A MIXED REALITY GAME FOR URBAN PLANNING

by Rune Nielsen, Thomas Fabian Delman & Tobias Løssing

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ABSTRACT

This paper presents a case study based on an innovative collaborative, game-based approach to urban planning utilizing mixed and augmented reality techniques. Modern urban planning involves a wide variety of interests and individuals, consequently new methods and tools are needed to assure the active involvement of all parties in the planning process.

The Harbour Game is a debating game employing visual tracking and pattern recognition to superimpose information, e.g. 3-dimensional models, text, and photos on physical artefacts facilitating the understanding of complex relations in urban planning. The paper discusses the Harbour Game as an innovative approach to urban planning and the technology used in the Harbour Game in relation to similar approaches.

KEYWORDS

Mixed Reality, Augmented Reality, Urban Planning, Debate Game, Citizen Involvement

INTRODUCTION

In the autumn of 2002 the project team *'Havnen På Spil'* created a game for debating urban planning processes on the municipal level in Denmark. Our main goal was to facilitate a new form of debate actively involving all parties in the urban planning process, regardless of qualifications and prior knowledge about urban planning. New techniques and tools for studying, discussing and planning urbanity have always had a strong influence on how we perceive our physical surroundings, as well as affecting the way we shape and use them. Considering the effect tools can have on developing and evaluating arguments, it is the intention of this paper to discuss a new approach to urban planning, using a game based on mixed and augmented reality. This paper will discuss the project by outlining the central problems in modern urban planning, summarize the use of games as tools, and finally describe and evaluate the Harbour Game from a planning perspective as well as from a technological point of view on mixed and augmented reality.

MODERN URBAN PLANNING

A central definition of urban planning is based on the romanticist understanding of the architect as the inspiring *créateur*, working towards the idea of a good society hand in hand with the political system.

The urban planner or designer is navigating between on the one hand aesthetic criteria and artistic desires, and on the other hand rules and needs described by the surroundings, e.g. authorities responsible for providing demographic analysis and environmental reports, commercial and private interests etc. Consequently the task of the urban planner is defined as creating the best possible result in the interlocking fields of relations and interest.

Parallel to the planned and controlled activities of creation a much more organic and uncontrolled process of formation is taking place. The urban surroundings have a life of their own that effect infrastructures and building constructions on all scales: industrial structures are being transformed into office buildings or apartments for living, areas to be used as recreational zones are deserted, while social activities arise in places meant to accommodate infrastructures or industry. This autonomous and chaotic behaviour is dynamically transforming the urban landscape regardless of master plans and urban planning.

In the 60s new tendencies emerged as a reaction against the structuralist use of master plans, which traditionally had considerable impact on urban planning in the western hemisphere. The Non-Plan (Banham, R. et al. 1969) was used as argument for a new way of developing urbanism. It was based on the actual flow and tendencies of e.g. political movements and market forces. The general idea was to let communities of interests take part in the shaping of urbanity. By integrating and involving them in the process of creation they were given a more direct influence on their own environment. Since the 1970ies this form of planning, at least in Denmark, has been tamed by institutionalizing the active involvement of the citizenry through e.g. public hearings.

Existing mechanisms for participation are assumed to guarantee a wide variety and a multidisciplinary planning approach. But quite often the hearings take place in the last part of the process, turning the participants into observers instead of contributors. Their influence is based on objections to proposals instead of allowing a constructive dialogue in the early stages of planning. Active involvement of all interested parties requires new approaches since the essential skills and knowledge for active participation in urban planning processes are not necessarily present among the public.

USING GAMES AS A NEW APPROACH

To ensure a broad foundation for the development of new approaches a multidisciplinary project team was established consisting of architects, process and usability consultants, political scientists and programmers. During our investigation of new approaches to urban planning we came up with the idea of a debating game based on augmented reality techniques. This game was developed and tested in a realistic setting: the urban planning process addressing the future use of the harbour areas in Aarhus, the second largest city in Denmark.

The general idea behind the game-based approach was that using games as tools allows for restricted and formalized communication and interaction based on transparent rules. At the same time games allows the players to define their characters and transcend real life conventions, convictions, and constraints. A simple set of rules also assures that all participating players are equal, regardless of preferences, qualifications and ambitions, since all share the same starting point, the same information, and the same possible strategies for 'winning' the game.

Using games and game theory in an urban planning context is not an entirely new approach. Late nineties theories of urban planning are focusing on game theory as a foundation for explaining power structures and strategies in urban planning. The Dutch architectural historians Crimson, describes planning and design processes as negotiation. They call their strategy Org-wars (Crimson, 1999), a play on words referring to *Organisationware*, a term used by economics describing administrative and political factors leading to implementation of knowledge and the use of physical elements. The designers state that:

> *"Orgware means influencing the organizational, legislative, bureaucratic and political structures that in the end define the effectivity of every proposal for the city."*
>
> (Crimson, 2001)

This approach stresses the simulationist perspective of game theory as opposed to games as a playful form of interaction:

"A simulation is not primarily intended as a 'game' but rather as a serious, policy-oriented study, and is therefore also designated as a policy exercise."
(Bueren & Mayer, 2002)

The goal of the Harbor Game was to focus on the playful user experience while at the same time obtain a solid foundation for the actual planning process.

THE HARBOR GAME

The Harbor Game was initiated parallel to the planning process implemented by the municipality of Aarhus. The project was divided into three phases, or dimensions:

- The 1st dimension, *The Width*
  - collecting data and engaging the citizenry.
- The 2nd dimension, *The Height*
  - creating scenarios using the Harbor Game.
- The 3rd dimension, *The Length*
  - qualifying and concluding the outcome of the earlier dimensions.

The main focus of this paper is the 2nd dimension but to present a fuller picture of the process the dimensions surrounding the actual game will be recapitulated briefly.

THE BASIC RULES AND SETUP

In the 1st dimension of the project the citizenry and other interested parties was engaged through posters, postcards, newspapers, newsletters, and a discussion forum on a website encouraging the citizens to participate and assure a wide foundation for the upcoming Harbor Game. During a period of three months different kinds of material concerning the specific areas was collected: submissions from architectural contests, abstract visions, and concrete projects formed the basis of 100 projects/collages to be used in the next dimension. The projects were

Figure 1. Left: The teams are preparing for the game by discussing strategies that they think will fulfill their wishes for the city and their predefined mission. Right: The four teams are situated around the gaming table with the audience watching from behind.

divided into eight categories: *Healthcare/social services, education, housing, industry/trade, cultural affairs, infrastructure* and *tourism.*

The 2nd dimension of the project the Harbor Game took place as a public event in November 2002. 16 players representing four groups of interest were invited: Politicians, industry/trade, experts and citizens. Among them was the Mayor of Aarhus, town councilors, NGOs, cultural experts, students, consultants, and architects specializing in infrastructure and planning. The teams were given different missions to make sure that different project types like e.g. infrastructure and housing was represented in the game.

Following a short introduction the players had to collect four projects each in the exhibition areas, then return to their team and agree on only four projects all in all that they believed could be used to solve their mission (See Figure 1). Throughout the game the chosen projects were represented by gaming pieces named project markers.

Parallel to the discussions of the teams, the audience could cast their vote and indicate what area of the harbour they would like the players to focus on. The harbour was divided into 16 areas and represented on a 2x4 meters cartographic gaming table (See Figure 1). Every area on the table had a default value representing abstract indicates of land value, status in the district plan, percentage of exploitation etc. The area values were adjusted in accordance to the votes of the audience, in such a way that the most popular areas would be the most affordable to use. At the same time the players could earn more points by following different strategies:

- *Collaboration*
  – developing a given area in collaboration with another team
- *Scattering*
  – placing project markers from different categories in the same area
- *Gathering*
  – placing project markers from the same category in the same area
- *Support*
  – the teams could support each others projects by placing a special support marker
- *Mission*
  – fulfill the team's mission.

Each game was turn based – two games were played during the day – consisting of four rounds and each team had two turns on each round. The sessions were controlled by a Game Master who moderated the debate and made sure that an equal amount of time was given to each team. Each team also had an assistant – a second – who advised the team according to rules and strategies.

During each turn a team could:

- Place a project marker in a desired area. It was required that the teams had to argue as to what, where and why
- Negotiate with another team about supporting a project
- Move one of its own project or support markers

At the end of the game the audience could vote for the team they liked best or took best care of their individual interests. The audience was also given the opportunity to take part in the debate whenever they wanted by using a microphone. Finally the points were added up and the Game Master compared the votes of the audience with the points given by the game.

THE TECHNOLOGY OF THE GAME

A prerequisite for the utilization of the game in a planning context as well as a starting point for a debate considering the many possible futures of Aarhus Harbor was to create a tool that supported the gathering of complex data and at the same time gave the audience a worthwhile experience while inspiring the debate. To meet these demands we chose Augmented Reality (AR) as our technological basis.

AR has yet to be established as an imperturbable paradigm within the field of Human-Computer Interaction (HCI). During the last decade AR has originated and taken shape from various theories and practices. Among the more prominent progenitors is Marc Weiser's notion of Ubiquitous Computing (Weiser, 1991). The short version of Weiser's vision informs us that computers will merge with physical artifacts in a way that will allow us to interact with increasingly complex, but invisible machines, through familiar interfaces such as kitchen utensils. Noticeably Weiser defines Ubiquitous Computing as being in opposition to Virtual Reality (VR):

> *"Indeed, the opposition between the notion of virtual reality and ubiquitous, invisible computing is so strong that some of us use the term 'embodied virtuality' to refer to the process of drawing computers out of their electronic shells. The 'virtuality' of computer-readable data – all the different ways in which they can be altered, processed and analyzed – is brought into the physical world."*
>
> (Weiser, 1991)

Weiser's paper became the starting signal for a polemic about the boundaries of VR. This debate resulted in a special edition of Communications of the ACM entitled Computer Augmented Environments: Back to the Real World. In their paper, *Knowledge-based Augmented Reality*, Feiner, Macintyre, and Seligman portrayed a system called KARMA which used see-through head mounted displays (HMD) allowing the user to see digital information superimposed on the physical world:

> *" (…) a personalized (…) augmented reality whose user interface is not restricted to the displays and interaction devices embedded in the surrounding world or held in the user's hands."*
>
> (Feiner et al.,1993)

With this groundbreaking paper the foundation for AR as an independent field of inquiry had been laid. As indicated AR draws upon a multitude of theoretical approaches, diverse practices, digital tools and interactive systems and it would be too great a task to define even a fragment of the last research and development within in the field during the last decade. Consequently we will limit ourselves to a small plot of this vast terrain, i.e. AR based on pattern recognition and stake out a few claims within this area in relation to the Harbor Game.

CYBERCODE & PATTERN RECOGNITION

Jun Rekimoto, the head of Sony Computer Science Laboratories' Interaction Laboratory, has shown the way in various projects using pattern recognition as the basis for AR user interfaces. One of these projects is CyberCode, a tagging system which makes use of camera-based pattern recognition and a visual tagging system based on the principles of barcodes (Rekimoto & Ayatsuka, 2000). One of the advantages of 2D patterns such as barcodes is that they are printable and thus low-cost compared to e.g. wireless signals, chips, and other more technical means of tagging physical artefacts. One of the main benefits of augmenting reality using methods such as Rekimoto's CyberCode tags is that we are presented with the opportunity for manipulating digital data through physical artefacts. The other obvious gain of AR is that we are allowed to overlay important, enhancing information on the physical artefacts, e.g. text, 3D models etc.

> *"When the CyberCode system identifies a real-world object from the attached code, the corresponding 3D-annotation information is retrieved from a database. The estimated camera position is used to superimpose this information on the video image. The 3D annotation data is stored on the local server, and when the user first encounters a new CyberCode ID, the system automatically downloads the corresponding annotation information"*
>
> (Rekimoto & Ayatsuka, 2000)

Many aspects of the Harbor Game are similar to the techniques of CyberCodes. Like CyberCodes the Harbor Game allowed the introduction of digital 3D models into a physical context through camera-based pattern recognition using 2D, printed patterns attached to physical markers.

THE HARBOR GAME AND PATTERN RECOGNITION

As mentioned above the technical point of departure for the Harbor Game was a kind of AR inspired by Rekimoto's use of low-cost pattern recognition. Specifically we used the open-source software ARToolKit as a foundation for the software we used in the Harbor Game.

> *"ARtoolKit is a software library that can be used to calculate camera position and orientation relative to physical markers in real time. This enables the easy development of a wide range of augmented reality applications."*
>
> (Human Interface Technology Lab 2002)

With a modified version of ARToolKit developed by the project team and a basic web camera it is possible to recognize up to 50 unique patterns and define their position in a system of coordinates by comparing a pattern filmed in the physical world with a predefined set of patterns stored in the database. In the Harbor Game we used 48 unique patterns. 16 of these were used as area markers which contained information about the geography of the different sections of the harbor as represented on the large map we used as a gaming table (See Figure 2). Consequently we were able to determine the position of the remaining 32 project and support markers in relation to the geographical areas on the map.

Figure 2. Left: The gaming table a web camera and area markers. Right: Section of the gaming table with an augmented projection of the game in the background.

For instance if the blue team placed the project marker, *E040 biotech Harbour*, in the vicinity of the area marker for area 3 the software would recognize the team's project and know that it had been placed in the geographical area called Pier 3. If another team subsequently was invited to support the project by placing a support marker next to the project marker, the software would recognize that the blue team's project in the area had been supported by e.g. the yellow team.

In this rather simple way the physical markers and the gaming table was augmented with a set of digital information projected onto a big screen (See Figure 2). The advantage of this augmentation was that we were able to add an extra layer of information to the physical objects and allow this extra layer of information to be manipulated through the manipulation of the physical artefacts. At the same time the augmentation was an integral part of the game itself allowing us to keep score and in the post-play stages we were able to use the digital information gathered through the augmented markers as a basis for debate and evaluation of the teams' actions. This will be explained in further detail in the section 'The city in the computer'.

As part of the augmentation of the physical artifacts we used the pattern recognition to superimpose information on the physical markers. These were

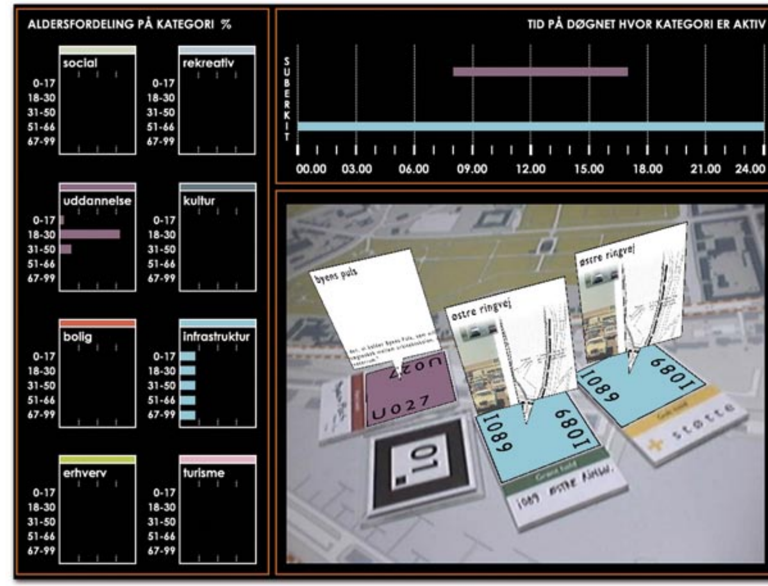

Figure 3. The screen displaying the video feed from the web camera and the superimposed augmentations, demographical representations (left) and the scale of activity (right top).

filmed and projected onto a screen placed in plain view of both players and audience. On the screen we projected a demographical representation of a given area and the projects placed in the area, as well as a scale of activity containing information about the level of activity of the project at certain times. We also used the screen to keep score at the end of each game. In the middle of the screen we projected the actual video feed with a section of the game board and the markers in the area with an overlay of digital information about the project in question (See Figure 3).

ARTOOLKIT AND MIXED REALITY

The team behind ARToolKit – the open source software used for the Harbor Game - is Mark Billinghurst and Hirokazu Kato from the Human Interface Technology Laboratory at University of Washington. Billinghurst and Kato put

ARToolKit in a context of Mixed Reality instead of AR, but still there are more than a few resemblances between their use of the technology and e.g. Rekimotos CyberCode and similar AR-tools.

The most significant difference is that Billinghurst and Kato focuses more on supporting real-time communication and collaboration, while Rekimoto's centre of attention is the augmentation of physical artifacts as containers for the storage of digital information to be called forth at a later time. Figure 4 shows how Billinghurst and Kato use 2D pattern recognition, which is augmented through the use of a HMD showing a videofeed apparently on top of the physical object. This is very similar to the technique used in the Harbor Game, but instead of HMD's we used a web camera and projected the augmented images on a large screen.

TANGIBLE BITS, PHICONS & GEOSPACE

As mentioned a significant aspect of AR is the inherent ability to manipulate

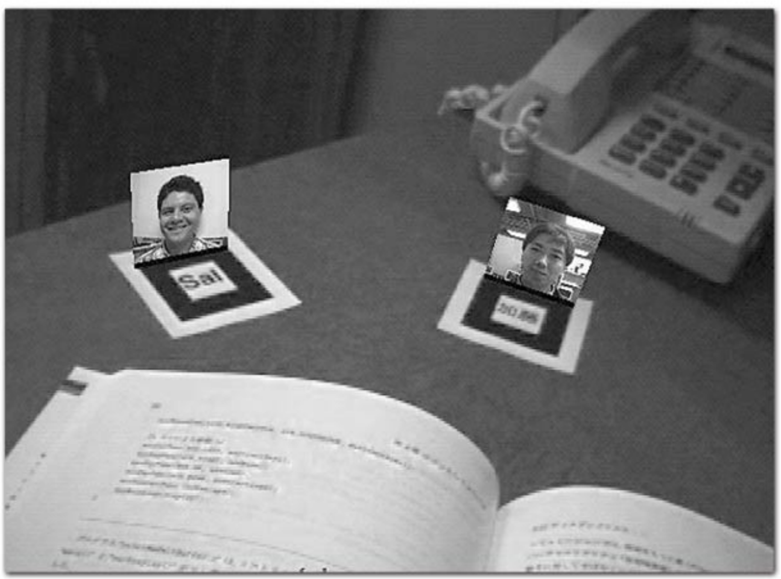

Figure 4. Billinghurst's & Kato's use of ARToolKit for mixed reality video conferencing.

digital information through physical artifacts. Actually this feature is covered more broadly within the field of Tangible Bits which borders and draws heavily upon traditions within classic interface research and design. The foundation here is the notion of Direct Manipulation (Shneiderman, 1997), which, incidentally, still is one of the most revered paradigms of HCI and commercial interaction design. The characteristics of Direct Manipulation are that interfaces based on this notion allow the user to work with and manipulate visually represented objects. The main traits of this kind of interfaces can be summarized as follows:

- Consistent representation of objects and actions through the use of meaningful metaphors
- Physical actions and manipulation of labeled artefacts as opposed to complex syntax
- Reversible operations with immediately visible results

This kind of interface is well-known from Windows and Macintosh – both systems are based on a sub-category of direct manipulation known as WIMP-interfaces (Windows, Icons, Menus and Pointing Devices) (See e.g. Oviatt, 1999). WIMP-interfaces have been challenged from various other approaches during the last decade and many of these also confront the classical notion of direct manipulation. But within the framework of AR, Tangible Bits tries to incorporate this approach as an integral part of Human-Computer interfacing. The concept of Tangible Bits is often accredited to Hiroshi Ishii, head of the Tangible Media Group at MIT Media Lab. In their paper, Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms Ishii and Ullmer describe the primary objective as the augmentation of physical artifacts with a specific focus on making the digital information tangible:

> *"'Tangible Bits' is an attempt to bridge the gap between cyberspace and the physical environment by making digital information (bits) tangible. We are developing ways to make bits accessible through the physical environment."*
>
> (Ishii & Ullmer 1997)


Figure 5. Ishii & Ullmer´s use of a phicon/tangible bit manipulating 2D graphical maps.

In the paper the authors describe a notion and an artifact called phicons – a compilation of the words physical and icons. These phicons are used as interfacing devices for manipulation of sections of a map of the MIT campus in the project Tangible Geospace (See Figure 5).

By combining physical objects and digital information a new class of Human-Computer interface is created based on or inspired by the classic notion of direct manipulation. The basic idea is in many ways similar to the traditional WIMP-interfaces, where any given icon represents something conceptually – and more often than not also visually – similar to the actual digital information e.g. a folder containing documents which can be dragged to the trashcan etc. Ishii & Ullmer also states that the likeness of the optical metaphor with the information the user is manipulation is the perhaps strongest argument for the application of Tangible Bits (Ibid.).

In a gaming context we recognize this seamless integration in e.g. Monopoly, moving a physical icon of a car, placing hotels and houses etc. Of course there is a major difference seeing that Monopoly – the board game at least – is not made digital yet and consequently we are not manipulating information in the same way as in Ishii & Ullmer's project, but nevertheless the principle is well known in this context.

THE OUTCOME

The output of the Harbor Game was a wide range of ideas and suggestions for the future use of the harbor areas, including proposals like houseboats for elderly, a multimedia library and the idea of a Rambla known from Barcelona.

The 3rd and last dimension of the project concerned the qualification and future use of the massive amounts of data from the 2nd dimension, the Harbor Game. During three months the project team developed methods and visualizations to handle the results of the game. The goal was to present the scenarios, results and understandings from the game at a public event as well as a contribution to future municipal planning processes. The presentation lasted two days and was defined by the following themes:

- *The city in the computer* – Interactive virtual scenarios and representations of the discussed areas
- *The computer in the city* – Interactive experiments using mixed reality techniques in a real-world context

THE CITY IN THE COMPUTER

The first day of the public event took place in Centre for Advanced Visualization and Interaction[1] (CAVI). CAVI was organized and furnished with different themes representing parts of the process.

Among the exhibited elements was the scenarios evolved through the Harbor Game. The scenarios were communicated by an interactive *Player* based on two

[1] CAVI, is a part of the University of Aarhus with activities within the fields of architecture, design, scientific visualization, art and culture [www.cavi.dk]

Figure 6. The setup showing the material from the 2nd dimension and the player.

Figure 7. The interface of the Player.

wall projections (See Figure 6):

- An interactive real time 3D-model of the entire gaming table
- A synchronized DVD-movie showing the players in action

The player was based on the recorded matrix of the markers from the Harbor Game. Relative time codes, marker ID, translation and rotation were recorded during the game and dumped as a text string. By using the ARToolKit framework it was possible to dynamically recreate the 3D-models from the Harbor Game.

An interface allowed the users to play both 3D-model and the synchronized DVD-movie, and to search for projects and arguments (See Figure 7). At the same time the users were allowed to navigate the 3D-model by orbiting a virtual camera. The camera could zoom in and out both to get an overview of the gaming table or to take a closer look at specific projects. Navigating through the negotiations and projects the users could bookmark events on a timeline referring to the extent of the game. If necessary this could be used to collect and compare information across time. The feature was also used to both skip sequences of no interest in relation to a specific subject and let the users try out more fragmented and anachronistically assembled arguments.

THE COMPUTER IN THE CITY

The second day of the event took place in the real context, the harbor area in Aarhus. 3D-models had been made to exemplify the outcome and consequences of the Harbor Game. Simplified models of buildings and constructions, which could be used as e.g. housing, industries or examples of infrastructures, had been prepared. The event was initiated in the information centre of the municipality

Figure 8. The scale model made by the municipality for discussing the plans in hearing.

where a 6m scale model of the harbor areas was exhibited. The model showed the official solution and was part of the public planning process of the municipal authorities (See Figure 8).

To follow up on the suggested projects and ideas from the Harbor Game a setup running ARToolKit was prepared. A presentation of the possibilities of the technology initiated a discussion with the visitors. By placing project markers in the physical scale model 3D-computer models were added. This resulted in a mixed reality output on a monitor giving a real time feedback to the discussion. Hereby the previously static model was turned into a dynamic framework for debate, in which the visitors could question the plans, and add or subtract the prepared ideas.

To place the 3D-computer model anywhere in the set of the physical model it was made possible to move, rotate and scale the augmented projects. In addition

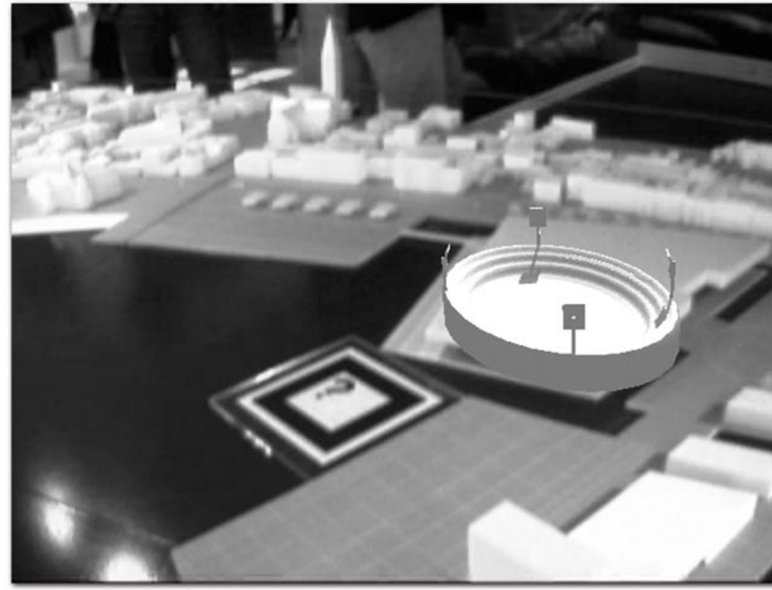

Figure 9. "I would like a stadium in the centre of the city!"

the marker could show more than one project. Attempting to visualize the consequences of the ongoing debate models was turned on and of, individually moved, rotated and scaled on all three axes (See Figure 9).

Afterwards the discussions continued outdoors. Portable setups made it possible to display and observe the consequences of the proposals in 1:1 mixed with the real-world context. Large markers were used to assure that the models could be seen from a distance.

Some markers were portable while another was a 10x10 meters, wall-mounted banner. As seen in Figure 10 the portable markers invited and engaged the visitors to physically move the markers and place the projects in a new and relevant context. These markers were used to discuss smaller proposals like houseboats etc. By adding 3D-computer models the large and fixed marker (Seen in Figure 11) allowed the visitors to discuss a specific larger area. Like the indoor version it was

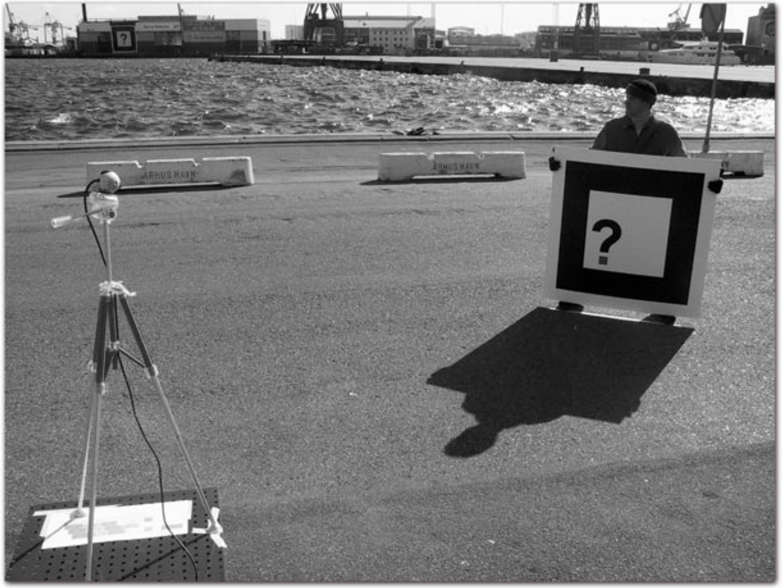

Figure 10. A portable marker used to demonstrate the possibility of easily moving and changing the visual consequences of a project.

possible to move, rotate and scale the added project individually. The experiment showed the importance and quality of having a shared representation and point of focus, but it also made clear difficulties in mixing real footage with more simple and abstract models visualizing open-ended ideas compared to fixed solutions. The 3D-models merged well with the scale model exhibited by the municipality but turned out to be in a too big contrast to the real world which promoted misunderstandings during the discussions based on the visual output on the portable monitors.

THE USE OF MIXED REALITY

One of the objectives of the project team was not to let the technology overshadow the issues at hand. The primary goal was the debate, and it almost went too well. This was shown by the fact that the big screen displaying the mixed

Figure 11. A 10x10 meters marker fixed in a central position of the discussed areas.

reality signal was used only occasionally. It might have been practical to have assigned the screen to a more prominent position, thus committing the players to use the additional information on the screen as a proactive input in the game.

The game showed a strong centre of attention on the physical gaming table and the game markers. The fact that the 3D possibilities of ARToolKit in the 2nd dimension of the project was only used for augmenting 2D signs of graphics related to the exhibited project, one could argue that other techniques might have been used. One way to go could be an installation setup like the previously mentioned Tangible Geospace project (Ishii & Ullmer, 1997) or The Luminous Table (Ben-Joseph et al., 2001) that could inspire alternative technical solutions. Even though the Luminous Table is more about simulating consequences and coherences than negotiation and debate in urban planning, the technical setup could inspire further iterations of the Harbor Game.

Another scenario could be to rethink the setup and use another type of tracking, RFID tags, 2D camera tracking from above or other positioning tools and then project and add information directly onto the gaming table and hereby emphasize the physical and palpable qualities of the game setup.

A third way could be to make a better use of the existing possibilities of ARToolKit by augmenting 3D-entities representing consequences of the ongoing discussions from the game and hereby let the intentions of the 3rd dimensions blend together with the Harbor Game, by being able to switch between the abstract game information and more illustrative 3-dimensional qualities that then could be used to aid the in-game debate.

A last improvement would be to emphasize the mixed reality qualities of the game by directing the players' and public's attention towards the projection that showed the action on the gaming table. The overview of the gaming table was not communicated well enough to the audience. The ARToolKit version (2.52, for Windows) was based on a feed from a web camera that consequently had to rely on a simple lens and low resolution, which resulted in difficulties of forming a general view of the entire table. Technically it is not realistic to think of an optical lens that can take in a 2x4m table in detail, but it could have been compensated by e.g. allowing the game master to switch between the live feed from the camera and a virtual camera – similar to the one described in conjunction with the interactive Player in the 3rd dimension – that could capture the whole gaming table as a virtual representation.

A TOOL FOR PLANNING?

There is no doubt that the technical problems can be solved in different ways. The fact that the audience in general did not engage and speak up during the Harbor Game is far more distressing for the project as a whole. Even though they had the necessarily technical and practical capabilities there seemed to be a lack of engagement and a gap between the active players and the more or less inactive audience.

The rules of and the interaction with the Harbor Game was more successful. The game facilitated a controlled but still lively debate between the teams. Even though the discussions seemed to work out well there were sometimes problems with the scale of realism. The fact that the game was a simplification of real world relations resulted in that the players once in a while tried to break out of the inherent constraints. E.g. the players were only allowed to place three projects in an area. This was made to encourage a spread of activities on the gaming table. But more than once this was experienced as a too tight a constraint and the teams tried to compensate by defining wide definitions of content of the project markers. There seem to be a dilemma according to the scale of realism: In closed forums with a high level of expertise and knowledge about urban planning, it could be useful to work with a higher level of realism, but in public processes trying to engage citizens in complex matters it can be necessary to work with even greater simplifications.

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ABSTRACT

This paper presents a case study based on an innovative collaborative, game-based approach to urban planning utilizing mixed and augmented reality techniques. Modern urban planning involves a wide variety of interests and individuals, consequently new methods and tools are needed to assure the active involvement of all parties in the planning process.

The Harbour Game is a debating game employing visual tracking and pattern recognition to superimpose information, e.g. three-dimensional models, text, and photos on physical artefacts facilitating the understanding of complex relations in urban planning. The paper discusses the Harbour Game as an innovative approach to urban planning and the technology used in the Harbour Game in relation to similar approaches.

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