Stellingwerff M.C.; Visual Clues in the Cyber-real Complex. In: K. Nys, T. Provoost, J. Verbeke, J. Verleye (eds.); Proceedings. AVOCAAD Third International Conference (Brussels, 4/6/2001), Hogeschool voor Wetenschap en Kunst, Brussels, 2001, p. 82-94.

cues

VISUAL ~~CLUES~~ IN THE CYBER-REAL COMPLEX

MARTIJN STELLINGWERFF
Faculty of Architecture, Delft University of Technology
Berlageweg 1, 2628 CR, Delft, the Netherlands
E-Mail: m.c.stellingwerff@bk.tudelft.nl

Abstract. Current Computer Aided Architectural Design deals with issues of complexity in creation and interpretation of the built environment, complexity of the computer systems and complexity of the representations of the design object. The term 'CYBER-REAL Complex' in this paper is defined as the whole (un)-conscious state of the architectural design project in the heads of the design-group and as how it is maintained in CAAD systems. The 'CYBER-REAL Complex' contains the design, its context and all related information such as planning, product specifications and design ideas.

An Intranet is an interesting means for storage and approach of such complex project-data. However the knowledge and data of the project participants remains in their heads and new methods have to be developed in order to get each participant to share his or her personal information about the project. Meetings and intense data retrieval by an Intranet can establish a useful 'CYBER-REAL Complex'. Then, as a designer wants to approach and change the information in the 'CYBER-REAL Complex', a very good set of tools, methods and media has to be at hand. The complexity of all the information can be overwhelming and it can take much effort to re-understand and re-interpret the information before new decisions and design-steps can be made.

Currently, the understanding of CAAD representations by the designer and the deliberate execution of operations on increasingly complex datasets through increasingly complex user interfaces takes too much time and effort. Enhanced ways of representation in the 'CYBER-REAL Complex' could help the approach and understanding of the information. Therefore the visual language of information systems needs further research and development.

This paper introduces my PhD research which explores several limits of human perception and ways to adhere to the human way of visual thinking in order to find and add new visual clues in CAAD, VR interfaces and in the 'CYBER-REAL Complex' as a whole. The research draws from knowledge of the Gestalt Theory and Perception Research. Findings of the research show that designers use distinct views to get overview and insight in the project data and they also show that different kinds of data representation are needed for different phases in the design process. Finally it showed that filtered and abstract represented information could be very useful for remaining focus in the otherwise overwhelming and complex dataset.

1. Introduction

Again, the organisers of the AVOCAAD conference came up with a tempting theme to focus on: *complexity*. What is complexity and why is it a typical theme to discuss in the realm of architecture and CAAD? Do architects want (a certain amount of) complexity in their design, or do they fight complexity?

Does a complex urban context, or a complicated design-brief tempt the architects' creativity, or does the complexity of their assignment hinder the emergence of bright thoughts and clear solutions? The answers to such questions will be diverse and it can be expected that there will be much discussion among the conference participants.

Personally, I think architects like the working space between complexity and clarity. Architects make compositions within an already existing world. Their design has an "inner logic" that can range from soberness till exuberance, from structural complexity to monumental / monolithic simplicity. The "outer logic" can likewise range from complex interwoven (urban) fabric to segregation in the (urban) desert. However, the compositions always deal with perceptive aspects of complexity and clarity.

Also, in CAAD, there is an attractive predicament between the demand for 'desktop clarity' [Breen, Stellingwerff, 1996] and the wish to arrange and handle complex data for the design process. This makes us design and propose new interfaces and intelligent systems for data management and mediated creativity.

Taking this into account, as a pre-statement for this paper, I consider complexity as a welcome given to deal with and I see complexity as a subtle design aspect that should neither be eliminated nor be neglected.

1.1 An attempt to define complexity

- Literally a complex is a composite.
- Complexity is what cannot be understood in one single thought or view.
- Complex is what can only be understood in parts at a time.

Therefore Complexity is always tempting our awareness. One moment we focus on aspect 'a' and are aware of 'a', another moment we shift our focus to aspect 'x' while we let the full awareness of 'a' slip away. By vividly shifting our focus, we can try to reach complete understanding of a complex case. Complexity can help to *broaden* our awareness.

- Complexity is opposite to clarity and unity of entirety.
- In contrast to complexity, clarity can help to *heighten* our awareness.
- Something is not complex if it can be completely understood and if each part of it can be contained within our awareness.

Complexity can be painfully attractive, tempting agonizing, as by definition some aspects escape from completeness. We can keep things in scope, shift focus, hip-hop over and about a complex case, we can try to rearrange or we can just let us overwhelm; complexity … that's nice; complexity … that's life…

1.2 Architects About Complexity

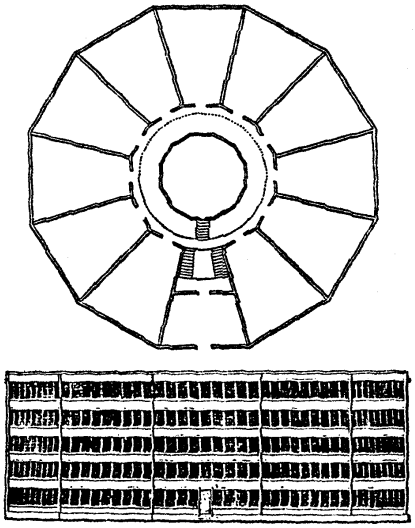
The well-known 'firmitas, utilitas, venustas' of Pollio Vitruvius seems to conflict with phenomena of disorder and complexity. Claude Perrault (1613-1688), translator of Vitruvius, aspired a rational and sociological theory of visual order. This already allowed seeing buildings as part of a layered semiologic system [Tzonis, 1982]. In contrast to rational considerations of Vitruvius and Perrault, William Hogarth (1697-1764) is far more positive about complexity. In the Analyses of Beauty (1753), Hogarth described the attractive middle course between the rigid academic form-grammar and lawless / chaotic disorder. [Lefaivre, Tzonis, 1984]. Hogarth wrote about alternation: 'variety as how we can see it in some parts of nature, adds to beauty. What I mean is "created variety" in contrast to un-designed variety, which is disorder'. He also mentions the beauty of variety in gradually

shrinking measurements. 'This can be seen in pyramids and curls …'. Nowadays we would classify many of such forms as Mandelbrot fractals. 'Simplicity without variety is completely disagreeable.' About complexity, Hogarth writes: 'bright minds always want to be busy. … I would define complexity of form as the property of an ensemble of lines which lead the eye and that will entertain the mind over an amusing hunting site.'

Giovanni Battista Piranesi (1720-1778), a contemporary of Hogarth, shows the figment of imagination in his *Carceri D'invenzione* (1760). These images show a real enthusiasm for complexity. Piranesi clearly used his 'imaging imagination' as a way to explore complexity of space.

In contrast to Piranesi, I would like to mention the Panopticon (1787) prison building of Jeremy Bentham, which is a typical example of clarity. The lines of sight are the ordering mechanism of the architecture in order to keep the prisoners watched.

Carceri D'invenzione (1760), Piranesi



Panopticon (1787), Bentham

This short paragraph with 17th and 18th century examples illustrates the different approaches of disgusted and embraced complexity. Nowadays, it is easy to find similar differences of mild and more extreme favours about complexity.

1.3 Computers to solve complexity

In 'Community and Privacy' (1963), Serge Chermayeff and Christopher Alexander describe the need for computers to solve complex design problems. The problems were too complex to oversee in one view. The initial thought was that computers could save time in solving such complex problems. Computers could unravel complexity by sheer computation power.

2. The 'CYBER-REAL Complex'

The term 'CYBER-REAL design' comes from the fifth International Conference on Computers in Architectural Design, 1998, at the Technical University of Bialystok in Poland. In his introduction to the conference book, Alexander Asanowicz states: 'Whereas Virtual Reality could really be treated as a sort of illusion, Cyber-Reality is a fully realistic being, defining the area in which our creative activities are taking place'…'While traditional tools enable visual artists (architects too) to work only on objects, the computer gives them access to the processes and sources of creative activity.'

In addition to Asanowicz' notion of Cyber-Reality as a new reality, I would like to distinguish three places for information within the 'CYBER-REAL Complex'. I have mentioned these three information-places in 'Changing approaches to the Real World' [Stellingwerff, 1997] :

"First there is the information in the mind of the designer. This mental information represents knowledge and vision for change and innovation of the existing situation in reality. The information does not have to be censored or refined. On the contrary, design thoughts should be free and vivid in order to formulate new ideas.

Secondly there is the information content of media. Media represent information extracted from reality and from the human mind. Media depict an abstraction in which certain aspects are in focus and others may be neglected. Drawings, (scale-) models, texts and images are design media, which can represent both ideas of designers and aspects from reality. Media do reflect and mediate information of real world objects and of objects of thought. That is why writing, talking and sketching can enlighten or refine a process of thought and that is also why some photos or documentaries give us a clear insight in a certain real situation. Media extend the 'now and here' of perceived reality to a much wider range including the impossible, the past, a future and elsewhere (e.g. in fiction and television). As far as the human mind is concerned, media can extend the short- and long- term memory and media can play a confronting role in conversation with one's own thoughts (e.g. in design sketches or by reading in your own diary).

Media, with the ability to reflect, can become a partner in a design process [1]. In contrast to ‘the mass media’ (especially television) these reflective media can exchange information in two ways. You can for example draw an image on paper and at the same time or later you can re-view the image. This ‘reflection’ gives insight in mental images, which are noted down. This enables an iterative design loop [2] in which ideas can be tested and refined.

Thirdly there is information in the real world, and we could possibly argue that the real world *is* in-formation. The, often complex, compound of a building site, the physical context and changing social and economical aspects of a neighbourhood can be seen as a source of reality information. This information can be both inspiring and constraining the designer. It might be clear that reality is an important aspect for design because every materialised design is immersed in a context of everyday users and other designed or natural objects."

The ‘CYBER-REAL Complex’:		
Reality IS and it can be changed	**Computer Media** **REPRESENT** **CONTAIN** **PROCESS** 1/2/3 bytes at a time or in a neural way	**Mind SHIFTS focus** 5 +/- 2 things at a time

In contrast to the computer as a 'complexity solver', in the approach of Chermayeff and Alexander (and many, many other researchers), the computer can also be used as a medium that reflects information of reality and information of the mind; a 'complexity representer'.

In this approach, the role of the computer is only one third of the whole ‘CYBER-REAL Complex’.

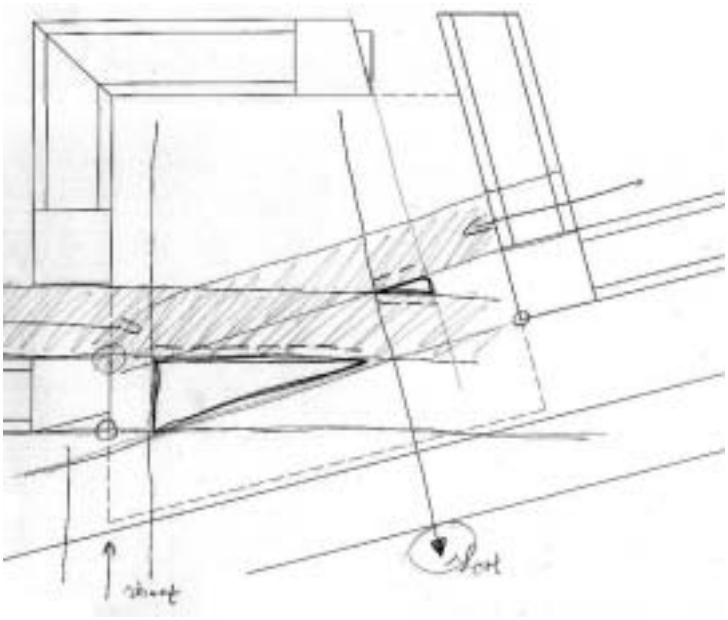
The role of the computer is to give us more or less complex representations of reality and reflections of our own thoughts in mind.

The adaptable representations on the computer screen help the designer to understand complexity and help to make shifts in mind-focus. Similar to the research of the 'right **tool** at the right time' [Yi-Luen Do, 1998], there could be a search for 'the right **view** at the right time'. That consideration formed the start of my PhD research.

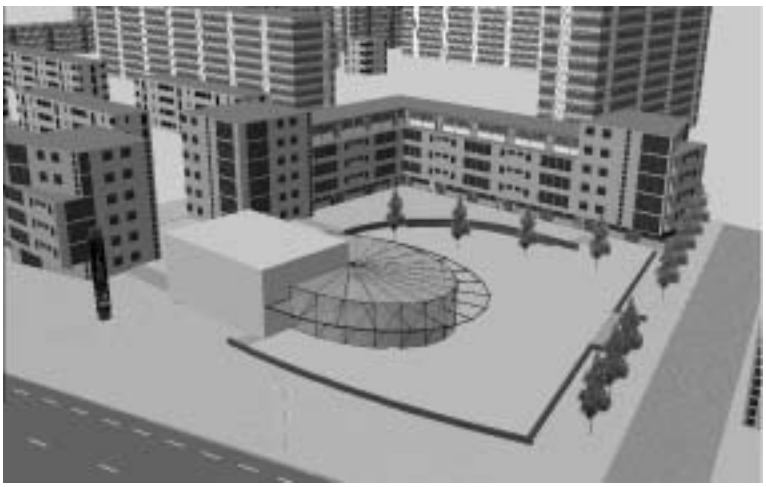
3. View preferences and their effects - a study of visual language for architectural design within a represented urban context

The thesis is a study of visual language for architectural design within a represented urban context. As a new means of visual representation, the possibilities of the Virtual Reality Modeling Language (VRML) were explored. Participating architects tested different 'view settings' and 'image parameters' and they expressed their view-preferences and reactions during different phases of a simulated architectural design process. Starting from the problem of representation the research seeks for the values of *reduced and enriched images* and compares *overviews and insights* within the newly available visual representation medium.

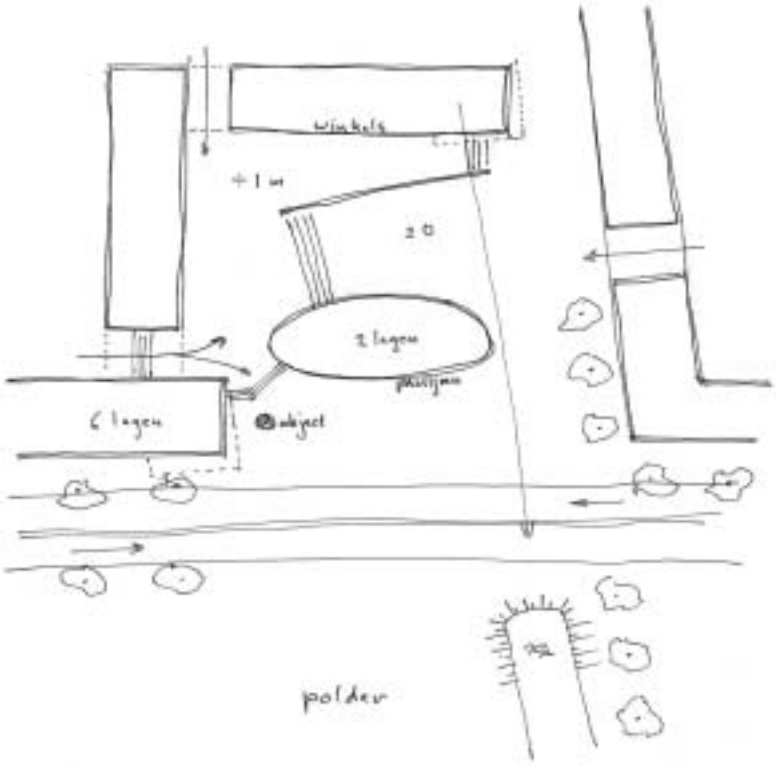
In a test, six architects were confronted with several prototypes for representation of an urban context. In order to find the usefulness and the effect of the prototypes, much effort was made to give occasion for response. It was feared that a questionnaire would not give insight into the real opinions of the participating architects. A questionnaire would only be a direct mirror of the given and the asked. Therefore, the test was composed as a simulated design process in which the architects had to investigate and design on the basis of a virtual building site. The prototypes were embedded into the test system and they were questioned along the design process. Instead of rigorous questionnaires, a more loose way of interviewing was chosen. A combination of open questions, some closed questions and instructions allowed the participant to respond in relation to different phases of the design process. The result of this approach is a series of twelve ‘virtual walks’ in which the participating architects and the interviewing researcher ‘wander through’ the represented design environment. While they walk, they talk with each other and while they interact with the virtual environment, a real kind of 'situatedness' emerges. Different points of view, opinions, questions and design ideas emerge, flow and go, almost like in a real walk.



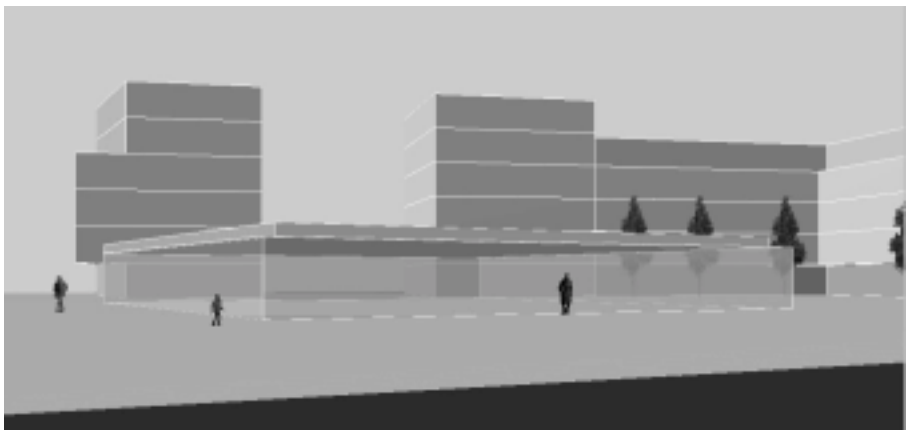
First design sketch of one of the participating architects…



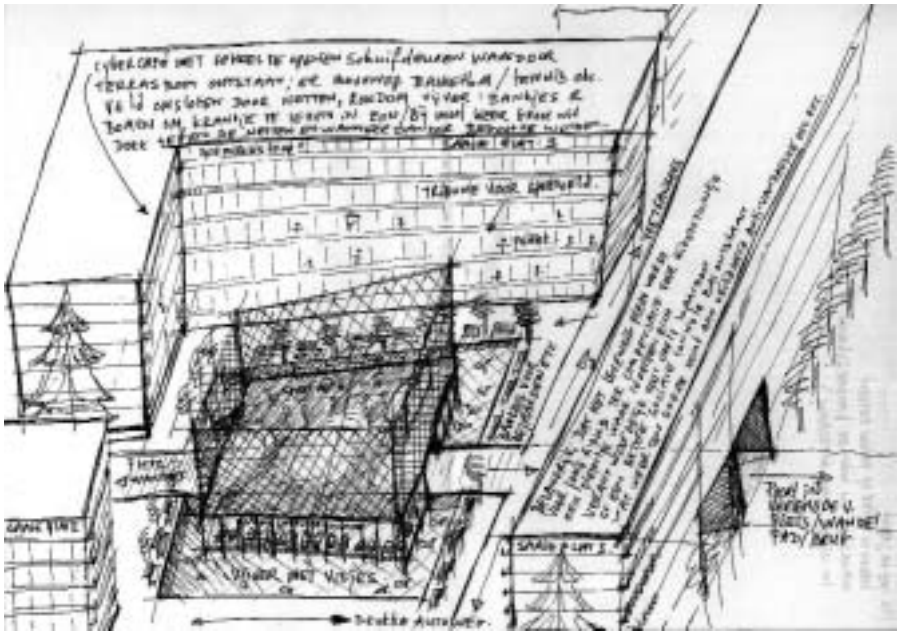
VRML model of the Design in Context, by the same participant…



Memory map of the same participant after 6 months…



The same context model, seen by another participant, in another preferred view type, with other ideas and other viewpoints...



Again, the same context, another design, a 'mental map', four months after seeing the computer images…

Through analyses of the virtual walk transcripts, conclusions could be drawn and a developing understanding of architects' view-preferences and the effects of such views became available.

The test with virtual walks made it possible to relate views of a representation system with views of mind. During the tests it became obvious that specific ways of looking at the VRML model and specific representations of the VRML model were important for the architects to understand the complexity of the urban environment. The preferences for private / design related use of images were mainly abstract images (only geometry, without many details or texture) from above (birds eye views), in order to get overview, and only some eye level views with a more realistic façade rendering were preferred for final visual checks. The effects of the wanderings through the model prove the notion that ideas are triggered by new impressions. For further, in depth description of the research and the findings, I have to refer to the thesis, which is scheduled to become available in Autumn 2001.

The theme of complexity, however, is tightly related with the above-mentioned research.

Handling complexity is possible if we shift our awareness from aspect to aspect and if we coordinate our point of view. The research system, built as a VRML prototype, can be seen as a first attempt to give a computer model the role of stimulator of thoughts and mental points of view. The computer gets the role of a 'CYBER-REAL creativity trigger'. Complex and clear reflected data are outer options in a range of possible representations; hopefully leading to broadened and heightened design awareness…

NOTES

[1] At the Symposium on Models of Human Action at the Sixth International Congress on Cybernetics, Systems Research and Informatics, Baden Baden, August 1993, Ranulph Glanville mentions 'Conversation' as one of three metaphors depicting design: *'Design is (like) a conversation -it IS a conversation- in the simplest case, held with oneself through the means of paper and pencil. The marks left on the paper (the drawings) talk back to you -giving you ideas- if you'll let them. (This is an act of listening.)'*

[2] In *'Inquiry by design: Tools for environment-behaviour research'* (Monterey, Cal.:Brooks/Cole) J. Zeisel presents a 'design development spiral' consisting of empirical knowledge which is refined in a circle of *image-*, *present-* and *test-actions*.

REFERENCES

Asanowicz, A.: 1998, '*From real to cyber reality*', in: *CYBER-REAL design,* conference book edited by A. Asanowicz & A. Jakimowicz, Bialystok, Poland.

Breen, Jack and Stellingwerff, Martijn: 1996, '*A Case for Computer Assisted Creativity through Clarity, project 12 Cad and beyond...*', in: *Approaches to Computer Aided Architectural Composition,* Technical University of Bialystok, Poland. Edited by Aleksander Asanowicz and Adam Jakimowicz, 1996. Summary published in: *Proceedings Computer Creativeness conference, 4th international conference on computers in architectural design*, edited by A. Asanowicz and B. Sawicki, Technical University of Bialystok, Poland.

Lefaivre, Liane and Tzonis, Alexander: 1984, '*Theorieen van het architectonies ontwerpen - Een historiese dokumentatie*', Socialistiese Uitgeverij Nijmegen.

Stellingwerff, Martijn: 1997, '*Changing approaches to the Real World*', in: '*CAAD - Towards New Design Conventions*', edited by Aleksander Asanowicz and Adam Jakimowicz, Technical University of Bialystok, Poland.

Tzonis, Alexander: 1982, '*Het architectonies denken - ontwerp, rationalisering van de architectuur en maatschappelijke macht,* Socialistiese Uitgeverij Nijmegen.

Yi-Luen Do, Ellen: 1998, *The Right Tool at the Right Time - Investigation of Freehand Drawing as an Interface to Knowledge Based Design Tools,* Thesis, Georgia Institute of Technology.