

# „Interactive Rooms - augmented reality in an architectural perspective“

**Peter G. Krogh**, Architect, Assistant Professor  
The Danish Center for Integrated Design  
Department of Communication Design  
The Aarhus School of Architecture  
Nørreport 20, 8000 Århus C DK  
+45 8936 0000  
Fax: +45 8613 0645  
peter.krogh@a-aarhus.dk

## **ABSTRACT**

This paper will discuss aspects of applying augmented reality technologies in architecture through experiments conducted in full-scale, and seen through the concept of atmosphere in architecture. Working with augmented reality in an architectural perspective brings a set of new artistic effects that will change the perception of the architectural space. The theories and experiments described in this paper take their departure in working interdisciplinary with full-scale models taking in considerations of both enhanced digital functions and as well as architectural working methods.

## **Keywords**

Interdisciplinary, atmosphere, mock-ups, augmented reality.

## **INTRODUCTION**

In the autumn semester of 1999 the Department of Communication Design at the Architecture School in Aarhus developed and gave a semester course with the title “Interactive Rooms” in collaboration with Kaj Grønbæk from InterMedia at the University of Aarhus. The aim of the course was to integrate architectural, artistic, humanistic and computer science perspectives on the use and implementation of technologies in our physical environment. The position argued in this paper is based on this interdisciplinary experiment.

## **INTERACTIVE ROOMS**

Applying augmented reality technologies to rooms and spaces will effect the perception of the architectural space.

A part of working with interactive rooms is to investigate our expanding possibilities for interacting with digital technologies, from today’s restricted use of fingertips on a mouse to include the whole body and this way enhancing our range of expressions for activating and communicating with and by technologies.

The perception of architectural spaces involves all our senses listen, touching, watching etc. and the total result of these impression could be seen as an atmosphere of the room that tunes us into a specific mode with both restrictions and possibilities for activities. Extreme examples could be that the sacred atmosphere of a church keeps us from yelling and screaming as well as the cheerful atmosphere of a bar keeps us from preaching and praying, if an event was to take place in an inappropriate environment then it would disturb and provoke us. Architecture can, when it is powerful, create specific atmospheres that direct a certain way of human behaviour and regulate activities. Working with augmented reality in architectural rooms is more than providing better and more complete ways of interacting with digital technologies, it further more includes an important task in making the resulting artistic effects of augmented reality an integrated part of the total perception of the architectural rooms and spaces. The concept of Interactive rooms share similarities with emerging research areas such as Cooperative Buildings [7], Virtual Reality, Augmented and Mixed Reality, [3].

## **Examples**

I will illustrate the kind of artefacts covered by the notion of Interactive rooms by examples from the above-described course „Interactive Rooms“, which comprised a series of projects that range from artistic installations to enhancement and support of work situations. The projects resulted in mock-ups related to actual physical entities in scale 1:1. In the projects there seem to be generally two interpretations of the use of augmented reality: the seamless integration of the physical and the digital environment, and secondly the work

with digital objects as a distinct part of the environment, intensifying the presence of digital technologies.

The projects that focused on the enhancement of work situations through digital accessories were concerned not to bring new abstract procedures into the work. The use of traditional interfaces was regarded as a possible obstacle for carrying out the work and as a disturbance that draws the attention away from the actual assignments that are to be carried through. The interaction with the digital technologies was established through the handling of paper and cards, and the way people normally would use these objects writing on paper, stacking paper, unfolding paper etc. The actual organisation of physical objects created a continuously updated digital parallel version that kept track of the process.

The projects that worked with an artistic approach to the "Interactive Rooms" were typically concerned about making the digital world distinct in the physical environment. The intention was to draw attention to the fact that digital objects are not limited to the picture tube but can, and presumably will, be a part of our everyday life. One of the projects worked with applying a digital shadow to physical objects. The digital shadow was designed as if the source of light came from the person who entered the room so when you'd walk around in the room the shadows would move. The personal movements would radically change the expression of the room. The intention was to create an atmosphere that should make the visitor aware of the possibilities in combining the digital world and the physical environments.

## **Methods**

Experiences from the course shows that the most efficient way of working with interactive rooms is based on scenarios, mock-ups [4] and prototypes [2], basically because scenarios take in the fact that actions come in series and events happens over time. Secondly scenarios provide the possibility for working with several users acting at the same time. The scenarios thought out during the course were in several projects based on video registration [6] of users performing their work. Based on the scenarios mock-ups were sketched out both in miniaturised scale as well in full-scale. The progression of the course showed that it was important to work in full-scale mock-ups to actually validate the impact of augmented reality applied to physical rooms and objects.

The students were inspired to form multidisciplinary workgroups involving both scientific and artistic competencies as a base for working out both analyses and solutions. The concept behind the course was, and is, that complex scenarios, as such found in augmented reality where the digital world joins forces with the physical world, can not only be evaluated and thought out in traditionally scientific

analyses. Often they can be captured and solved in one artistic principal design based on careful analyses, which creates consensus and makes paradoxes of everyday life easier to live with.

## **WORKING WITH AUGMENTED REALITY AND ARCHITECTURE**

Augmented reality supplies us with not only a new functionality related to our objects, spaces, working and living habits, but also can be seen as a part of a new way of working with artistic effects in design and architecture where digital technologies are incorporated.

In the last 20 -25 years the architectural discussions have been focusing on aesthetics, rather than on the impact that architecture has on it's users. The architectural efforts have been aiming at reaching specific design expressions rather than on supporting the atmosphere artistic effects create in the architectural spaces. The work has been more related with artistic creation than with problem solving. In the last 5 years there seems to have risen awareness, a concern for establishing a broader notion of design that can include all the aspects of a design intention. The concept of atmosphere was introduced by the philosopher Gernot Böhme [1] as the basic concept for a new aesthetics without a point of departure in art. Atmospheres are interesting and difficult to work with, where is atmospheres fund, does it belong to the things that surround us, is it in our selves or is it something in between? Much indicates that it is something in between, though this doesn't fit with classical philosophical ontology where there is nothing between the subject and the object.

To work with atmospheres we have to see ourselves as sensing bodies and not just as subjects gifted with consciousness and self-consciousness. We have to regard the things that surrounds us not as single objects, but as constellations of objects that imposes a certain atmosphere into our minds, an atmosphere more powerful than the specific aesthetics of an object.

Augmented reality is bridging the gap between the physical and the digital environments and by nature it only exists through the constellations of objects both physical and digital. Augmented reality can with the above described in mind be seen as a sort of atmosphere, a category, which is possible to conceptualise and design and thereafter decide what objects should be part of the concept to fulfil the design intentions.

## **FUTURE WORK**

For the next year I'm involved in a research project focusing on enhancing the work process for industrial designers. The

work habits and conditions for industrial designers are characterised by the intensive use of documentation in all kinds of digital and physical formats: technical specifications on paper, sketches in digital format, samples of physical materials etc. This documentation is situated in various places around the room, the sketch of the main concept is attached to the wall with a piece of tape where it is sight all the time, samples of materials are kept with other samples from other projects etc.

The lack of formal coherence between the various documents related to a design project is evident and the informal coherence of the documentation is often found in the mind of the key person of a project. One of the ideas in the research project is to work with augmented reality as the connecting factor so that both physical and digital objects would contain information on how they are related to other documents and design projects.

Secondly the project will investigate the possibilities for working aesthetically with augmented reality related to the design of work environments.

## REFERENCES

1. Böhme, Gernot (1995) *Atmosphere*. Essays zur ein neuen Ästhetik. Frankfurt a. M: Suhrkamp Verlag
2. Bødker S. & K. Grønbæk (1991) *Design in Action: From Prototyping by Demonstration to Cooperate Prototyping*. Pp. 197 - 218. Design at Work Cooperative Design of computer Systems, Lawrence Erlbaum, Hillsdale, New Jersey
3. Ecrim News (1997, Oct.) *Computer Vision and Virtual Reality*, European Research Consortium for Infomatics and Mathematics, no. 31
4. Ehn, P. & M. Kyng (1991) *Cardboard computers: Mocking-it-up or Hands-on the Future*. Pp. 169 - 195. Design at Work Cooperative Design of computer Systems, , Lawrence Erlbaum, Hillsdale, New Jersey
5. Heath, Christian & Luff P. (1996) *Convergent activities: Line control and passenger information on the London Underground*. Pp. 96 -129. In Cognition and Communication at Work.
6. Mackay, Wendy E. (1999), *Video Techniques for Participatory Design: Observation, Brainstorming & Prototyping*, lecture notes Department of Computer Science, Aarhus University
7. Streitz, N.A. et al (1998) *Roomware for Cooperative Buildings: Integrated Design of Architectural Spaces and Information Spaces*. Lecture notes in Computerscience Cooperative Buildings. Integrating Information, Organization, and Architecture.
8. Wigley, Mark (1998) *The Architecture of Atmosphere*. Daidalos 68, Pp. 18 - 27.