपा की प्रान्तीय कमिटियाँ बन चुकी थी तो फिर बिहार में प्रान्तीय कमिटी 14 वर्षों के बाद क्यों बनी, सवाल स्वाभाविक भी है। इसके जवाब के लिए जब इसकी पृष्ठभूमि पर हम गौर करते हैं तो पाते हैं कि 1934 ई. में काँग्रेस सोशलिस्ट पार्टी का गठन हुआ था।

काँग्रेस सोशलिस्ट पार्टी के गठन के पश्चात् भारतीय कम्युनिस्ट पार्टी एवं काँग्रेस सोशलिस्ट पार्टी के बीच एक समझौता हुआ। इस समझौते के तहत हिन्दी भाषी क्षेत्रों तथा वर्तमान उत्तर प्रदेश, बिहार में भाकपा की स्थापना नहीं की जायेगी और यहाँ के कम्युनिस्ट कांग्रेस सोशलिस्ट पार्टी में रहकर काम करेंगे। कांग्रेस सोशलिस्ट पार्टी के मेरठ प्रस्ताव मार्क्सवाद–लेनिनवाद के सिद्धान्तों को भी स्वीकार किया गया था जो कम्युनिस्ट एवं कांग्रेस सोशलिस्ट की एकता का आधार बन सकता था।[4] काँग्रेस सोशलिस्ट पार्टी के महासचिव जय प्रकाश नारायण और आचार्य नरेन्द्र देव जैसे कुछ अन्य नेता कम्युनिस्ट पार्टी के नेताओं के साथ वैज्ञानिक समाजवाद के आधार पर एक ही संयुक्त पार्टी के निर्माण की बातें कर रहे थे। मगर काँग्रेस सोशलिस्ट पार्टी का एक दूसरा हिस्सा भी था जिसमें प्रमुख थे अशोक मेहता, मीनू मसानी इत्यादि जो एकता के साथ–साथ कट्टर सोवियत विरोधी थे। फलतः काँग्रेस सोशलिस्ट पार्टी में घोर कशमकश बना हुआ था।

कृष्णाचंद्र चौधरी भी हालाँकि कम्युनिस्ट पार्टी के बिहार में नहीं बनने का कारण, भाकपा महासचिव पी.सी. जोशी एवं कांग्रेस सोशलिस्ट पार्टी (कांसोपा) के तात्कालीन महासचिव श्री जय प्रकाश नारायण के बीच हुए समझौते को ही मानते हैं। मगर श्री चौधरी का मानना है कि जय प्रकाश नारायण ने काँग्रेस सोशलिस्ट पार्टी का गठन गाँधीजी के वरद्हस्त से इसलिए किया कि काँग्रेस से हटकर सीधे कम्युनिस्ट पार्टी में लोग नहीं चले जायें। इसलिए काँग्रेस सोशलिस्ट पार्टी का गठन काँग्रेस एवं कम्युनिस्ट पार्टी के बीच एक बाँध के रूप में किया गया और जयप्रकाश की मंशा कम्युनिस्टों को सुधारने की थी जबकि भाकपा के तत्कालीन महासचिव श्री पी.सी. जोशी संघर्ष के लिए एक मंच की तलाश में थे और काँग्रेस सोशलिस्ट पार्टी को लड़ने के लिए एक मंच के रूप में प्रयोग करना चाहते थे।[5] हालांकि कम्युनिस्ट पार्टी से कुछेक एक सिद्धान्तकारों का मानना है कि भाकपा एवं काँसोपा के बीच समझौते के कारण ही बिहार में कम्युनिस्ट पार्टी की स्थापना में इतना विलम्ब हुआ।

हालाँकि वर्तमान बिहार सचिव मंडल के सदस्य एवं बिहार कन्ट्रोल कमीशन भाकपा के अध्यक्ष श्री मोहन झा का कहना है कि भाकपा एवं कांसोपा के बीच समझौते जैसी कोई बात नहीं थी, वरन् उस समय ऐसी परिस्थिति ही नहीं थी कि बिहार में कम्युनिस्ट पार्टी बन सके। बिहार के विभिन्न स्थानों में कम्युनिस्ट टोलियाँ थी मगर एक दूसरे से संपर्क नहीं था। पार्टी गैर कानूनी थी इसलिए वे खुलकर भी नहीं आ सकते थे। इसलिए 1939 तक पार्टी की बिहार में स्थापना नहीं हो सकी थी।[6]

बहरहाल जो भी हो अधिकांश कम्युनिस्ट नेताओं का मानना है कि लगभग 1936 में भाकपा के तत्कालीन महासचिव श्री पी.सी. जोशी एवं काँसोपा के तत्कालीन महासचिव श्री जय प्रकाश नारायण के बीच समझौता हुआ था कि हिन्दी भाषी प्रदेशों में यथा यू.पी., बिहार में कम्युनिस्ट पार्टी की स्थापना अभी नहीं की जानी चाहिए और कम्युनिस्ट सदस्य काँग्रेस सोशलिस्ट पार्टी में ही रहकर काम करें जो सही जान पड़ता है। हालाँकि अभी तक इस तरह के कोई लिखित दस्तावेज नहीं पाये जा सके हैं।

इसलिए भाकपा के पोलित ब्यूरो ने बिहार में पार्टी की इकाई फिलहाल नहीं बनाने का फैसला किया था। पार्टी में प्रवेश के इच्छुक बिहार के तमाम वामपंथियों को पार्टी के तत्कालीन महामंत्री श्री पी.सी. जोशी का एक ही आदेश था ''अच्छा काँग्रेस सोशलिस्ट बनो।''[7] इस आदेश का अनुपालन करते हुए श्री कार्यानन्द शर्मा, मंजर रिजबी, किशोरी प्रसन्न सिंह, शिव वचन सिंह, चन्द्रशेखर सिंह, इन्द्रदीप सिन्हा इत्यादि तो बिहार में भाकपा बनने पर भाकपा में आ गये मगर योगेन्द्र शुक्ल–जैसे लोग बराबर सोशलिस्ट ही रह गये।

काँसोपा एवं भाकपा के बीच मतभेद

आमतौर पर कांग्रेस सोशलिस्ट पार्टी एवं भारतीय कम्युनिस्ट पार्टी के बीच विभिन्न सवालों पर मतभेद होते रहते थे। यह मतभेद कांग्रेस के मार्ग 1939 में सम्पन्न त्रिपुरी अधिवेशन में वामपंथी उम्मीदवार सुभाषचन्द्र बोस के कांग्रेस अध्यक्ष चुने जाने से और गहरा गया। श्री सुभाष बोस के अध्यक्ष पुनः चुन लिये जाने से दक्षिणपंथियों ने कांग्रेस के अंदर भयंकर संकट पैदा कर दिया। कांग्रेस वर्किंग कमिटी के 15 सदस्यों में से 12 दक्षिण–पंथी थे। महात्मा गांधी का दक्षिणपंथी उम्मीदवार पट्टाभिसीतारमैया थे। चुनाव में सुभाष चन्द्र बोस को 1575 तथा पट्टाभिसीतारमैया को 1376 वोट मिले थे।[8] गाँधीजी ने सितारमैया की हार को खुद अपनी हार बताते हुए कहा ''सुभाष के प्रतिद्वन्द्वी की हार स्वयं मेरी हार है।'[9]

गौरतलब है कि गांधीजी आजीवन कांग्रेस के सदस्य भी नहीं रहे और सुभाष चन्द्र बोस कांग्रेस के निर्वाचित अध्यक्ष थे फिर भी दक्षिणपंथियों ने यह प्रस्ताव पास करवाया कि सुभाष बोस कार्यकारिणी मनोनीत करें परंतु जो गांधीजी को पसंद हो। वस्तुतः यह प्रस्ताव सुभाषचन्द्र बोस को इस बात का अल्टीमेटम था कि या तो उन्हें दक्षिणपंथियों की कठपुतली बनकर रहना होगा अन्यथा अध्यक्ष पद छोड़ना होगा। यह प्रस्ताव विषय समिति में 135 के विरुद्ध 218 वोटों से पास हो गया। कितने ही वामपंथी राष्ट्रवादियों और खासकर सोशलिस्टों ने इस अवसर पर ढुलमुलपन दिखाया था और प्रस्ताव के पक्ष में वोट दिया था।

कांग्रेस अधिवेशन के प्रस्ताव के अनुसार कांग्रेस वर्किंग कमिटी के सदस्यों के बारे में सुभाष ने गांधीजी से सलाह की लेकिन कोई फल नहीं निकला। सुभाष दक्षिण–पंथियों की कठपुतली बनने को तैयार न थे और दक्षिणपंथी उनके नेतृत्व को मानने को तैयार न थे। फलतः अप्रैल 1939 में ए.आई.सी.सी. के कलकत्ता अधिवेशन में सुभाष ने अध्यक्ष पर से इस्तीफा दे दिया।[10] दक्षिणपंथियों ने झटपट राजेन्द्र प्रसाद को अध्यक्ष बनाकर पूरा नेतृत्व अपने हाथ में ले लिया। शीघ्र ही दक्षिणपंथियों ने सुभाष के खिलाफ अनुशासन की कार्यवाही कर बंगला कांग्रेस कमिटी के अध्यक्ष पद से हटा दिया और फरमान जारी किया कि वह कांग्रेस में किसी भी पद पर तीन साल तक नहीं रह सकते।

दूसरा महत्वपूर्ण मतभेद कम्युनिस्ट पार्टी एवं कांग्रेस सोशलिस्ट पार्टी के बीच द्वितीय महायुद्ध के संबंध में था जो दोनों पार्टियों के बीच एकता समाप्त करने का मुख्य कारण बना।

संयुक्त राष्ट्रीय मोर्चा बनाने का प्रयास

दूसरे महायुद्ध के पहले तक साम्राज्यवाद विरोधी शक्तियाँ काफी ताकतवर हो चुकी थीं और उनकी एकता भी मजबूत हुई। मजदूरों, किसानों और अन्य श्रमजीवियों के आर्थिक आन्दोलन धीरे–धीरे राजनैतिक आंदोलन के साथ जुड़ते गये। ऐसे समय राष्ट्रीय मुक्ति संग्राम को सफल क्रांति की ओर ले जाने की जरुरत थी। इसके लिए सबसे जरूरी था संयुक्त राष्ट्रीय मोर्चा, एक क्रांतिकारी कार्यक्रम और क्रांतिकारी नेतृत्व। कम्युनिस्टों ने इसी उद्देश्य की सिद्धि के लिए ''नेशनल फ्रंट'' नामक साप्ताहिक पत्र निकाला था। इसके संपादक थे पूरन चंद जोशी और संपादक मंडल में उनके अलावा अजय कुमार घोष, श्रीपाद अमृत डाँगे, भालचंद यंवक रणदिवे और मुजफर अहमद।[11] उनका घोषित लक्ष्य था साम्राज्यवाद के विरुद्ध मार्क्सवाद–लेनिनवाद के आधार पर संयुक्त राष्ट्रीय मोर्चे की स्थापना के लिए हर तरह का प्रयत्न करना।

ऐसे संयुक्त राष्ट्रीय मोर्चे के लिए चार काम करना निहायत ही जरुरी था। पहला यह कि सभी समाजवादी ऐक्यबद्ध किये जायें, दूसरा यह कि सभी वामपंथियों की एकता कायम की जाय, तीसरा ऐक्यबद्ध जन संगठन स्थापित किये जायें और चौथा कांग्रेस को संयुक्त राष्ट्रीय मोर्चे में रूपांतरित किया जाए। वामपंथी कांग्रेस सोशलिस्ट और कम्युनिस्ट इन बातों को समझते थे और इसलिए उन्होंने इस दिशा में प्रायः चारों कदम एक साथ उठाने की कोशिश की। जन संगठनों की एकता कायम करने में वे सफल हुए। मजदूर आंदोलन की फूट प्रायः समाप्त हो गयी और ए.आई.टी.यू.सी. में फिर सब एकबद्ध हो गये। लेकिन अन्य तीन कार्यों में बहुत ज्यादा सफलता नहीं मिली।

यहाँ यह उल्लेखनीय है कि क्रांतिकारी शक्तियों की एकता के लिए सोशलिस्टों और कम्युनिस्टों की एकता निहायत आवश्यक थी। उनकी एकता के बिना कोई भी संयुक्त राष्ट्रीय मोर्चा संभव न था। इस बात को गैर कानूनी कम्युनिस्ट पार्टी के नेतागण तथा

कॉंग्रेस सोशलिस्ट पार्टी के अधिकांश सदस्य और नेता समझते थे। इसलिए दोनों पार्टियों के प्रतिनिधियों को लेकर ''ऑल इंडिया कांटेक्ट कमिटी'' स्थापित की गयी थी। इसका उद्देश्य था दोनों पार्टियों के कार्यकर्ता मिलकर कार्य करें। कम्युनिस्ट पार्टी के अनेक सदस्य और कार्यकर्ता कॉंग्रेस सोशलिस्ट पार्टी के सदस्य बने और उसे शक्तिशाली बनाया। वास्तव में वामपंथी कांग्रेस सोशलिस्ट और कम्युनिस्ट चाहते थे कि कांग्रेस सोशलिस्ट पार्टी और कम्युनिस्ट पार्टी मिलकर एक हो जायें और मार्क्सवाद–लेनिनवाद के आधार पर एक संयुक्त सोशलिस्ट पार्टी की स्थापना हो। लेकिन कांग्रेस सोशलिस्ट पार्टी के मीनू मसानी, अशोक मेहता, राम मनोहर लोहिया और अच्युत पटवर्द्धन–जैसे लोगों का नेतृत्व मूलतः कम्युनिस्ट विरोधी था।

कम्युनिस्ट पार्टी चाहती थी कि कम्युनिस्ट पार्टी और कांग्रेस सोशलिस्ट पार्टी के कार्यकर्ता एक साथ मिलकर जगह–जगह पर काम करें, काम के जरिये एक दूसरे का विश्वास प्राप्त करें और उनके बीच एकता कायम हो। अनुकूल अवसर आने पर दोनों पार्टियों को मिलाकर एक कर दिया जाए और इस नयी पार्टी का नाम ''संयुक्त सोशलिस्ट पार्टी'' रखा जाए। वामपंथी कांग्रेस सोशलिस्ट उनकी इस योजना का समर्थन करते थे। चूँकि दक्षिणपंथी कॉंग्रेस सोशलिस्ट नेता ऐसी एकता नहीं चाहते थे इसलिए वे असंभव प्रस्ताव रखते थे। उन्होंने कहा कि वे भी चाहते हैं कि कम्युनिस्ट पार्टी और कॉंग्रेस सोशलिस्ट पार्टी मिलकर एक हो जाये। कम्युनिस्ट पार्टी अपना सिद्धान्त और अपना कार्यक्रम छोड़, कॉंग्रेस छोड़, कॉंग्रेस सोशलिस्ट पार्टी के सिद्धान्त और कार्यक्रम को अपना ले और वह अपने को भंग कर दे और उसके सारे सदस्य कांग्रेस सोशलिस्ट पार्टी के सदस्य बन जायें।[12] अगस्त 1937 में उन्होंने ये शर्ते रखी और अपने को मार्क्सवादी घोषित किया।

अप्रैल 1938 में कांग्रेस सोशलिस्ट पार्टी का चौथा सम्मेलन लाहौर में हुआ। इस सम्मेलन में दक्षिणपंथी सोशलिस्ट अल्पमत में रहते हुए भी नेतृत्व में आ गये।

मीनू मसानी जैसे दक्षिणपंथी कांग्रेस सोशलिस्ट नेताओं ने सोशलिस्टों और कम्युनिस्टों की एकता को तोड़ने के लिए एड़ी–चोटी का पसीना एक कर दिया। 1938 में मीनू मसानी ने तो एक दस्तावेज भी प्रचारित किया जिसका नाम दिया ''कांग्रेस सोशलिस्ट पार्टी के विरुद्ध कम्युनिस्टों का षडयंत्र।'' इस दस्तावेज में उन्होंने कम्युनिस्ट पार्टी के एक गुप्त सर्कुलर को उद्धृत किया और उसी के आधार पर यह सिद्ध करने की कोशिश की कि कम्युनिस्ट कांग्रेस सोशलिस्ट पार्टी को अंदर से तोड़ने और कमजोर बनाने का षडयंत्र कर रहे हैं।[13]

मीनू मसानी द्वारा प्रचारित कम्युनिस्ट पार्टी के इस सर्कुलर में पार्टी ने अपनी सभी कमिटियों और सदस्यों को आदेश दिया था कि वे कम्युनिस्टों और सोशलिस्टों की एकता को मजबूत करने के लिए जी–जान से कोशिश करे जो कम्युनिस्ट कांग्रेस सोशलिस्ट पार्टी के अंदर काम करते हैं वे उसे लोकप्रिय और मजबूत करें तथा अपने कार्यों द्वारा अपने विरोधियों का भी विश्वास प्राप्त करें। इसके अलावा पार्टी ने आशा व्यक्त की थी कि इस तरह एक साथ काम करने से एक दिन दोनों पार्टियों के बीच मतभेद दूर हो जायेंगे और दोनों को मिलाकर एक सोशलिस्ट पार्टी बन जायेगी।

कांग्रेस सोशलिस्ट पार्टी के दक्षिणपंथी नेताओं की इन चालों के बावजूद सोशलिस्टों और कम्युनिस्टों के बीच बढ़ता सहयोग देख, जुलाई 1939 में मीनू मसानी, अशोक मेहता, राम मनोहर लोहिया और अच्युत पटवर्द्धन ने पार्टी की कार्यकारिणी से इस्तीफा दे दिया और खुलकर अपना कम्युनिस्ट विरोधी रूप जाहिर किया। उन्होंने समाचारों में बयान दिये और आरोप लगाया कि कम्युनिस्ट अनुप्रवेश बहुत ज्यादा हो गया है तथा राष्ट्रीय आन्दोलनों के स्वतंत्र विकास में बाधा डाल रहा है।

भाकपा का द्वितीय महायुद्ध के चरित्र के संबंध में विचार :

इस प्रकार से कांग्रेस सोशलिस्ट पार्टी के दक्षिणपंथी नेतृत्व ने कम्युनिस्ट सोशलिस्ट एकता को आखिर तोड़ ही दिया। इस दक्षिणपमंथी कांग्रेस सोशलिस्टों का आक्रमण कम्युनिस्टों पर उस समय और तेज हो गया जब भाकपा ने द्वितीय विश्वयुद्ध को ''साम्राज्यवादी युद्ध'' कहा। कम्युनिस्ट पार्टी के पोलित ब्यूरो ने एक बयान देकर युद्ध के बारे में अपनी नीति स्पष्ट की और बताया कि ऐसी हालत में क्रांतिकारी शक्तियों का काम क्या है। युद्ध के चरित्र के बारे में उसने कहा ''यूरोप में आजकल जो युद्ध चल रहा है वह फासिज्म के खिलाफ जनतंत्र का युद्ध नहीं है। वह साम्राज्यवादी युद्ध है, दूसरा साम्राज्यवादी युद्ध, 1914–1918 के विगत

महायुद्ध का वारिस और उत्तराधिकारी है।'' पोलित ब्यूरो के बयान में आगे कहा गया कि ''राष्ट्रीय स्वतंत्रता की प्राप्ति के लिए युद्ध के संकट का क्रांतिकारी उपयोग नये काल में राष्ट्रीय शक्तियों के सामने यही केन्द्रीय काम हैं। साम्राज्यवादी युद्ध को राष्ट्रीय मुक्ति के युद्ध में बदलने की संभावना वर्तमान है।''[14] अर्थात् कम्युनिस्ट पार्टी ने साम्राज्यवादी युद्ध को राष्ट्रीय मुक्ति युद्ध में बदलने की सारी क्रांतिकारी शक्तियों को एक मोर्चा पर लाने, जन आंदोलन को क्रांतिकारी रूप देने, गाँधीवादी तकनीक की बेड़ियों को तोड़ फेंकने और राष्ट्रीय मुक्ति संग्राम को सफल बनाने का नारा बुलन्द किया।

दूसरी ओर कांग्रेस सोशलिस्ट पार्टी का दृष्टिकोण इससे भिन्न था। द्वितीय विश्वयुद्ध के दौरान युद्ध में भारतीय सहभागिता का पार्टी ने डँटकर विरोध किया और यह घोषणा की कि भारत को युद्ध में किसी भी रूप में भाग नहीं लेना चाहिए। वे किसी भी तरह ब्रिटेन की हार चाहते थे क्योंकि ब्रिटिश साम्राज्य के ध्वस्त होने के बाद ही वे भारत की स्वतंत्रता की आशा करते थे। स्वभावतः ''दुश्मन का दुश्मन हमारा दोस्त'' की भावना से ये मुक्त न थे।[15] कम्युनिस्ट पार्टी और कांग्रेस सोशलिस्ट पार्टी की समझ के बीच यही अंतर युद्ध के दूसरे दौर में उनके अलगाव का, अलग–अलग रास्तों पर जाने का कारण बना।

इस प्रकार काँसोपा और भाकपा के बीच का समझौता और एकता भंग हो गया। बिहार काँसोपा के मुखपत्र ''जनता'' ने ''स्तालिन के ये बेटे'' शीर्षक से लेख लिखकर कम्युनिस्टों को खुली गालियाँ दी।16 इसके बाद और कोई रास्ता नहीं था कि बिहार में भाकपा का गठन नहीं हो। फलतः 20 अक्टूबर 1939 को भाकपा की प्रान्तीय इकाई का गठन किया गया।

अब सवाल उठता है कि बिहार में भाकपा की प्रान्तीय कमिटी गठित करने का क्या आधार था और कैसे लोग कम्युनिस्ट पार्टी में आये?

किसान सभा, छात्र संघ तथा ट्रेड यूनियनों में पार्टी के कार्यकर्ताओं को विभिन्न तरीकों से सरकारी दमन का मुकाबला करते हुए आगे बढ़ना पड़ा। इस जंगजू संघर्ष का ही परिणाम था कि 1940 के अंत एवं 1941 के शुरू होते–होते काँसोपा तथा नव निर्मित फारवर्ड ब्लॉक से कुछ कार्यकर्ता कम्युनिस्ट पार्टी में शामिल हो गये।

9 जनवरी, 1941 के छात्र संघ का सारण सबडिवीजनल कन्वेंशन हुआ जिसमें सरकारी एवं पुलिस दमन चक्र की तीव्र भर्त्सना की गयी तथा छात्रों से अपने जन आन्दोलन एवं जन संघर्ष तेज करने का अह्वान किया गया। फलतः कई स्कूलों एवं कॉलेजों में छात्रों की सफल हड़ताल हुई। दूसरी तरफ इस बार भी 26 जनवरी को बड़े पैमाने पर छात्रों द्वारा पूर्ण ''स्वाधीनता दिवस'' मनाया गया।

जैसा कि ऊपर के पाराग्राफों में जिक्र किया जा चुका है कि किसान मोर्चे पर कम्युनिस्ट कार्यकर्ता पूरी तरह सक्रिय थे, मार्च 1941 में किसान सभा ने ''टैक्स नहीं, लगान नहीं'' का नारा देकर किसानों के आन्दोलन को तेज किया जिसमें कई किसान नेता गिरफ्तार कर लिये गये। स्वामी सहजानन्द सरस्वती ने जेल से निकलते ही दरभंगा के लगमा गाँव में किसानों की एक आम सभा की जिसमें सरकारी आँकड़ों के अनुसार 7000 से अधिक लोगों ने भाग लिया। इसमें भाकपा ने अहम भूमिका निभायी।

इस प्रकार से 20 अक्तूबर, 1939 की भाकपा की बिहार इकाई को स्थापना की गयी। अपने स्थापना काल के एक–डेढ़ साल बाद ही भाकपा बिहार में प्रमुख शक्ति के रूप में उभर कर सामने आयी। किसान सभा और छात्र संघ पर भाकपा का लगभग कब्जा हो गया था। भाकपा बिहार में निर्णयक शक्ति की ओर बढ़ रही थी।

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Study on the Taxonomic Revision of The Genera Cycads (CYCADACEAE)

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ABSTRACT

Introduction : The vast majority of the species are not exclusive to island habitats but may also be found on continental landmasses.
Aim of the study : The main aim of the study is to Taxonomic Revision of The Genera Cycads (Cycadaceae)
Material and method : Gloriosa superba L., the experimental plant, was gathered from eleven different districts throughout the state of Tamil Nadu.
Conclusion : RAPD investigations conducted on the mother plant and the plant grown in vitro revealed no genetic differences.

I. INTRODUCTION

1.1 OVERVIEW

The only member of the family Cycadaceae to be found in India is the genus Cycas, which also serves as the only representative of the cycad subfamily. The approximately one hundred species that make up the genus Cycas may be found growing wild in a zone that stretches from northern Australia to southern China, all the way to Madagascar in the west and Tonga in the east (Hill, Stevenson and Osborne 2007). There are nine different species of this genus that may be found in India. These include Cycas annaikalensis Singh & Radha, Cycas circinalis L., Cycas beddomei Dyer, Cycas indica Lindstrom & Hill, Cycas nathorstiiSchust., Cycas pectinata Ham., Cycas sphaericaRoxb., Cycas swamyi Singh & Radha, and When compared to China and northern Australia, which both display large local radiations, the cycad flora of India is rather scarce in terms of both the richness of its species and the overall number of individuals. The survival of Indian cycads is mostly under jeopardy as a direct consequence of human activities. These slow-growing plants with extended reproductive cycles are on the verge of extinction as a result of human activities such as agriculture, the destruction of forest land, urbanisation, and excessive harvesting of plant parts for use in food and other sociocultural activities. Around the globe, many different conservation efforts for cycads have been explored, but only a select handful of them have proven successful. As a direct consequence of this, the populations of many species continue to dwindle in their native environments. The failure of cycad conservation programmes to raise awareness among local residents who live in close proximity to areas containing wild cycad populations has been a serious deficiency. Without the active engagement of villages and other local people, conservation efforts are far more likely to fail in the long term, as has been shown

by previous experiences. What is required is a paradigm for conservation that is capable of effectively educating and motivating individuals who live in close proximity to cycads to get active in the sustainable management of these plants. The study of relics like cycads, which have structures and developmental paths that are very ancient, gives us the opportunity to learn more about the early beginnings of seed plants and their modern-day analogues. The loss of these priceless antiques without first gaining a comprehensive understanding of their significance would be a blow to scientific research. The three families of cycads were included on the IUCN Red List of Threatened Plants in 1997 as being among the most endangered plant families in the whole world. The vast majority of the species are not exclusive to island habitats but may also be found on continental landmasses.

1.2 SIGNIFICANT TRADE CYCADS

Cycads are an ancient group of plants that are now represented by over 300 species across 11 genera and three families (Cycadaceae, Stangeriaceae, and Zamiaceae). They may be found in the tropical and subtropical regions of 58 range states around the world, including areas of North America, South America, Central America and the Caribbean, Asia, Africa, and Oceania. The loss of habitat and the commercialization of plants obtained in the wild are the two factors that pose the greatest risk to the survival of wild species. Fifty-two percent of the world's animal and plant species are in danger of becoming extinct.

According to the data collected through trade, the majority of the cycad market is comprised of specimens that have been artificially propagated. In point of fact, just 38,500 of the approximately 30 million plants that have been registered as exports during the course of the 24 years that are included by the dataset have been declared to be of wild origin. The great majority of these plants had their beginnings in Australia, which is one of the few places in the world that allows salvage harvesting. This method involves removing plants from areas where they are in danger of being destroyed as a result of land clearance. The residual trade in plants of wild origin from other range states includes plants that are transported for research reasons or for use in botanical gardens. This trade involves less than 1,500 individual plant species. There is little indication that the commercialization of wild-collected plants for scientific research or botanical gardens is being used for illegal plant trafficking. Since 1990, the commercial trading of just 458 plants of wild provenance has occurred for these uses. In addition, it is abundantly obvious that there is a general dearth of scientific knowledge on the dynamics of cycad populations as well as the influence of harvesting and management strategies on cycad populations. Because there is no other evidence available on which to establish harvest quotas, scientific authorities rely their conclusions that there is no threat to the population primarily on the number of the population. According to recent research on the dynamics of cycad populations, the harvesting procedures that are now in use may not always be acceptable. For instance, new study conducted in Australia reveals that sustainable harvesting programmes that are correctly managed may produce a better conservation result than salvage harvesting, which is presently done in a significant amount of situations.

1.3 TAXONOMIC NOTES ON ENCEPHALARTOS FEROX (CYCADALES: ZAMIACEAE), WITH THE DESCRIPTION OF A NEW SUBSPECIES FROM MOZAMBIQUE

The taxonomy of the African endemic cycad genus Encephalartos Lehmann has suffered from various taxonomic problems despite the fact that it has been stable over the last two decades, and there are presently 65 species and two subspecies that are recognised. An over-appreciation at the particular level, as maintained by Dyer (1965a) and Vorster

(2004), is attributable to their unwillingness to recognise infraspecific ranks, since solid phylogenies, demonstrating affinities, had not yet been established at the time of their research. Even molecular phylogenies are not completely determined, despite the fact that recent work has resolved species groups with sufficient support (ranging from two to seven taxa).

II. LITERATURE REVIEW

Khuraijam, JS & Singh, Rita (2020) Cycas pectinata is a taxonomically convoluted and complicated organism that is found natively in Southwest China, Northeast India, Bhutan, Bangladesh, Nepal, Southeast Asia (Myanmar, Thailand, and Vietnam), and Southeast Asia (Thailand and Vietnam). A comprehensive morphometric study of the taxonomically unique vegetative and reproductive structures of Cycas populations in India found variations across populations that support their classification as two separate species: Cycas pectinata is only found in the western portion of the Indo-Burma Range (IBR), while the Southeast Asian taxon known as Cycas divyadarshanii is being described and illustrated here as a new species. Both of these regions are located in India. The new species of Cycas may be recognised from Cycas pectinata by its long and thin microsporophylls as well as the absence of a thickened protrusion on the adaxial surface of the leaf blade, which is noticeable in C. pectinata. Both species have distinct anatomical characteristics, and their pollen has a distinct structure. The connection of these species with distinct hypothesised beetle pollinators also lends credence to the classification of them as separate taxa.

Lopez-Gallego, Cristina &Calonje, Michael & Griffith, M. &Khuraijam, JS. (2020) The 10th Worldwide Conference on Cycad Biology, which was held from the 16th to the 21st of August in 2020, was very well-attended and had a genuinely international scope, with over 150 delegates coming from 17 different countries. During the course of this conference that lasted for a total of six days, four of those days were dedicated to the academic programme of presentations. These presentations consisted of fifty-five oral presentations, seven plenary speeches, and a poster session that had nine poster presentations. The discussions, which were broken up into 10 distinct sessions, covered a wide variety of issues, including horticulture, conservation, ethnobotany, ecology, genetics, and systematics, to name just a few of the many sub-fields covered. It was a privilege for me to take part in this initiative as a member of the Cycad 2015 Organizing committee. The academic agenda had a variety of presentations that were not only educational but also garnered positive feedback from attendance. CYCADS is the official newsletter of the IUCN/SSC Cycad Specialist Group, and it is our pleasure to share in this special edition of CYCADS the results of this spectacular meeting that took place earlier this year. In this special edition of CYCADS, the official newsletter of the IUCN/SSC Cycad Specialist Group, we are pleased to share the results of the spectacular meeting that took place earlier this year. We would like to extend our gratitude to J.S. Khuraijam for all of the hard work he put into bringing together this special edition of CYCADS.

Tang, William & Xu, Guang&Marler (2020) It is thought that three different kinds of beetles that live in the cones of cycads (Cycadales) in the northern hemisphere are responsible for the pollination of these plants. The primitive weevil subtribe Allocorynina of the Coleoptera family Belidae is only found in the cycad genera DioonLindl. and Zamia L., both of which are native to the New World. There is a family of weevils known as the Curculionidae that is unique to Cycas L. and seems to be a relatively new coloniser of cycads in the northern hemisphere. There are members of the beetle subfamily Pharaxonothinae (Erotylidae) living in each and every cycad genus in both Asia and the New World. There is a comparison

made between the patterns of continental drift and the phylogenies of cycads and the phylogenetic trees of these beetles, which are based on DNA analysis and backed by morphological investigations. It is believed that these groups of beetles originated in Laurasia, and that at least one of these groups dispersed to high latitudes during times when conditions throughout the world were rather warm.

Ahmed Ismail, Princedream& Hassan, Hossam &Moawad (2020) The crude extracts of the leaves of three different species of Cycas plants, Cycas armstrongiiMiq., Cycas circinalis L., and Cycas revoluta Thunb., all exhibited the presence of a variety of secondary metabolites when they were put through a metabolic profiling process. Because this is the first time that these known components have been reported for this species, a comprehensive phytochemical investigation of C. armstrongii fractions led to the separation of 15 separate classes of known components. These components were chemically characterised as follows: naringenin; dihydroamentoflavone; 2,3-dihydrohinokiflavone; amentoflavone; 2,3-dihydrobilobetin; isoginkgetin; prunin; naringin; vanillic acid; p-coumaric acid; -sitosterol; stigmasterol; -sitosterol In addition to this, the radioprotective ability of the three different species of Cycas plants was also studied. The ionising radiation experiment was carried out by subjecting the complete bodies of rats to an 8 Gy dose. By use of an intragastric tube, the extracts of all three species of Cycas were given to the animals at a dosage of two hundred milligrammes per kilogramme. According to the findings, extracts from Cycas spp. considerably reduced the damage caused by radiation to the brain and pancreas, and they also showed protection against the oxidative stress that was caused by radiation. Histopathological examination likewise provided supporting evidence for the findings.

Aluri, Jacob Solomon Raju &Kunuku (2019) In the places where they are distributed, Cycas sphaerica and C. beddomei are historically used as essential sources of food and medicinal. They are exploited without discrimination in a way that is the farthest thing from scientific, and as a consequence, their surviving numbers have been reduced. The traditional applications of these two species are discussed in this work with the intention of persuading the researchers to investigate scientific approaches to using them in an appropriate manner.

III. MATERIALS AND METHODS

3.1 RANDOM AMPLIFIED POLYMORPHIC DNA (RAPD)

3.1.1 Plant material

Gloriosa superba L., the experimental plant, was gathered from eleven different districts throughout the state of Tamil Nadu.

Places of sample collection in different locations of Tamil Nadu

Sl. No.	District	Placeofcollection	Code
1.	Dharamapuri	Keelasangapadi	GS1
2.	Erode	Malamedu	GS2
3.	Tiruchirappalli	Pachamalai	GS3
4.	Nilgiris	Gudalur	GS4
5.	Coimbatore	Marudhamalai	GS5

6.	Nagapattinam	Vedaranyam	GS6
7.	Ariyalur	Jayakondam	GS7
8.	Namakkal	Chinnavelur	GS8
9.	Salem	Edapadi	GS9
10.	Dindugal	Oddanchatram	GS10
11.	Pudukkottai	Narthamalai	GS11

In a similar manner, both the in vitro plant and the in vivo plant were used in order to compare and contrast the genetic fidelity of the in vitro and in vivo plants. GTC is the code that has been allotted for the in vitro plant, while GWD is the code for the in vivo plant.

3.1.2 DNA isolation

The DNA was isolated from the leaves of the experimental plant Gloriosa superba L that had been frozen for thirty days. In order to evaluate the performance of each extraction technique, we employed three distinct approaches: the Modified CTAB Method, the CTAB Method with Some Minor Modifications, and the Phenol-Chloroform Method with Some Minor Modifications.

3.1.3 Quantification of DNA

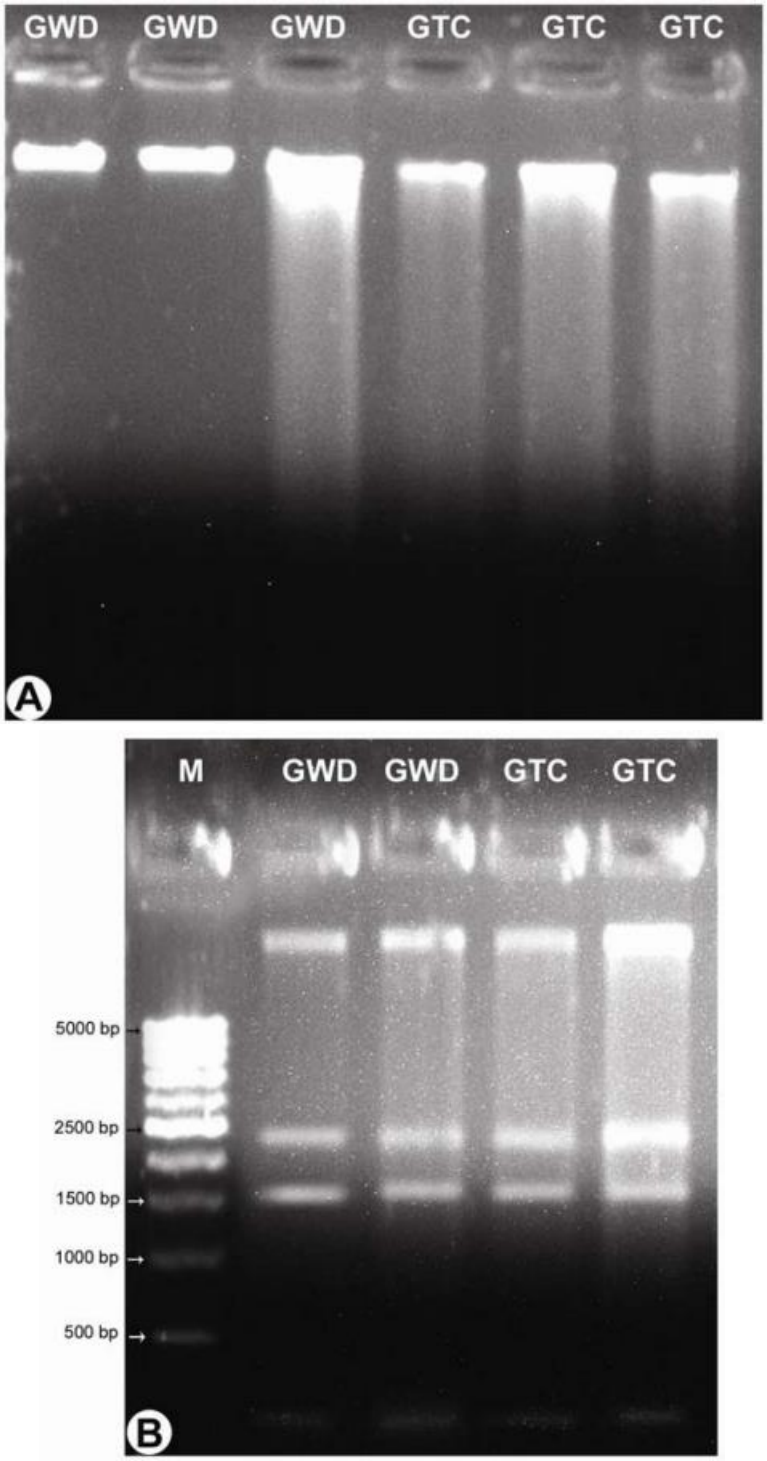
Quantification of the DNA was achieved by the use of a nano-drop spectrophotometer (Thermofisher Scientific, USA) in conjunction with the ND-1000 Ver.3.6, 2008 software. The number of DNA samples was evaluated by calculating the ratio of absorbance at A260/280. The results showed that the ratio ranged from 1.6 to 2.0, which indicates that the DNA samples were of a quality that was pretty satisfactory and were electrophorized on an agarose gel containing 0.8%.

IV. RESULTS

4.1 POLYMORPHIC STUDIES USING RANDOM AMPLIFIED POLYMORPHIC DNA MARKERS

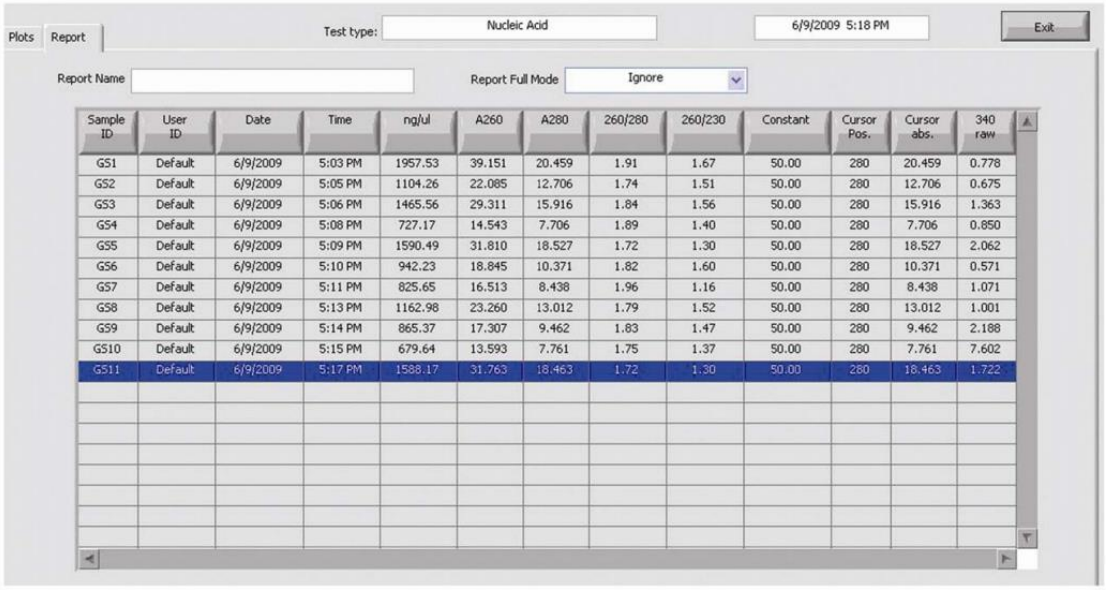
4.1.1 DNA extraction

Plants used in medicine often have a greater number of secondary metabolites. Because of these secondary metabolites, the process of isolating DNA might be difficult, and the DNA that is obtained in this manner is not appropriate for PCR amplification. In this work, the genomic DNA was extracted from the frozen leaves of G.superba that were gathered from various locations in Tamil Nadu by adhering to the techniques given by Murray and Thompson (1980), Doyle and Doyle (1987), and Bell et al. (1981). Both the Murray and Thompson approach and the phenol-chloroform method produced a meagre quantity of DNA, which resulted in inadequate PCR amplification. The Cetyl Trimethyl Amino Bromide (CTAB) technique devised by Doyle and Doyle (1987) proved appropriate for the extraction of DNA with high purity and high quantity for both in vivo grown plants and in vitro.



A. Electrophoretic analysis of genomic DNA isolated from leaves of *in vivo* and *in vitro* plants.
B. RAPD electrophoretic profile of *in vivo* and *in vitro* plants.
GWD : *In vivo* leaf ; GTC : *In vitro* leaf M : DNA Marker

Plate 1



Sample ID	User ID	Date	Time	ng/ul	A260	A280	260/280	260/230	Constant	Cursor Pos.	Cursor abs.	340 raw
GS1	Default	6/9/2009	5:03 PM	1957.53	39.151	20.459	1.91	1.67	50.00	280	20.459	0.778
GS2	Default	6/9/2009	5:05 PM	1104.26	22.085	12.706	1.74	1.51	50.00	280	12.706	0.675
GS3	Default	6/9/2009	5:06 PM	1465.56	29.311	15.916	1.84	1.56	50.00	280	15.916	1.363
GS4	Default	6/9/2009	5:08 PM	727.17	14.543	7.706	1.89	1.40	50.00	280	7.706	0.850
GS5	Default	6/9/2009	5:09 PM	1590.49	31.810	18.527	1.72	1.30	50.00	280	18.527	2.062
GS6	Default	6/9/2009	5:10 PM	942.23	18.845	10.371	1.82	1.60	50.00	280	10.371	0.571
GS7	Default	6/9/2009	5:11 PM	825.65	16.513	8.438	1.96	1.16	50.00	280	8.438	1.071
GS8	Default	6/9/2009	5:13 PM	1162.98	23.260	13.012	1.79	1.52	50.00	280	13.012	1.001
GS9	Default	6/9/2009	5:14 PM	865.37	17.307	9.462	1.83	1.47	50.00	280	9.462	2.188
GS10	Default	6/9/2009	5:15 PM	679.64	13.593	7.761	1.75	1.37	50.00	280	7.761	7.602
GS11	Default	6/9/2009	5:17 PM	1588.17	31.763	18.463	1.72	1.30	50.00	280	18.463	1.722

Plate 2 quantification of DNA isolated from 11 accessories of Gloriosa Superba L. by Nanodrop spectrophotometric method using ND-1000 version 3.5.2

When employing the CTAB approach, the amount of DNA that could be extracted from in vivo plant leaf samples (GWD) and in vitro plant leaf samples (GTC) varied from 331.16 ng/µl to 581.91 ng/l. The proportion of A260 to 280 was anywhere between 1.64 and 1.93. The DNA yield of the plant samples that were obtained from 11 different locations in Tamil Nadu showed a variance that varied from 679.64 ng/µl to 1957.53 ng/l. It may be deduced from the fact that the absorbance values (A260/280) varied from 1.72 to 1.91 that the DNA samples were of an acceptable grade.

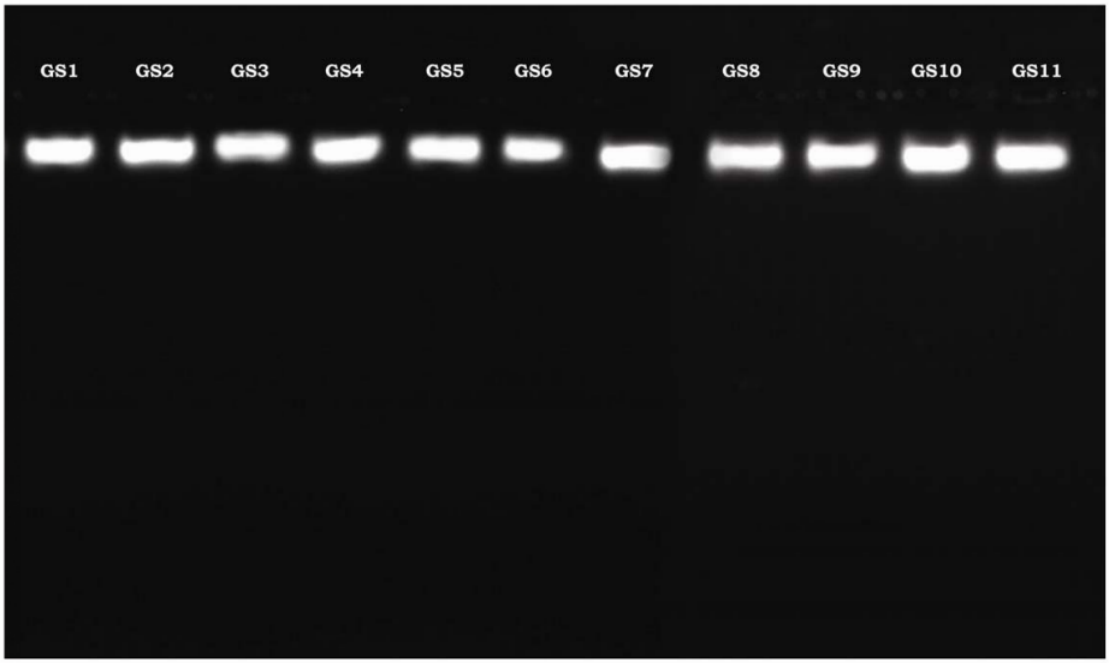


Plate 3 electrophoretic analysis of genomic DNA of 11 accessions of Gloriosa Supreba L.

The CTAB approach, with just a few tweaks here and there, produced satisfactory results for G.superba. It's possible that this is because of the changes that were made to the protocol. The concentrations of certain components were the primary factor that differentiated the CTAB approach from those of other methods. It produced a quantity of DNA suitable for use in PCR amplification. The CTAB method, with some minor modifications, produced the best DNA quality from the leaves of G.superba, despite the fact that the protocol

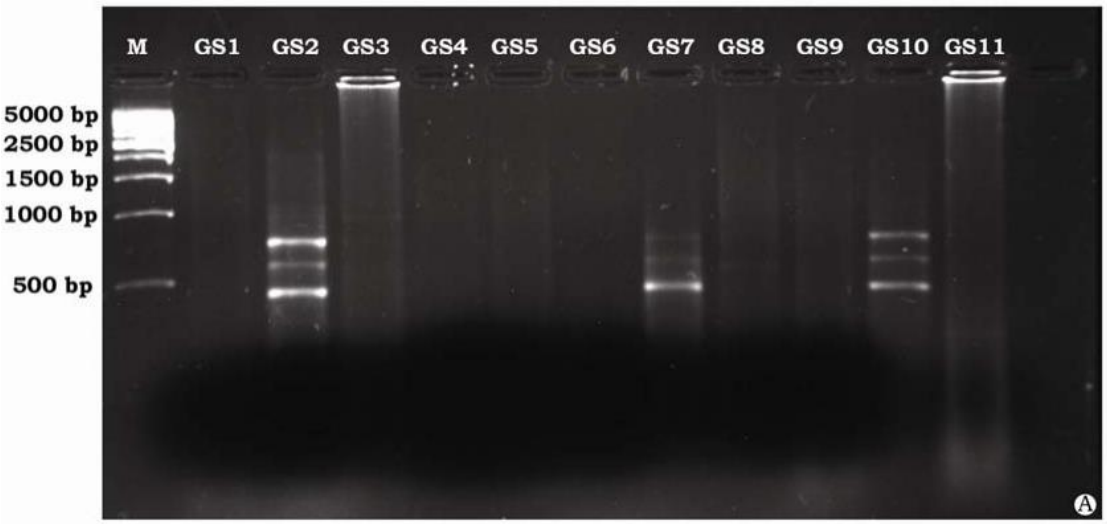
was labor-intensive because it required more quantities of solutions and also time-consuming. This conclusion was reached based on a comparison of three different protocols for the isolation of DNA. It was found that the procedure produced sufficiently clean DNA for use in PCR amplification, which was a positive result.

Seemanti Ghosh et al. (2008) conducted polymorphism research on Gloriosa superba using the CTAB technique. For those investigations, they extracted DNA from fresh and immature leaf tissues from 15 plants from each population of Gloriosa superba. Our findings are comparable to those of Seemanti Ghosh et al. (2008). Kumar et al. (2007) employed the young and healthy leaves of Senna sulfurea DC. ex Collad. and Senna surattensisBurm. The CTAB technique, with some minor adjustments, was utilised to isolate DNA from a total of 38 different accessions. The findings show that RAPD markers are capable of distinguishing between S.surattensis and S.sulfurea in an accurate and consistent manner. Ana Maria Waldschmidt and colleagues (1997) tested three different procedures for DNA extraction in Melipona quadrafasciata. These procedures differed in the concentrations of specific substances in the extraction buffer. The researchers discovered that adequate DNA can be extracted from a method with minor modifications, which highlights the need for modification in an existing method.

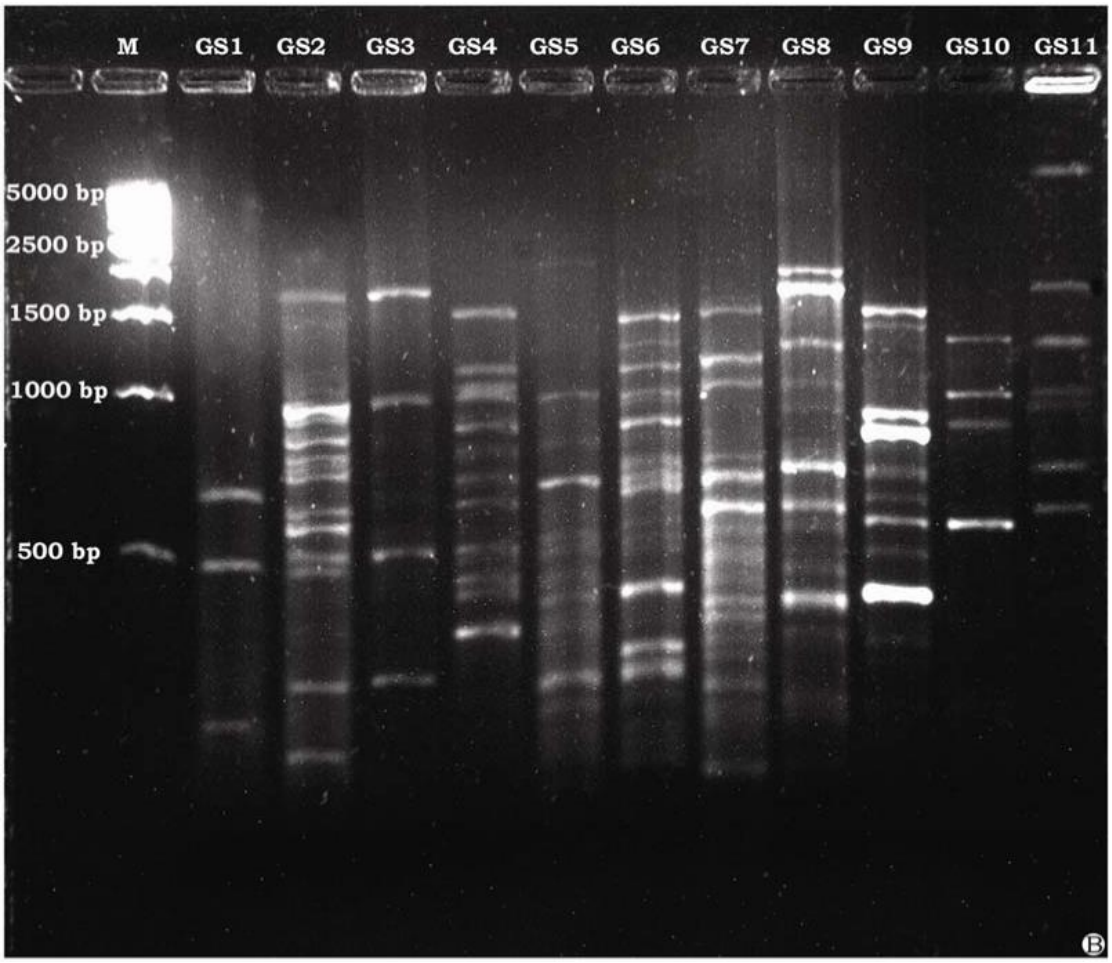
For the purpose of RAPD and restriction digestion, Abdin et al. (2007) established a procedure for the separation of genomic DNA from dry and fresh roots of medicinal plants. When compared to DNA extracted using the techniques of Dellaporta et al., (1983) and Doyle and Doyle, the approach used a modified version of the CTAB protocol, which resulted in the production of a significant amount of very pure DNA (1990). There were significant quantitative and qualitative variations found in the DNA samples that were acquired using the three distinct approaches. According to the findings that we obtained, the CTAB approach (Doyle and Doyle, 1987) with some slight adjustments was a better suitable choice for the extraction of DNA from Gloriosa superba L.

4.1.2 RAPD analysis

In this study, 11 accessions of G.superba that were obtained from various regions of Tamil Nadu were used to test a total of 12 operon- and random-generated single-stranded primers that were each 10 bases long. Only three of the twelve primers that were employed in the amplification produced distinct bands: OPA 1, OPA 8, and OPA 9. The existence of bands allowed for the identification of all of the accessions. Primers OPA 8 and OPA 9 amplified DNA in every one of the 11 accessions they were tested on. The OPA8 test found 128 polymorphic bands, the OPA9 test revealed 66, and the OPA1 test revealed 37 polymorphic bands. The remaining nine primers did not show any bands that could be scored. On average, the OPA1 provided 3.08 bands, whereas the OPA8 provided 10.66 bands and the OPA9 provided 5.5 bands. There was a total of 340 RAPD products that were scored (an average of 28.33 bands per primer), with the number of bands per primer ranging anywhere from 2 (OPA7) to 128 (OPA8); 206 of these products were polymorphic. The observed amount of polymorphism averaged out to be sixty percent. The OPA8 and OPA9 primers produced the greatest level of polymorphism, one hundred percent, compared to any other primers used.

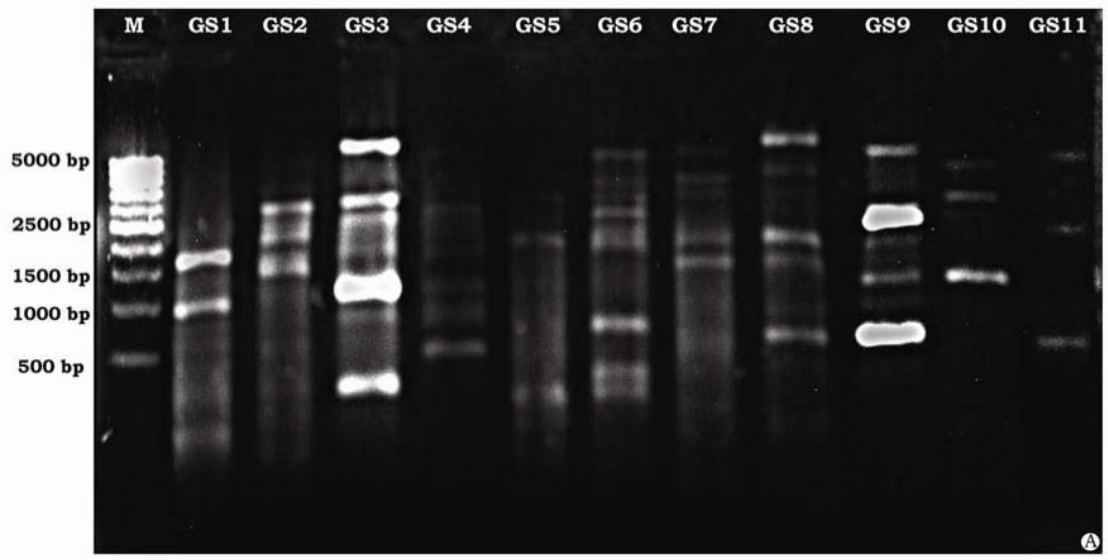


RAPD profile of 11 accessions of Gloriosa Superba L. after amplification with OPA1 primer

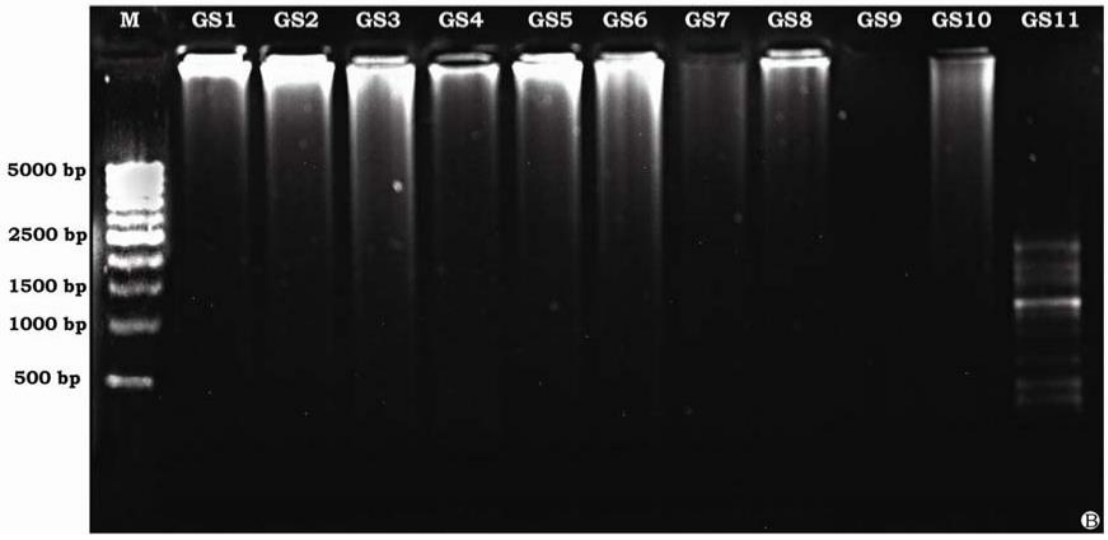


RAPD profile of 11 accessions of Gloriosa Superba L. after amplification with OPA8 primer

Plate 3



RAPD profile of 11 accessions of Gloriosa Superba L. after amplification with OPA9 primer



RAPD profile of 11 accessions of Gloriosa Superba L. after amplification with OPA10 primer

Plate 4

One population-specific RAPD marker was all that was needed to distinguish each of the eleven accessions uniquely. OPA1 produced a fragment of 2245 base pairs only in GS2; OPA4 produced a fragment of 971 base pairs only in GS 10; OPA8 produced a fragment of 106 base pairs only in GS5; and Primer OPA10 produced a fragment of 358 base pairs only in GS11. Along with the genomic DNA, the OPA 10 primer (GTGCAACGTG) was used to amplify GS11, and this resulted in the production of a single band. This band seems to be of utmost significance in the process of diagnosing GS11 accession. This might be used to delegate an identity, and it could also be utilised in the process of developing a "molecular identification" for this entry. It is clear that this species has a sizeable potential for the discovery of singular RAPD markers that are more genetically distant from one another. Nevertheless, there is a possibility that some of the one-of-a-kind features are shared by other accessions that are part of a larger group of accessions. In the research, reproducible findings were achieved by using a particular mix of primers and templates for DNA. It was ensured that none of the parameters were changed by taking the utmost caution. RAPD analyses using the OPA8 primer were performed on the DNA that was isolated from plant leaf samples both in vitro and in vivo. The findings showed

that the band intensity histogram of each gel verified the monomorphic character of the gels and excluded the possibility of any genetic differences.

V. Conclusions

RAPD investigations conducted on the mother plant and the plant grown in vitro revealed no genetic differences. These findings demonstrated that in vitro plants do not undergo any changes to their genetic make-up and that they are virtually identical to plants grown in the wild. This suggests that the in vitro techniques can be extensively used for the conservation and large-scale propagation of medicinal plants because there is an increasing need to produce a large number of plants of improved quality, which holds, good promise in this field. In addition, there is a growing demand for the propagation of medicinal plants because there is a growing demand for the use of medicinal plants. In the current study, an antibacterial evaluation of methanolic extracts of different parts of G.superba was performed. These parts included the in vivo tuber, seed, leaf, and pod, as well as the in vitro plant. The results showed that these extracts possessed measurable inhibitory action against both gram-positive and gram-negative bacteria. When compared to the other parts of the plant, the seeds and tubers of this plant offer a much greater inhibitory activity against several microorganisms. As a consequence of this, the seeds and tubers of this plant possess potent antibacterial qualities.

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