

Screenless Display Technology

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Abstract: This paper discusses about the new computing technology i.e., Screenless display, that has become a good prospect in the near future for a wide range of applications. The main idea behind this technology is displaying the image without any physical screens like projector, LCD etc. This paper it is a survey paper that demonstrates about how the screen less display technology works and its applications in the various fields of science. Using this display technology, we can directly project any image on the human retina, free space and to the brain of human. It requires only light weight device and at the same time the privacy will be at the high state.

Keywords:Hologram, VRD, LCD, Screenless displays

I. Introduction

Screenless display is nothing but a display which can be shot at any place wherever the user wishes to have the screen. It can be at any direction or place such as on the wall or in the open space. Nowadays the technology is changing very rapidly in the existing machines and in the tools in order to solve the problem at the high level. It would be not wrong in saying that the Screenless display technology would be a life-changing concept and also one of the most interesting topics for the research. This technology also solves the problem of the space of display in one place. It is a system of displaying information/data through an electronic video source without using screen at all. Screenless display technology is the present evolving computer-enhanced technologies. It will surely be the one of the greatest development in the field of technology in the upcoming future. Several patents are still researching on this new technology which can change the whole view of the displays.

Screenless Display Technology was such an excellent thought that had come into many experts in order to solve the major problems related to the size of the device. For less space taking screen displays have made the need of Screenless displays more than ever. Screenless, by the word clearly means 'no screen'. So, Screenless Displays can be defined as a display which helps to display and even transmit any information without the help of screens.

There are many types of Screenless display that are under development which are described below-

- * Visual Image display
- * Retinal Direct display
- * Synaptic Interface.

II. History

Reto Meier, is an "Android Developer Advocate for Google" he recently laid out a fairly science-fiction account of where computer (or at least mobile) interfaces are headed [1]. One thing that will definitely change the use of working on the average laptop, it is like working on a desk that is as big as a sheet of the paper. That is why all our "files" are quite inch high. The solution to the productivity and immersion is more, bigger screens - hence the proliferation of external monitors, another secondary reading devices and even cell-phones with improbably large screens [2]. So-called "Pico" projectors that are named for their tiny size already exist and also the HD version of it exists. And there are huge no. of mobile phones, which have built-in Pico-projectors such as the Samsung Show, - so outside of market demand there's nothing that will stop this prediction from becoming a truth.

A. Visual Image Display

The Visual Image Screenless display includes any image that is visible to the naked eye. The common example of the Visual Image Screenless display is the hologram. Holograms were used mostly in telecommunications as another to screens. Holograms they must be transferred directly, or they must be stored in numerous storage devices (such as holodiscs) the storage device can be attached or hooked with the holo projector, so that the stored image can be accessed. Virtual retinal display systems is a class of screen less displays in which the images are directly projected onto the human retina. They can be identified from the visual

image systems because the light is not reflected from some of the intermediate object onto the retina; so it is instead projected directly onto the human retina.



Figure 1: The Visual Image

a. HOLOGRAM

This is form of a photography that provides a three dimensional image, and some technologies are now creating images using lenses, helium neon and holographic film. The word holography comes from the Greek words $\lambda\omicron\varsigma$ (holo; "whole") and $\gamma\rho\alpha\phi\acute{\eta}$ (graph; "writing" or "drawing"). A 3D image will be projected and appears in the air whenever the laser and object beams overlaps with each other. The Hologram provides high quality images and videos and those images can be viewed by human eye, and that does not require any special observation device. [3]

b. WORKING OF HOLOGRAM

Holographs can work by using a laser beam that can interfere with an object beam. When these two beams get in the way of one another, they can create what looks like a three dimensional image. This image can then be recorded for processing by recording the diffraction of the light and the way in which the beams interfere with one another. As we can see the working of the hologram as shown in the following figure.2)

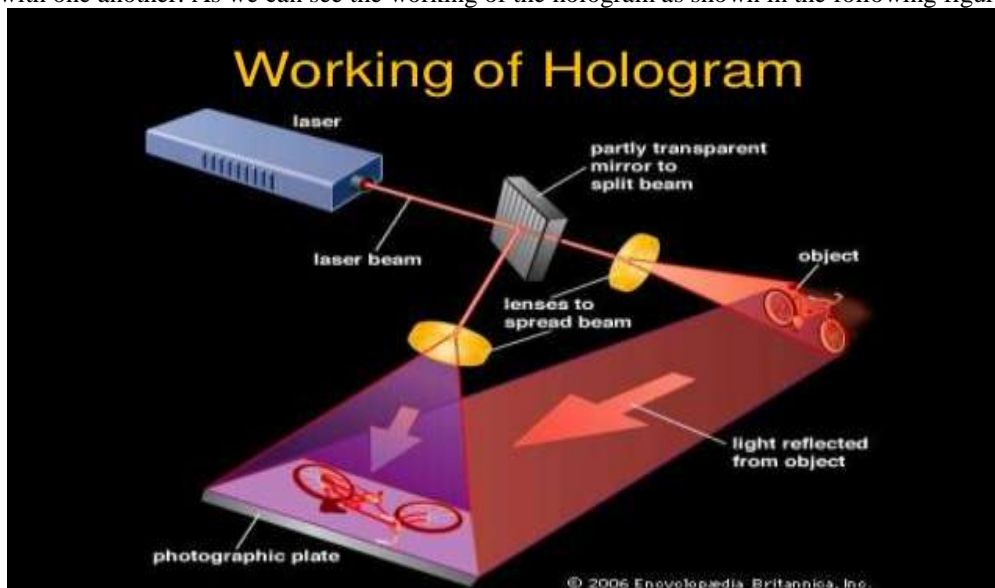


Figure 2: The Working of Hologram

B. Retinal Direct Display

A virtual retinal display (VRD), also known as a retinal scan display (RSD) or retinal projector (RP), is a Screenless display technology that draws a raster display (like a television) directly onto the retina of the eye, instead of image being reflected by any substance. This can create an effect of image viewing from several feet away or at a wider and clearer view of any object that is using special lasers or LEDs to scan light essentially into the optic nerve by mixing the primary colors. The user sees what appears to be a conventional display floating in space in front of them. The same concept applies to the computer monitor, who mainly focuses on the viewed image onto the retina that needs to be converted into signals for the brain, but by the optic

nerve however the VRD is more efficient and effective. Glyph has also developed a Virtual Retinal Display it also uses a MEMS (micro electro mechanical system) type of system.

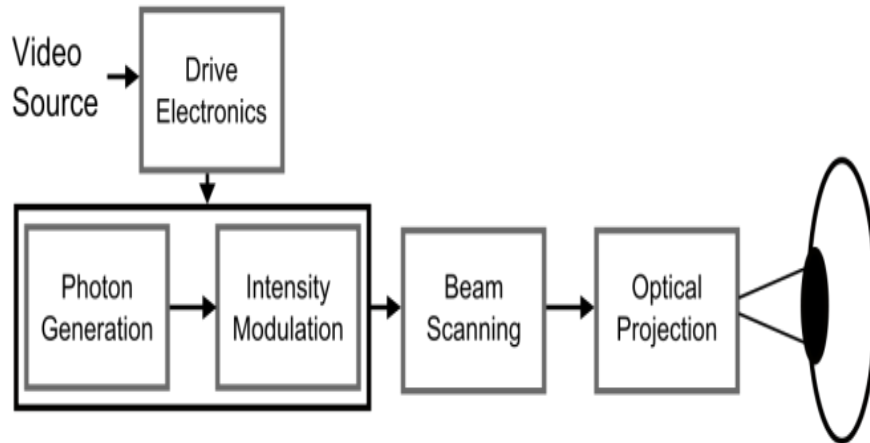


Figure 3: The Virtual retinal display algorithm

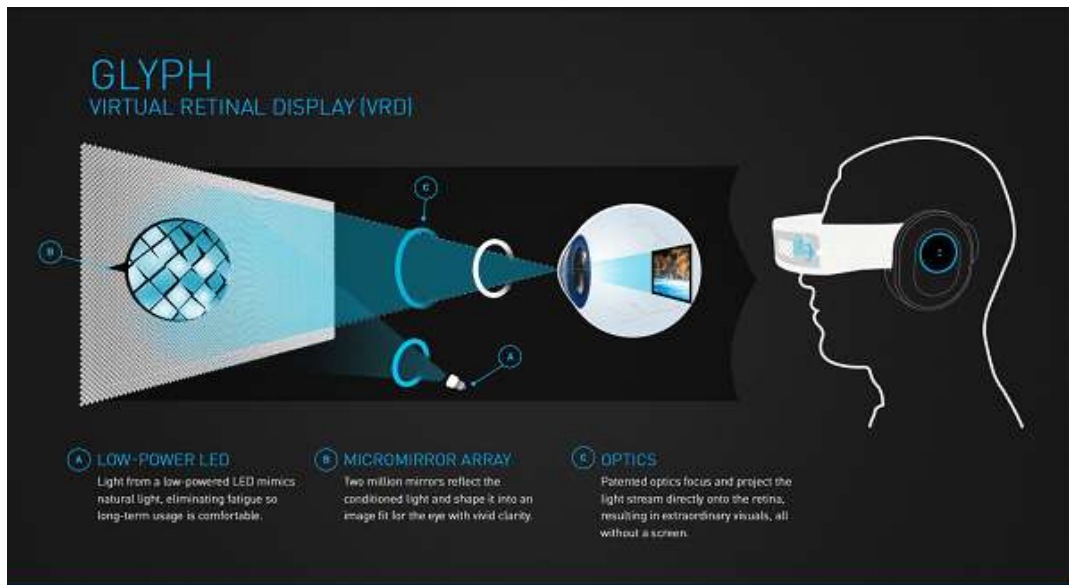


Figure 4: The Glyph - Virtual Retinal Display

C. Synaptic Interface

Synaptic display is a type of Screenless display technology that does not display the image in free media or onto the retina. It displays **by sending the signals directly into the brain with the help of the optic nerve.**



Figure 5: The Synaptic Interface

There are no light that are involved, basically the electrical impulses. This method is **tested on the horseshoe crabs** by recording their nerve images. Therefore, further the neural code transmitted to the brain by the optic nerve. This display offers the possibility of providing sight for the blind people by using implanted electronics to the bypass nonfunctional parts of the eye. It can give users the benefit to view images in a greater coordination and complexity than the eyes capable of producing it. However this method requires more research and development for their further production of worldwide application can be implemented.

III. Applications Of Screenless Display Technology

1) **Medical field:** By allowing the physician to view a virtual X-Ray of infected areas information that is concerning that patient during surgery. Virtual images produced by VRD could be laid-down with the patient by tracking the view of the physician in relation to the position of the patient.

2) **Manufacturing field:** The same concept as that is used in medical field can be used in manufacturing environment by viewing virtual blue print that uses C3 images to identify parts placement and operation information.

3) **Transportation system:** It can be beneficial in any transportation system by proving the display that can project virtual map of the surrounding area therefore in siding vision of providing reference state train characteristics and craft instrumentation

Some other Applications of the Screenless Display technology



Figure 6: The Application applied to mobile technology

Application applied to mobile Technology Screen less displays technology is also implemented for the development of the screen less laptops. A laptop that is without an LCD can be a very helpful, portable solution when connected to CRT or fixed LCD monitors.



Figure 7: The Laptops without screens

Screenless laptops would also be a green solution, giving value to donated CRT monitors that would otherwise be heading for landfills. Portability means that volunteers, who don't always have the time on daily

basis to travel to people's homes, can more proper way and easily maintain this computer. Screenless display technology is also widely applicable in the field of holograms projection.



Figure 8: The Hologram Projection

Hologram projection is result of a technological innovation that is truly going to helps in touch less holographic interfaces. In fact, a hologram projection projects 3D image of so high quality that it will feels as if we can touch them. However, holographic projection is still under progress acceptance as until now, the conventional holograms, which offer 3D images.

Latest laser technology are also implementing the special technique of the screen less display through the presence of the several 3D scope animation or the screen provides the advantage of being combined with the Laser Valve Video Projector(LVV)that helps in projecting video images by the use of the laser light instead of the Xenon Arc lamps. Laser technologies have given apeak over the other technologies as the LVP gives the projector an outstanding depth in the focus.



Figure 9: The Virtual screen

It is implemented in the emerging of the new screen less TV's. Imagine that while watching the TV picture will be magically appearing in the thin air. The pictures will just floats in front of the viewer; this is going to be a latest emerging technology.



Figure 10: The Magical display in air

IV. Advantages & Disadvantages

Advantages:

Low power requirements-Six diodes are required only and a few of a watts to deliver the images to the user's eyes.

High resolution images- The pixels in the images projected by the diodes can be made smaller than is possible with any CRT or flat panel display, so higher resolution can be achieved. With retinal help of retinal projectors, the only limitation in the resolution of visual images will be the resolving power of the users' eyes.

Larger portability- The combination of the diodes, lenses, and the processing components in a retinal projector system will weigh only a few ounces.

Wider viewing angle –With the help of the Retinal projectors we will also be able to provide a wider field of view than is possible with display screens.

More verified color- By balancing the light sources to every the intensity of red, green, and blue light, retinal projectors can provide a wider range of colors – and more main is fully saturated colors – than any other display technology.

Greater the brightness and more better contrast- Retinal projectors can be provided by the higher levels of contrast and brightness than any other display system

Ability for display 3D images-According to their capability of presenting high definition image-pairs, retinal projectors can be delivered and the most highly realistic stereoscopic movies and it is still pictorial images to their users.

Low costs

Disadvantages:

The principle disadvantage is that Virtual retinal display:

- The (VRD) is not yet present in the significant quantity.
- Prototypes and special experimental models are now created, but their cost per unit is high.
- The VRD technology comes under the progress and Development.

V. Future Enhancements

For the futuristic development of this evolving new technology, several researches are being organized and the several well-known IT sector companies and the other best labs that are present in the world are handling over the project of the Screenless display technology.

- In year 2001 Microsoft had begun to work on an idea for an Interactive table that mixes both the physical and the Virtual worlds.
- Multi touch is an interaction technique for human - computer and the hardwired devices that apply it, which allows users to compute it without any conventional input devices.
- Development & enhancement of the micro vision also gives the revised and the futuristic view of the screen less displays. This technology of the micro vision is the very well useful in the Artificial Retinal Display properties.
- Japanese scientists have invented the pair of intelligent Glasses that are able to remember last time where people saw their keys, Hand-bags, iPods, and mobile phones.

VI. Conclusion

This paper has been elaborately discussed about the Screenless Display Technology which is one of the most emerging computer technologies and has become a new exciting one for the upcoming generations as a field of the futuristic technology. Due to the ability of having various advantages which are involved in the making, designing, coding of the Screenless, this needs the plenty of knowledge and the process for the development is still under the improvement. May be in the future the world may be dominated by the screen less display technologies and this enriches the world of technological empowerment in the field of the computer technology. Screenless display technology promises the cost effective aspect and also the brighter future in the computer technology.

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