View Preferences and their Effects in a Contextual Virtual Environment with Adaptable Representations

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Abstract: Design problems are initially ill defined. A process of exploration, conceptualisation, development of alternative solutions and tests of the initial ideas is needed to find interesting and useful solutions. The urban context of a building site can provide hints, inspiration and constrains for various architectural design options. The design process can get the form of a constructive conversation between the designer and the applied design media if those media actively provide specifically needed tools and appropriate representations of the design and its urban context.

This paper will report on a recently finished PhD research for design support systems that visualise the urban environment as a context for new architectural design. The main experiment focussed on the constructive conversation while the architect and the researcher ‘wandered’ through the digitally represented urban environment.

In relation to the eCAADe theme of city-modelling, this short paper will especially focus on some of the findings and conclusions of the research and several recommendations regarding to city-modelling are provided.

Keywords. Architectural design; urban context; visual representation, city-modelling.

Introduction

Architectural design is characterised by the important relation between the design object, the user and the urban context. Unlike a mobile product, the architectural object as a whole cannot move to it’s own free market (Fokkema, 2002). Buildings should function in the environment where they stand for several decades or even for centuries. Therefore, the experience of the urban environment as context for architectural design is an important starting point for most architects.

Digital design media combine contextual models (e.g. city models), models of the design artifact, design tools and evaluation tools. Digitization of design media allow the re-use of models and the adaptability of interfaces and content. Recent studies show the accurate adaptability of the toolset in digital design media (Yi-Luen Do, 1998). The adaptability of contextual representations is the subject of this study. In reference to Yi-Luen Do, the title of this study could be: ‘The right view at the right time’.

The urban environment was modeled in such a way that several representation parameters (fog, transparency, viewpoint, refinement of façade-
textures) can be adjusted. The different representations were tested by participating architects who expressed their view-preferences and reacted to the contextual information during a simulated design process. During the test with the architects, all reactions and expressions were recorded in order to find effects of the different representation types.

Research method

A VRML-model was made of a non-existent neighbourhood. The urban model consists of several parts which can be switched on and off in order to get the right view. Several JavaScript codes, embedded in the VRML code, add novel functionalities to the urban model. The view settings can be chosen by means of an icon menu. The object transparency and the atmosphere (fog) in the model are parametrically adaptable.

Six architects participated; each architect was invited for two design sessions. During the sessions all actions and reactions were recorded. The virtual reality system showed the 3D-model of the specific urban setting and it allowed to interactively change view-position and to alter the various representation types. Thus, the architects were provided with much contextual data for a specific design task. The evaluation of the recordings focused on how the provided data served as information for the architect and subsequently how this information triggered the emergence of their design ideas.

While 'wandering' through the virtual model, the architects could express and choose their view-preferences in terms of characteristics (such as: the abstraction or detailed-ness of façades and whether or not there were trees and scale puppets visible), environment characteristics (such as: fog and transparency) and specific viewpoints (such as: eye-level-views or an animated helicopter-view). Several times the architects were questioned about their spatial understanding of the urban site and along the process they could make sketches and express their design ideas. After the virtual site visit, each architect made a design for the open area in the urban context.

In a second research session the own and each other’s design was to be judged in relation to the urban context model. In this second virtual walk, the architects again expressed their preferences and talked about their visual understanding. During the experiment, the model-images on the screen were captured and the sound was recorded. This resulted in six illustrated interviews with architects. Thus the research gave many insights in architects’ view preferences and the ‘design-process-effects’ of the views. The flow of the test was arranged by means of a research protocol.

Research findings and conclusions

The research provided many answers and several unexpected insights. In advance of the PhD thesis, the overview in this paper is kept short and just indicative, while it takes many more pages to accurately ground the conclusions.

Discourse analyses of the recorded data shows that the virtual representations actually triggered the thoughts of the participating architects. They were situated in the urban context and their ideas were tightly related to what they momentarily saw. Changing viewpoints changed their points of view. Coming back to certain viewpoints activated memories to the same thoughts. However, the lack of enough ‘incubation time for development of design ideas resulted in relatively thin-based design concepts. Overall the experiment provided many outspoken insights of reasoning designers during their work.

The insights contribute to the current knowledge about the architectural design process,
about design media and about 3D models for/of design. This new knowledge is supposed to lead to more efficient and creative use of existing tools and to developments of new types of design media with new features, which are in accordance with appropriate modes of representation. The gained insights can also lead to a more effective organization of 3D urban models so that, during the design process, different needs for information can be better supported with accurate visualizations.

As architects are already trained in reading abstract drawings, they often want to see similar abstract views in virtual reality models. The abstractness of form without texture enables them to focus on specific spatial aspects of the design and the site. In the communication with the client, the participating architects preferred to make the design as clear as possible, while the representation of the urban environment (the urban context) could be shown in a less realistic way. In order to achieve this, the use of transparency was an unexpected means to suppress the presence of the environment. Also a black and white representation of the surroundings in combination with a coloured design was preferred.

Other interesting results of this research are concerned with the differences between ‘overview’ (birds’ eye view) and ‘insight’ (eye-level view) and about the emergence of initial design ideas while observing the different model impressions. As an example the quote about looking in different ways, e.g from eye-level and from above, from one architects is provided here: A1: “I’m someone who prefers to have overview. Working in plans and sections gives overview, while insight comes intuitively... The perspective view has a communication role and can be used to check your design. An overview (plan or section drawing) makes that I do not forget things, while a perspective drawing puts things behind each other and that makes me fear to forget aspects that cannot be seen. I use colour pencils in order to structure my drawings. Only if something is very complicated, you have to draw in 3D. However, 3D is to check, 2D is to make! I think: the more information, the more insight. But, the less information, the more overview. So, black and white images give more overview and if more information is added, the more confused I will get.”

The study of developing thoughts of the participating architects were the most interesting results of the research. Here, only briefly, some motives of one single architect are presented. Most surprising was the way in which the initial design ideas quickly rooted into the architects’ narrative. This will illustrate the type of research and can be called exemplary for many other findings that showed quite similar tracks of design idea development.

From the start, the architect in this example was focussed on lines of sight. At first some lines of sights from eye-level views in the streets were tested and drawn. Then the notion came up that people in the houses that surrounded the building site, should keep their view to a nearby pond and urban park. Later on this notion was transformed into a design constraint and then into an operational concept for the whole placement of masses on the open building site. Many months later, the architect was asked to draw a drawing of the design from memory, again the lines of sights were generative to reconstruct the memories of the design.

This shows in a stunning way how discourse of a designer can be focused and directed by single ideas. In the processes of the other five interviewed architects, similar narrow but generative ideas directed their development of thoughts. Each time a revaluation of previous observations led to stronger convictions and finally to generative concepts. Architects are trained to underpin their thoughts and to construct logic in their designs and in their narrative. However, this study
revealed that the developing design discourse can sometimes (as in this study) be too narrow for alternative thoughts. The setting of the research experiment can be blamed to have stressed the participants to come with ideas in a very short time. On the other hand, from this, in a positive way, it can be concluded that design systems and group-work / collaboration should support different views, both in terms of computer aided representation methods and in terms of time and occasion to rethink and communicate one and the others’ points of view.

**Recommendations**

In reference to the yearly discussions on city modelling, as part of the eCAADe conference events, this paper will be concluded with a number of ‘recommendations’ that could lead to new discussions and possibly to better usability of city models for actual design activities. The direct interviews with participating architects in the research experiments and several personal reflections directed to these recommendations. In the PhD thesis, more foundation is provided to relate the recommendations to findings, conclusions and their origin in a number of experiments.

In the architectural design process, it is important to allow different kinds of seeing; it is necessary for an architect to have overview and insight. Design media can/should provide both types of views. This can e.g. be effectuated through provision of a ‘bird’s eye view’ and a ‘pedestrian view’. Furthermore it is of utmost importance to provide means that allow the designer to easily check and build perceptive relations between the two sorts of views. Orientation tools, such as a ‘virtual map’ and other ways to combine different views on one screen can help the designer to check their ideas and concepts.

The possibility to adapt the representation of a city-model can help to trigger different thoughts and to check different aspects. Not just the best quality (in terms of realism) is important, also more abstract views, leaving space for imagination and different interpretations can play an important role in the design process. Designers often want to see ‘less’ in order to concentrate on one specific aspect of the design. In general, design media would become more attractive if they can be adapted to momentary specific needs. The active provision of the right tool and the right representation at the right time is a key factor of adequacy within an overload of possible functionalities in currently available software.

Design is such a personal undertaking that tools and media should be open for alternative use. The architect should not be limited to one imposed and demanding ‘system’. In architectural design, there is always a real context that can be visited. Reality should not be surpassed by its representations. Both real and virtual walks through the site’s neighbourhood can provide revelations. Furthermore, traditional (non digital) design media can still bring interesting thoughts and should not be neglected in a well supported digital design environment. In general, changing design media, getting new views and different feedback, gives new insights on possibly stranded visions.

It is important to take time. Design ideas have an incubation period. Views need to be re-presented and re-viewed in order to become mature. The design and method of use of design media and city-models can be arranged in order to provide incubation time. In this sense, building your own context models, on the basis of geometry-sets and private recordings /notations of the site, can be useful for architects. The time that it takes to make the actual model (whether it is a scale-model or digital-model) allows to become familiar with the site and provides the architect to reflect on each aspect.
Finally, it can be concluded that such research needs to be continued in order to discover the important role of ever-new design media on the thought processes of architects while they use the new media. Quality of a digital model is too often considered to be equal to features that support realism in the images. Realism is only one quality. Unrealistic, schematic or reduced aspects proved to be other qualities in the representation of a city-model.

References

