Workshop Report

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*"... only the voyage to the inside, to the infinite
time and space of digital code will be left, like
virtuality shows us a basic idea of what could be."*
Florian Rötzer, Leonardo special, 1991

FROM CAD GRAPHICS TO AN ART EXHIBITION

The results that will be outlined have been reached at the University of Munich, Faculty of Architecture, Institute for Structural Analysis of Buildings, thanks to Doctor Pittioni and Professor Grimme, who extremely backed our work.

It started in September 1990 when a group of students decided to focus on questions raised by CAD generated renderings and plots. At that point it seemed to be obvious that CAD systems were about to fundamentally change architectural representation as we know it, which relies heavily on formal, visual and aesthetic qualities, and was developed over hundreds of years. At the same time computers are creating new realities as in high-resolution realistic renderings, animation or virtual reality systems. It was necessary to explore the resulting new techniques and possibilities while applying them to architectural projects.

The following essay will throw a few spotlights on different aspects and results:

"Again and again we face borders that we have to cross, driven by curiosity and a dull idea, accompanied by slight fear and uncertainty."

Neugier, Einsamkeit, Wirklichkeit; Leonardo special, 1991

Building studies using CAD

Buildings by i.e. the Japanese architect Tadao Ando or the Austrian modernist Adolf Loos were modeled and rendered on a powerful modeling programm, and the effects of light, color, shading and perspective geometry on spatial visualisation were analysed. Special attention was given to plotting techniques.
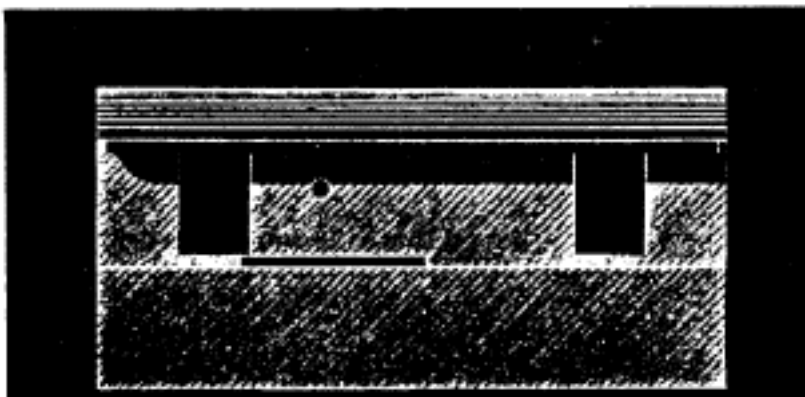

elevation using hatchures of different density to create depth with a pen plotter

Lines

"Lines are abstract, they comefrom the perception to see three dimensions as two. Lines devide, and if they enclose a plane we call them outlines.

Kurt Wirth

Architectural information is, by tradition, transmitted through two-dimensional lines. Drafts created by plotters are perfectly precise and at the same time seem to lack human touch and style. Plotter-generated perspective views miss the depth and clarity of a well done hand-made drawing. Especially in interior perspective views the density of lines usually increases heavily from foreground to background, while the human brain expects less detail and color in the distance.
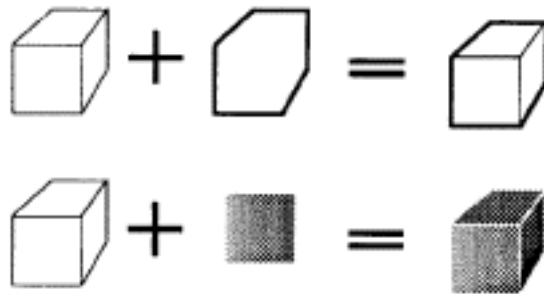
Outlines

Plots of computer-modeled volumes are always based on their complete geometric description, while for volume recognition, mainly the outline shape of the volume is of importance. In using outline techniques with attention to the relationship between line gravity, size of paper and viewing distance, we found that we could highly increase the readabifity of plots with high density of "es.

From the world of lines, an abstract world without light, the next step was shading the three-dimensional objects and using planar graphic systems to visualize them.
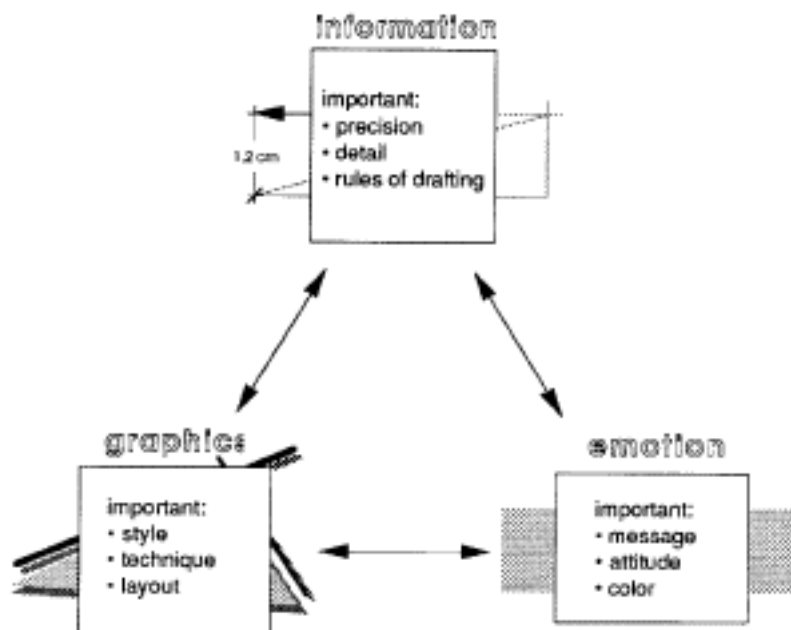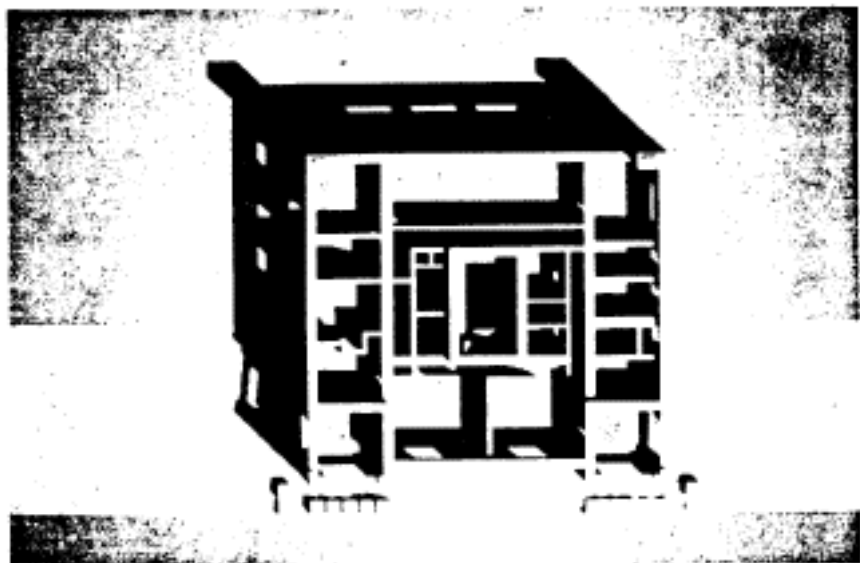
pool from the terrace
villa project by Adolf
Loos, using hatchures
from a pen plotter

Planar graphics

"It´s the shadow that gives the objects shape and depth"
Michelangelo

floor plan from the
terrace villa project by
Adolf Loos, shaded
rendering with deep
shadows

	0,3	0,4	0,5	0,7	1,0	
1,0	0,5	0,7	1,0	1,4	2,0	10
0,9	0,6	0,8	1,1	1,6	2,2	9
0,8	0,6	0,9	1,3	1,8	2,5	8
0,7	0,7	1,0	1,4	2,0	2,9	7
0,6	0,8	1,2	1,7	2,3	3,3	6
0,5	1,0	1,4	2,0	2,8	4,0	5
0,4	1,3	1,8	2,5	3,5	5,0	4
0,3	1,7	2,3	3,3	4,7	6,7	3
0,2	2,5	3,5	5,0	7,0	10,0	2
0,1	5,0	7,0	10,0	14,0	20,0	1

diagram showing hatchure density in relation to pen size and line spacing

Stepping into the world of light and shadow we lose abstraction and gain realism. Changes in greyscale are the basic means by which volumes under light define themselves.

A white sheet of paper is unlimited, with neither direction nor dimension, depth is not defined.
A plane of a certain greyscale has mass and depth, two planes of same size and greyscale seem to he in the same layer. On a medium gray background, white planes are visualized above, while black ones are below. This turned out to be a very effective way of simulating depth, and by adding deep shadow to floor plans, elevations and sections volumes and lighting conditions could be adequately represented.

Hatchures

In using hatchures of different density and line gravity to represent planes of different brightness we found a way of translating the colorful renderings that our systems produced on the screen into plots which could be created by any pen plotter. Different systems of colored background and line colors were applied.

interior view, simulation of lighting conditions and architectural space.

White-blue-black

After consulting a biologist, specialized in visual perception, black or white objects on a blue background turned out to be especially useful in adding depth to two-dimensional plots. Blue is emotionally neutral and the human brain is used to it as background color, the sky and the sea is blue. Bright objects on a blue background attract attention and appear to he close, while dark objects appear to be further away. Almost any other background color was found to cause undesired emotions, with the drawings having less depth and clarity.

Color

Realism → ← Abstraction
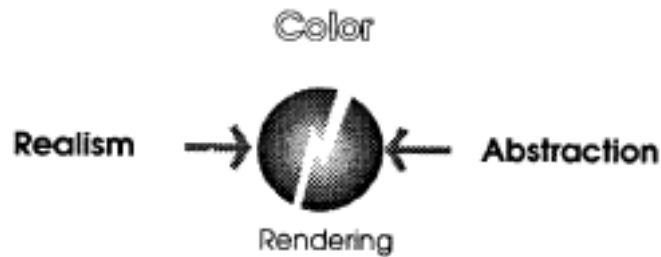
Rendering

Color

Color in renderings turned out to be difficult to handle, because it often ignores or even counteracts the contents and purpose of a picture. Even worse, gaudy renderings often lead to a misinterpretation of the CAD picture and are reason for many prejudices among architects. This lead us to using mainly greyscale or monochrome colors in architectural renderings.

Animation

"...we are no longer subjects of a given world, but projects of alternative realities.
From the subservient, subjective position we straightened up into projecting. We become adult. We know that we are dreaming."

Vilem Flusser, Leonardo special, 1991
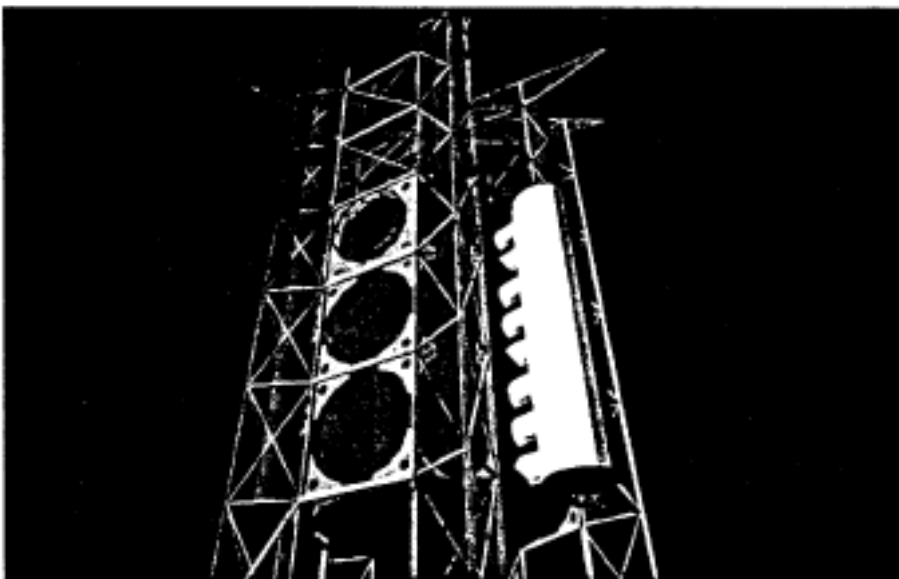
under water research
station, screen shot
taken from online
animation

At this point we were confronted with a CAD system of the latest generation that enabled us to visualize and move in architectural objects directly after modeling them. Together with fast hardware this system turned out to be an extremely powerful design tool. It was used in a number of design projects and in some cases even replaced traditional design tools like sketching or building scale models.

Design decisions could be easily evaluated from a human perspective and could be presented in public in an innovative way. It became clear that the way we view and understand architecture is changing rapidly and that there will he a new form of architecture that will only exist as data in computers and can only be experienced through them.

To meet this new challenge we decided to join our ideas and results with others from fields outside of CAD. For this purpose the project 'SOFT TARGETS-Visions in space' was founded, aiming at a more complex way of viewing the rapid developments in the information society.

SOFT TARGETS- Visions in space
"The sky was the color of television, tuned to a dead channel."

William Gibson, Neuromancer

Accompanying the ECAADE conference the exhibition SOFT TARGETS- Visions in space gives an idea of what the future could bring. Computer-generated visions from various fields are shown using only video beamers and large scale projections. The shown objects are created from immaterial data and are presented immaterially. 'Me interests of science, technology and industry, which sponsored the project were united in an interactive network.

Installation
Lothringerstr.,
exhibition
SOFT TARGETS
Munich, Oct. 91

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http://www.ecaade.org