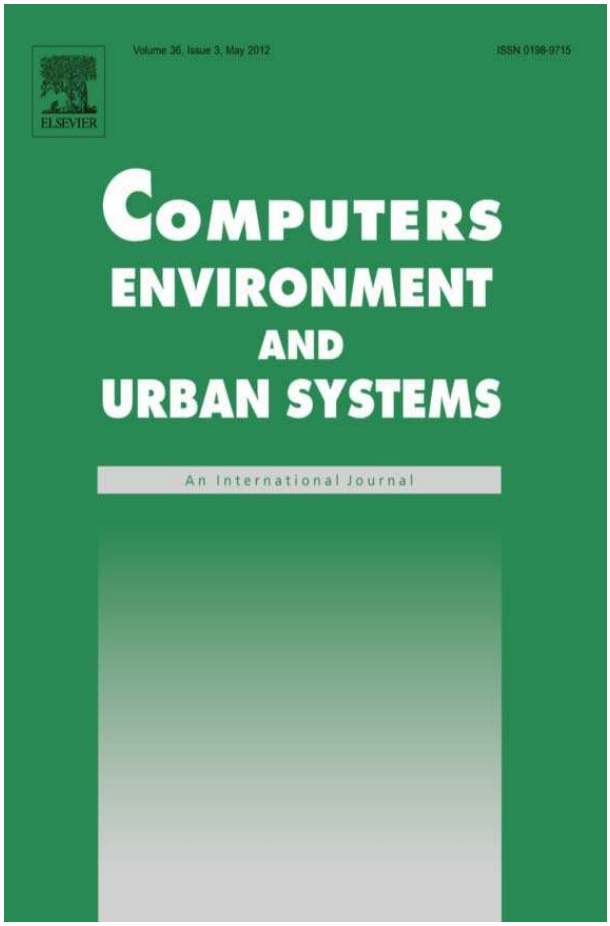

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Playful public participation in urban planning: A case study for online serious games

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ABSTRACT

The aim of this paper is to study the implementation of online games to encourage public participation in urban planning. Its theoretical foundations are based on previous work in public participatory geographical information systems (PP GISs), play and games, with a special focus on serious games. Serious games aim to support learning processes in a new, more playful way. We developed the concept of playful public participation in urban planning, including playful elements such as storytelling, walking and moving, sketching, drawing, and games. A group of students designed an online serious public participatory game entitled NextCampus. The case study used in NextCampus was taken from the real-world question of a possible move of a university campus to a new location in the city of Hamburg, Germany. The development of the serious public participatory game NextCampus resulted in a physical prototype, user interface design, and a computational model of the game. The NextCampus game was tested with the help of two groups of urban planning students and presented to three external experts who provided valuable recommendations for further development. The critical comments questioned the level of complexity involved in such games. The positive comments included recognition of the potential for joy and the playfulness a game like NextCampus could evoke.

1. Introduction

Public participatory online applications aim to attract citizens to discuss current issues related to their environment and to improve the process of public participation in general. An integration of geographic information systems (GISs) with public participatory tools represents one of the latest innovations in this area. Public participatory GIS (PP GIS) research (Al-Kodmany, 1999, 2001; Carver, 2001a, 2001b; Craig, Harris, & Weiner, 2002; Kingston, 2007; Kingston, Carver, Evans, & Turton, 1999; Kingston, Carver, Evans, & Turton, 2000; Rinner, 1999, 2005, 2006; Sieber, 2003) discusses ways of integrating the new applications into participatory processes and considers which new functionalities and technical characteristics could offer the most benefit to users. In the past, these technologies and other map-based applications were frequently criticized as being too complex for the majority of potential users (Steinmann, Krek, & Blaschke, 2004). New forms of collaboration and technical solutions emerged during the Web 2.0 era. For example, Google Maps and Google Earth can be used by lay users and non-experts without intense training. Recent research on collaborative mapping also known as "geography without geographers" (Sui, 2008, p. 4), "volunteered geographical information" (Goodchild, 2007), "neogeography" (Turner, 2006), or "naive geography" (Egenhofer & Mark, 1995), expands the notion of the "public" from prior work in PP GIS to include much wider, distributed participation (Hardy, 2008).

Despite these new forms of collaboration and innovative technologies, Moody (2007) demonstrates that the use of GIS technology to involve citizens in participatory urban planning does not seem to empower citizens. An important factor in such findings was described by Krek (2005), who observed that many citizens are "rationally ignorant". The theory of rational ignorance has also been presented in public choice theory (Buchanan & Gordon, 1962; Gunning, 2002). Krek (2005) applied it to public participation in urban planning. According to the rational ignorance condition, citizens decide to be rational, ignoring, for example, an urban planning participatory process because participation would require a high investment of time and effort to ascertain the current planning situation. The question is still relevant: how can we overcome these significant barriers to public participation and attract additional citizens to participate?

The aim of this paper is to study the implementation of serious games to encourage online public participation in urban planning. This is a novel research field in which we integrate spatial representations that are close to reality within the concept of the game. Spatial representation includes geo-referenced maps or 3D representations. We focus on online serious games in the field of urban and regional planning to potentially bring playfulness and pleasure to the serious processes of urban planning decisions with public participation. With its inherent elements of collaboration, competition, reward and fun, game play adds additional motivational

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factors that could entice people to participate in urban planning processes. In addition to elements of play, it offers conventional factors, such as incentives (money, gifts, and vouchers), self-interest, and altruism. Our research is based on the assumption that playfulness and games can potentially address the issue of rational ignorance by attracting more people to participate in and learn about urban planning situations. Their participation might provide valuable input for the urban planners and will hopefully result in new insights into urban planning.

In this paper, we describe the design of an online game that concentrates on the possible move of a university campus from its current location to a new one. This topic is based on a real-life situation in the city of Hamburg, Germany. Initial public discussions of possible options began in 2008. Politicians and urban planners developed several solutions for the possible move of the university campus, which needed to be discussed with the citizens of Hamburg. The public discussions related to this issue motivated a group of students to develop the prototype of an online public participatory game titled NextCampus. This serious game was designed as a research experiment. It included a physical prototype of the game, a design of the user interface for the online application and the computational model of the game. It was finally tested with the help of urban planning students and evaluated by external experts. In the research presented in this article, we focus on the design and development of a serious game for online public participatory planning processes. It is test-executed with the help of the physical and computational prototype.

The article is organized as follows: in Section 2 we review the relevant literature on public participatory geographic information systems (PP GISs) and introduce playful elements such as storytelling, walking and moving, drawing and sketching. In Section 3, we introduce the concepts of play and games with a focus on serious games. In Section 4, we demonstrate the game design of the physical prototype, the user interface design and the computational prototype of the serious game titled NextCampus. Section 5 summarizes the executed tests of the NextCampus game, questions and comments by local experts, and the test results. Conclusions and further research in this area are presented in Section 6.

2. Literature review

2.1. Public participatory geographic information systems

Despite interesting technical developments, including the integration of GIS, multimedia, and argumentation maps (Rinner, 2001) into participatory processes, we have not observed increased citizen participation in community planning. A number of authors have contributed to the new field of public participatory geographic information systems, including, but not limited to (Pickles, 1995; Schroeder, 1996; Al-Kodmany, 1999, 2001; Kingston et al., 1999, 2000; Carver, 2001a, 2001b; Craig et al., 2002; Haklay & Tobón, 2003; Jankowski & Nyerges, 2001; Kingston, 2007; Sieber, 2003). Rinner (1999) introduced the concept of argumentation maps, which link public participatory comments with a map and model them as objects in a database. The background is provided by argumentation models as a way of structuring the dialog in the planning process. In the 1990s, research on PP GIS concentrated on the technical architectures, functionalities and capabilities of the various applications (Steinmann et al., 2004). Technical improvements are important, but they are not the only factor influencing the use of these applications and their successful implementation in participatory processes. "Simply making a GIS available on the Internet does not constitute an effective participatory decision support solution. The GIS-based tools itself cannot encourage higher public participation in planning since GIS software and spatial data are expensive and require substantial investment in learning how to use them" (Krek, 2008). Recently, researchers recognized that "people are central in PP GIS research" (Georgiadou & Stoter, 2010) and that there is a need to access computer-based applications and information infrastructures from the user's point of view (Schlossberg, & Shuford, 2005; Nedović-Budić, Pinto, & Budhathoki, 2008; van Loenen, Crompovets, & Poplin, 2010; Poplin, 2010). The integration and inclusion of people, or citizens, is crucial to urban planning and other participatory processes.

New methods and technical possibilities for online public participation require the re-thinking or "reengineering" (Hammer, 1990; Hammer & Champy, 1993; Hammer & Stanton, 1995) of current participatory processes in urban planning. We propose a variety of elements that could be included in the concept of playful public participation (PPP) or participation encouraged or enhanced by play and joy (Krek, 2008). These elements include online storytelling, walking, moving, sketching, drawing and games.

2.2. Storytelling

Story is a basic principle of the mind's perceptual organization with a long cultural tradition. According to Turner (1994), most of our experience, knowledge, and thinking is organized as stories. The mental scope of a story is magnified by the functions of association and projection; one story helps us make sense of another. "The projection of one story onto another, as in a parable, is a basic cognitive principle" (Turner, 1994) that appears everywhere from simple actions to complex literary creations. Storytelling has its origins in ancient times, when images, symbols, words and improvisation were used to share stories, myths and legends. Traditionally, oral stories were passed from generation to generation, surviving solely through memory. Sharing knowledge and ideas in the form of stories can be used as an innovative approach to playful public participation. Telling citizens a story or asking them for their stories provides a form of communication and exchange. In the case of participatory urban planning, access to planning information is not "through reports and documents, but may have to be gained through oral histories, story-telling and poetry" (Odendaal, 2006).

The term 'digital storytelling' has been often used to describe the uses of new media for creating new or innovative narrative forms, as exemplified by hypertext fiction and game narratives (Johnson-Laird, 1993; Klaebe & Burgess, 2008; Klaebe & Marcus, 2007; Lambert, 2006). Digital storytelling is part of the broader new media landscape in which new technologies of communication, such as the Internet or location based services (Paay et al., 2008; Schroeter & Foth, 2009), are altering both the form and the content possible for historical discourse "with the processes of transmission arguably becoming less conventionally narrative-based and instead more visual and individuated" (Klaebe & Burgess, 2008). Allan (2004) suggests that "the Internet, videos, and CDs generate representational practices that are increasingly visual and offer an appealing alternative to non-visual, narrative-based historical discourse".

Games usually include stories, which entertain, educate and attract people (Krek, 2008; Poplin, 2011). Computer games and virtual reality build upon a foundation of sophisticated multimedia and Web 2.0 storytelling (Bryan & Alan, 2008), including voice, music, or 3D visualizations (Mallan et al., 2010). Each of these options offers new technical possibilities for representation.

2.3. Walking and moving

Walking and moving can be performed physically or in a computer-based environment. In the physical world, this concept was introduced by Rottenbacher (Rottenbacher, 2004a, 2004b), who gathers groups of people living in a certain area and unites them

in a municipal project. They meet in a municipality building or another part of the village or city, where they are briefly introduced to the issues that need to be discussed. After this introduction, they walk together through the planning environment. The joint activity becomes a "walk and talk" in which citizens can exchange opinions, feelings about the plan, and communicate with planning experts and other attendees. This approach results in people getting to know each other's motivations through interactions, and learning about the current and potential planning situations.

This idea can be implemented in online applications as well, introducing elements of movement, walk, communication and other forms of play. Virtual tours are entertaining and can be educational. Elements of movement in virtual environments bring with them challenges related to the diverse mental maps and different visions for future change in the heterogeneous group involved in the process. Tensions between the individual vs. group interest can arise, but while engaged in the playful, pleasant activities of walking and communicating, these tensions can become a collaborative contribution to the plan, offering valuable input to the planners in charge.

2.4. Sketching and drawing

Sketching seems particularly well-suited to capturing objects and situations in a spatial environment, such as geographic space. Among other researchers (Blaser, 1997; Blaser & Egenhofer, 2000; Egenhofer, 1996; Egenhofer & Mark, 1995; Vajjhala, 2005), Blaser (2001) studied the techniques and strategies people use when sketching. The study showed that paper and pencil sketches contain primarily simple and abstract objects composed of only a few strokes. The spatial configuration of a scene is primarily expressed through the topological ordering of objects relative to one another. Metric relationships are used to refine spatial configurations. These and other findings suggest that sketching is an appropriate modality of interaction with a computer when one wants to describe and capture object configurations within a spatial environment, such as a geographic information system.

Modern technologies explore the possibilities of drawing online. If designed in an attractive way, drawing and sketching can be valuable tools of expression, constituting another possible element of "playful public participation" (Krek, 2008). Sketching and drawing can be playful activities, and public participation activities can use free-style drawings in the initial, motivational phase. Drawing is often used as a method of expressing new ideas and visions. One implementation of this idea can be found in a drawing game called Urbis' Create Your Own SuperCity (SuperCity, 2010). Besides drawings, it includes other activities, such as exhibitions of unique insights into the culture of the modern city, in this case focusing on an expanded London of the future and including explorations of design, architecture, graffiti, music and the urban environment. Geo-referenced drawings can be attached to a digital map and presented within a Web-based public participatory application. Drettakis, Roussou, Reche, and Tsingos (2007) demonstrates the usability of the integration of geo-referenced drawings into a real-world virtual environment (VE), claiming that "they respectively enable better appreciation of overall ambience of the VE, perception of space and physical objects as well as the sense of scale".

3. Theoretical framework: concepts of play and games

3.1. Play as a central element

Psychological and anthropological studies of play have resulted in a range of definitions. Huizinga (1955) defines play as a free activity. Gilmore (1971) states that "play refers to those activities which are accompanied by a state of comparative pleasure, exhilaration, power, and the feeling of self-initiative". Piaget (1962) believes that play has two primary features: it is done "for the pleasure of the activity, something that Huizinga ignores, and without any effort at adaptation to achieve a definite end". He believes the attitude of the child is the indicator of whether or not the child is playing and seeks to distinguish between "efforts to learn" and those activities that are "only a happy display of known actions". Caillois (2001) defines it as "a free, uncertain, unproductive activity". This lack of productivity, sometimes also called "inefficiency" (Suits, 1990), reflects the lack of desire to win, earn money, or gain goods. It is simply play.

The English language makes a distinction between *game* and *play*. This is not the case in all languages. For example, in German there is only one word, "spielen", which describes both concepts. "Playing a game" is translated into "man spielt ein Spiel". The same is found in the Slovene language, translating the phrase into "igrati igro". The distinction made by the English language offers an advantage in understanding the differences between the elements of this intriguing relationship. This distinction makes sense for the approach presented in this article. We consider play a broader concept than a game. A game is a subset of play, and the activity of play is at the same time a subset of every game.

3.2. Definitions of a game

The word "game" is used to describe many different activities. Parlett (1999) claims it is not worth insisting on any of the proposed definitions. Definitions vary from author to author, depending on the author's particular focus and point of view.

"Reduced to its formal essence, a game is an activity among two or more independent decision-makers seeking to achieve their objectives in some limiting context. A more conventional definition would say that a game is a context with rules among adversaries trying to win objectives" (Abt, 1970). Costikyan (2002) defines a game as "a form of art in which participants, termed players, make decisions to manage resources through game tokens in the pursuit of a goal. One of the most interesting components of these two definitions is the acknowledgement that a game is an activity in which players make decisions". Suits (1990, p. 48) offers the following definition: "To play a game is to engage in activity directed towards bringing about a specific state of affairs, using only means permitted by rules, when the rules prohibit more efficient in favor of less efficient means, and where such rules are accepted just because they make possible such activity".

A game can also be considered as a system. A system is a set of elements that affect one another within an environment to form a larger pattern that is different from any of the individual parts (Littlejohn, 1989; von Bertalanffy, 1968). Littlejohn (1989) defines the following parts of the system:

- Objects, which are the parts, elements, or variables within the system.
- Attributes, which constitute the properties of the objects.
- Relationships among the objects.
- Environment, in which the objects and their properties exist and interact.

We can demonstrate these concepts using the game of chess as an example. The objects in chess are the figures on the board and the board itself. The attributes are the characteristics we associate with the figures: for example, the figure of a knight, sometimes represented by a horse, which can move on the board in a very specific way. The relationships are the actual positions of the figures

on the board and their relationships, which change while playing the game. A knight at a certain position on the board might threaten one or several of the competing player's game pieces. The environment in this case could be either the board (if not included among the objects) or the play of the game itself. This structure of the game as a system can be applied to different games.

3.3. Examples of games

A variety of different games exist. It is almost impossible to discuss all possible examples, but we will describe some of them in this subsection to elucidate their basic characteristics and the main differences among them.

- *Non-digital and digital games*: Non-digital or traditional games do not use computers or other electronic devices in the creation of a game environment. Digital games do involve computers and other electronic devices in the creation of the game environment.
- *Autonomous games*: are games that do not require active human participation in order to function. An example of an autonomous game would be two robots playing chess without the interaction of a human player. See, for example, Bailey, Mercer, and Plaw (2004).
- *Ubiquitous games*: This expression emerges from ubiquitous computing. Weiser (1993) suggested the following three characteristics for ubiquitous computing: invisible, calm, and connected. Applying these principles to games has resulted in the development of so-called ubiquitous games. A fascinating example is the game Can You See Me Now (Benford et al., 2006), which is played simultaneously on the street using GPS devices and online on the computer. Another example is Pac-Manhattan, which is a large-scale urban game. The main players of the game are Pac-Man and four players dressed as the ghosts Inky, Blinky, Pinky and Clyde, who run around the Washington Square Park area of Manhattan. Each player on the street is teamed with a controller in the control room. "Using cell-phone contact, Wi-Fi internet connections, and custom software, Pac-Man and the ghosts can be tracked from a central location and their progress will be broadcast over the internet for viewers from around the world" (Pac-Manhattan, 2010).
- *Non-competitive games*: These games shift the focus away from winning and more toward the fun of playing and win–win relationships. They encourage playfulness and often cooperation. One example is a game called Circle Stories in which children create a story together. One child offers an opening sentence, and one by one, each child adds a line to build the story, which makes its rounds through the group as many times as needed (NonCompete, 2010).

3.4. Serious games

The term "serious games" refers to games designed to do more than just entertain (Michael & Chen, 2005). Zyda (2005) provides the following definition: serious games are "a mental contest, played with a computer in accordance with specific rules that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives". Serious games are often designed as virtual environments explicitly intended to educate or train. Two key features of serious games are their educative and immersive qualities.

In training settings in which learners need to acquire a skill or competence, games provide extensive opportunities for drills and practice. The players, or learners, of the game master skills and information through repetitive practice (Mitchell & Savill-Smith, 2001). One example of an educative game environment is SCAPE (Sustainability, Community and Planning Education), which was developed for secondary schools. It is a simulation focused on the principles of urban sustainability. The game offers a learning experience based on creating and imagining a future for an urban area (Podleschny, 2008; Polson & Morgan, 2010). The virtual micro-worlds of games allow educators to create learning activities that may be too dangerous or too costly to replicate in the classroom (Kirriemuir, 2003). For example, in a gaming environment, students can blow circuits, mix lethal chemicals or make mistakes in a surgical procedure without killing a real-life patient. Therefore, gaming affords new opportunities for learning that are not available in traditional media.

Casual games are typically not viewed as educational, but they can be immersive. Players may experience immersion within a virtual world through features such as interactive stories, which provide context and clear goal structures for problem solving in the game environment. Researchers have noted that common features of all intrinsically motivating environments include challenge, control, and fantasy to pique curiosity and engage attention (Lepper & Malone, 1987; Malone, 1981; Reiber, 1996). One example of an immersive game is Blossom Entrepreneurship, a serious game created by Micro-Enterprise Acceleration Institute (MEA-I), a not-for-profit organization sponsored mainly by Hewlett–Packard. Blossom is a management and role-playing game in which the player manages and develops a business through smart use of technology (Blossom, 2010).

The main strengths of serious gaming applications may be generalized as belonging to the areas of communication, visual expression of information, collaboration mechanisms, interactivity and entertainment (Anderson et al., 2009; Salen and Zimmerman, 2004). Examples include games used in military applications and training (Squire, 2006; Squire, Giovanetto, Devane, & Durga, 2005; Squire & Jenkins, 2003), health care, cultural heritage (Anderson et al., 2009), policy and management issues, urban planning and public participation (Krek, 2008; Poplin, 2011), and change management. Play, an important contributor to human development, maturation, and learning, is a main ingredient of serious games.

4. Case study: a serious game for public participation

To test the concept of a serious game and its applicability and usability in a public participatory process, a group of students (Kulus, Prill, & Wagner, 2009) designed a playful serious game, NextCampus, under my supervision. The game was related to a specific case study taken from discussions started in 2008 in the city of Hamburg, Germany. This real-world situation requires public participation.

4.1. Urban planning situation

The game NextCampus focuses on the topical issue of the location of the campus of the University of Hamburg. The current campus is located close to the railway station Dammtor (Fig. 1), partially in the city district of Eimsbuettel and partially in the neighboring district of Rotherbaum. Both locations are attractive and close to the downtown area of the city and beautiful Lake Alster. They are surrounded by many small businesses, restaurants, bars and cafes serving the needs of the student population living and studying in this area.

The university buildings at the current location need serious renovation to enable the university to develop and prosper in the future. This is one of the main reasons for a possible move of the university campus to a new location, as stated by the Public Authority for Science (2008). A working group developed the following four possible scenarios for the solution of the problem

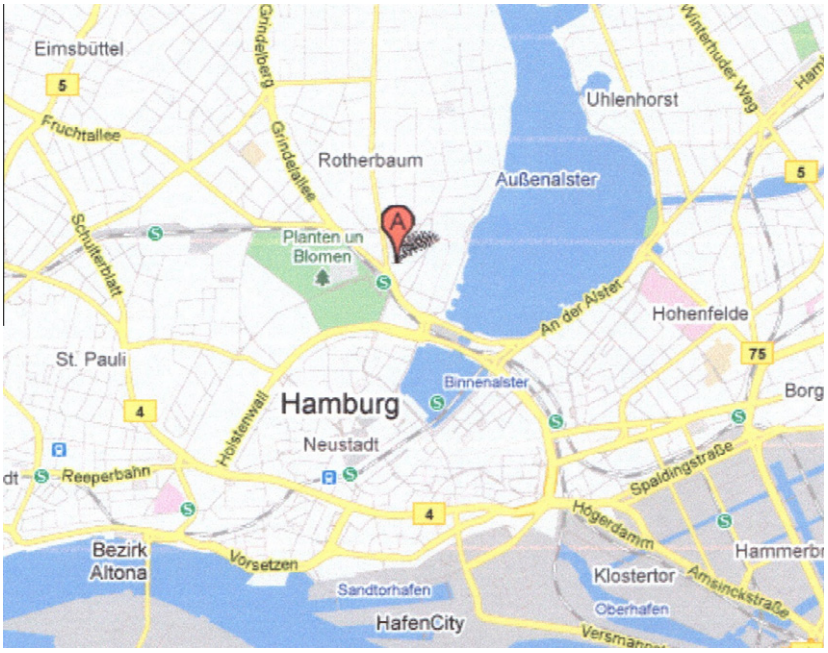


Fig. 1. Current location of the university (©2010 Google, ©2010 Tele Atlas).

which included renovation of the buildings at the current location; demolition and new construction of some buildings at the current location, partial relocation to the new site or complete relocation to the new site. These four scenarios were analyzed by the responsible stakeholders according to the urban development guidelines, renovation and construction costs, overall budget, and the available lots for new buildings at the selected locations. The results of this analysis and the comments of the involved stakeholders were summarized in a study.

In the next phase of the decision-making process, the current situation needed to be discussed in an open dialog between the urban planners, government, and citizens of Hamburg. The city government and the TuTech Inovation Institute developed an online discussion forum (http://www.zukunft-uni.hamburg.de/), which enabled the citizens to express their opinions on the suggested topics. The forum was text-based and did not include any map-based or multimedia representations of the four possible scenarios. To support this dialog, we developed a concept and the prototype of an online serious game entitled NextCampus. The main goal of the online game was to present and describe the current situation to the citizens and stakeholders and to demonstrate the consequences of the selected decisions for the involved parties.

4.2. Elements of the game

The main elements of the NextCampus game are the environment of the game, the objects included in the game, the goals, the rules of the game, and the player.

4.2.1. Environment

The game environment concentrates on the current location of the university close to the downtown area of Rotherbaum (Fig. 1) and the new proposed location in Kleiner Grassbrook (Fig. 2). The game includes only these two locations.

4.2.2. Objects

The objects in the NextCampus game include university buildings, stakeholders, their moods and satisfaction levels and unpredictable events. The university buildings in the game model the situation as it is found in the real world. The details of the buildings used in the game are the result of thorough research performed for the game design; the game uses the latest information about these objects. The stakeholders are the students, university employees, small businesses, and local inhabitants. Their moods and satisfaction levels are represented in a playful way with emoticons. They are measured on a scale between 0% and 100% satisfaction. The unpredictable events are automatically activated by the game and include petitions and protests from small businesses, university administration protests, student protests, student occupation of buildings, citizen protests, donations 1–3.

4.2.3. Goals

The main goal of the NextCampus game is to find the most satisfactory urban planning solution for the university campus. Translated into the language of the NextCampus game, this means keeping the stakeholders' satisfaction levels above 50% and maintaining a high available budget. One important goal is to educate players about the current situation of the university campus buildings and the possible consequences of a variety of actions measured by money spent or gained.

4.2.4. Rules

The rules of the game define how the NextCampus game can be played. The player starts with a budget of 150,000,000 money units and the mood and satisfaction levels of the stakeholders set at neutral. Every decision made by a player has an impact on the overall budget and the stakeholders' satisfaction. The consequences are calculated within the computational model of the game. The player can play the game, aiming to satisfy the stakeholders, as long as she still has some money available. The winner is the player who retains the highest available budget and achieves the highest level of the stakeholders' satisfaction.

4.2.5. Player

The game is designed for one individual player. There is no interaction with other players; however, the combined views of many players/participants can be collected by the urban planners. The player can interact with the game environment and use it in a

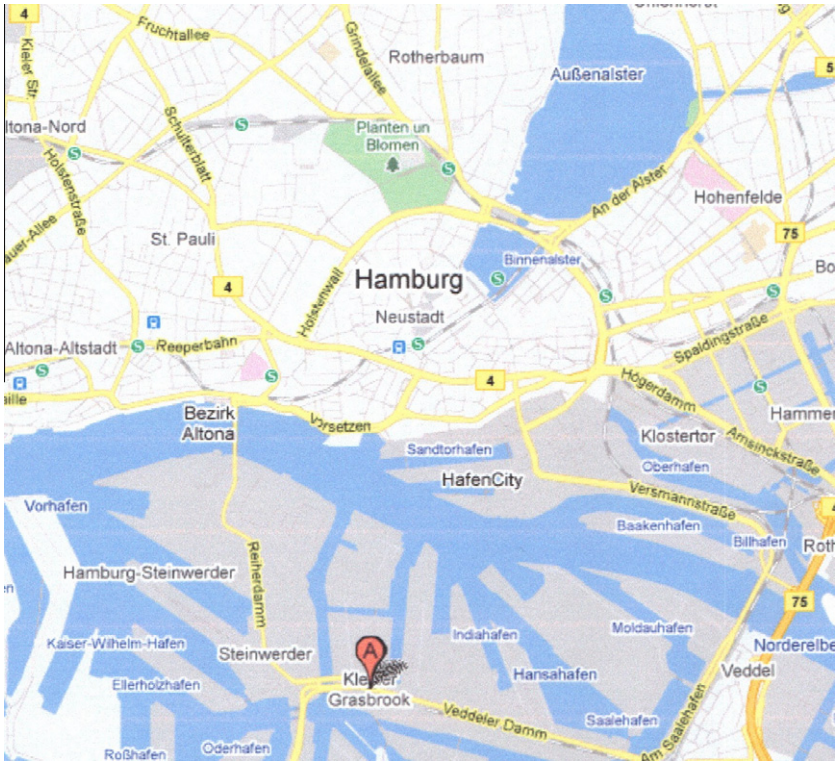


Fig. 2. Proposed location of the university (©2010 Google, ©2010 Tele Atlas).

dynamic way; she can learn about the buildings and their functions and obtain historical information about the buildings and the current number of students and university staff.

Fig. 3 shows the flow of play and the decisions available to be made by the player. The player can first request information about the buildings, their functions and the number of students and employees. The player then chooses a strategy for play and can go directly to the strategy and start playing if she feels comfortable with the level of information about the buildings she already has or if she just wants to play for fun. She can choose from the following strategies: partial relocation of use, renovation, sell, or demolish.

Partial relocation of use at the existing location means that certain functionalities of the current building can be moved to a new building. For example, the library can be moved to another building on the same campus. Partial relocation of use to the new location means that a new building has to be built at the new location in Kleiner Grasbrook. Renovation means renovating the existing buildings at the current location. Renovation can be inexpensive (A), expensive (B), or very expensive (C). Choosing the sell options means selling the building, resulting in a new purpose and use for the building. The demolition option means demolishing the building; the newly available parcel becomes a property that can possibly be occupied by another building.

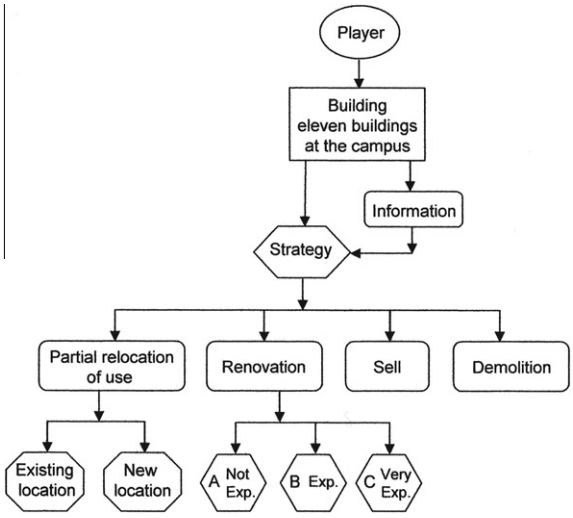


Fig. 3. The player's strategies.

4.3. Physical model of the game

The NextCampus game was designed through an interactive process. After the first sketches were made, we decided to design the game prototype. Three master students of urban planning implemented the model of the game and described it in a report (Kulus, Prill, & Wagner, 2009). The model of the game consists of the physical prototype of the game (Fig. 4), the user interface design (Fig. 5), and a digital simulation of the tasks executed by the computer.

The physical prototype consists of the following items:

- A map of the main playground or "Campus" with flexible lots for the buildings.
- Two game plans.
- One game plan of the new location at Kleiner Grasbrook.
- Eleven models of the buildings made of Styrofoam.
- Eleven cards describing the buildings and their status.
- Eleven flags for the status of the buildings: (a) unoccupied; (b) renovated; (c) sold.
- Eight experience cards with the descriptions of possible events: (a) a patron appears; (b) protests by small businesses; c. small businesses plan a petition; etc.

Fig. 4. Physical prototype of NextCampus game.

- One pool of buildings for the storage of the main function into the city portfolio.
- Five emotions, in the form of emoticons, for the visualization of the different moods or satisfaction levels of the stakeholders.
- Design of the user interface for the online NextCampus game.

The physical prototype of the game represented the first step in the development of the online game. It was combined with the computational model, which was executed in a computer environment. Along with the physical prototype presented in this article, a web design of the user interface was developed. Fig. 5 gives an impression of one of the main pages of the online prototype of the NextCamupus game. The user interface design was created through an interactive process within the student project group and has not yet been tested for usability.

4.4. Computational model of the game

The computational model of the NextCampus game consists of a PowerPoint presentation with an auditory and digital introduction to the game, eleven Excel spreadsheets for eleven different university buildings, one Excel spreadsheet for the calculation of the events, one Excel spreadsheet for the calculation of the budget, and one Excel spreadsheet for the calculation of the stakeholders' satisfaction levels.

- *PowerPoint presentation*: with auditory and digital introduction to the game The PowerPoint presentation introduces the current situation at the university campus and the general economic situation in Hamburg. It provides a dramatic opening for the game and aims to motivate the player to start playing the NextCampus game.
- *Building tables*: Eleven Excel spreadsheets for eleven different university buildings.

The Excel spreadsheets for the eleven different university buildings include information about the strategies available, strategies played and the cost or benefit of each strategy. The structure of these tables is the same for all eleven buildings.

Table 1 shows an example of the Faculty 2 building located at Allendeplatz 2. The first two columns, A and B, include descriptions of the strategies that can be selected by the player, as follows: partial relocation of the use on the existing or new location; renovation, which can be inexpensive (A), expensive (B), or very expensive (C); and sale or demolition of the building. Columns C through G present the moods or satisfaction levels of the involved stakeholders, including the students (S; column C), lecturers (L; column D), small businesses (SB; column E) in the city district Rotherbaum at the university campus, inhabitants (I; column F) of the district of Rotherbaum, and the university administration

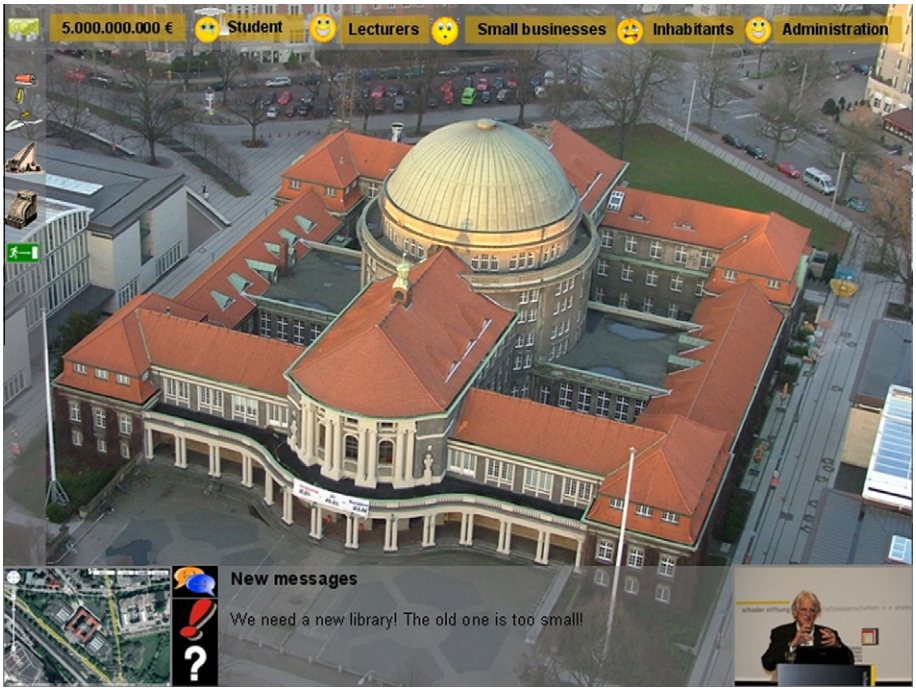


Fig. 5. Design of the user interface of the NextCampus game.

Table 1
Example information for faculty building 2.

A Faculty 2 Allendeplatz	B	C MoodS	D MoodL	E MoodSB	F Mood I	G Mood UD	H Play	I Costs or benefits (Money unit)
Partial relocation of the use	Existing location	−3	−3	−5	−2	−2		−150,000
	New location	3	3	−6	−2	3	x	−9000,000
Renovation	A	2	2	2	2	−3		−500,000
	B	3	3	2	2	2		−3000,000
	C	5	5	2	2	2		−5000,000
Sell		−3	−3	−3	−3	0	x	+15,000,000
Demolition		−4	−4	−5	−2	−2		−10,000,000

(UD; column G). These moods are indicated with numbers ranging from +10, meaning very satisfied with the situation, to −10, meaning very unsatisfied, with 0 representing neutral. Column H (Play) indicates the strategies selected by the players during the game play, which are indicated by x. In this sample case, the player played the option of a partial relocation of the building's use into the buildings at the new location at Kleiner Grasbrook and decided on the option of selling the building.

Table 1 demonstrates the changes in the moods of the stakeholders depending on the selected strategy. The changes are described with a number of points ranging between −10 and +10. The model was simplified, with a focus on the mood of the small businesses; only small businesses at the current location of the campus were considered in the model. The situation at the new location is related to a variety of possible consequences, which are difficult to predict. The model simplifies its estimation of the mood and satisfaction of the currently known small businesses at the current location. The numbers in the eleven building tables were prepared in advance and are fixed in the system. They result, in part, from a preliminary study of the stakeholders' interests and partially from the game designer's group assumptions. These numbers are visible to the player so that she can choose her strategy based on the consequences presented in the building tables.

For example, in this case, the strategy of partial relocation would result in -6 points for the small businesses in the district of Rotherbaum, where the current university is located; obviously, they would lose many of their student customers. In addition, the inhabitants of the district would feel the absence of the vibrant student life, resulting in a mood and satisfaction level of −2 points. The moods of the students, lecturers and the university administration will achieve a level of three points. Column *K* indicates the costs and the benefits of the selected choices allocated to the strategy; partial relocation of the Faculty 2 building, for example, costs −150,000 money units, while selling the building will add a benefit of +15,000,000.

- *Unpredictable events table*: One Excel spreadsheet for the calculation of unpredictable events.

The Excel spreadsheet of unpredictable events lists all possible events and their associated costs or benefits. Unpredictable events can cost the following sums of money units: protests from small businesses can cost 20,000 or 25,000; petitions from small business can cost either 20,000 or 1000,000; protests from the administration can cost either 20,000 or 50,000; protests from the students can cost 80,000 or 3000,000; student occupation of the building can cost 40,000 or 1000,000; and protests from the citizens can cost 40,000 or 500,000. The benefits include three possible donations: donation 1 of 20,000, donation 2 of 100,000, and donation 3 of 250,000.

- *Budget table* : One Excel spreadsheet for the calculation of the budget.

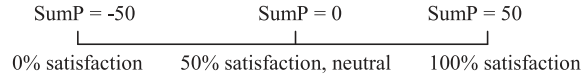
The computational model of the NextCampus game calculates the game budget using data from the eleven building tables and the table of unpredictable events. This is the budget available to the player during the game. The budget calculation is performed as follows:

$$\text{Budget} = \text{Starting budget} + \text{Donations} + \text{Costs or benefits of strategies}$$

The computational model registers every strategy played and summarizes the results of the different strategies played by one player. The budget calculation includes only strategies played by the player marked with "x" in the building tables, adding the consequences of unpredictable events from the unpredictable events table, also indicated with "x". The player's starting budget is 150,000,000 money units.

- *Stakeholders' moods table*: One Excel spreadsheet for the calculation of the stakeholders' moods.

The stakeholders' moods are calculated with the help of the points written in the eleven building tables and in the table of unpredictable events. These tables indicate the number of points gained or lost when a certain strategy is selected. They are specified for every stakeholder and every possible strategy. The points can be negative in case of unhappiness or dissatisfaction with the strategy or positive in case of happiness or satisfaction related to the strategy. The computational model of the NextCampus game summarizes all the points (SumP) gathered for each stakeholder separately. The calculation of the stakeholders' moods is performed in the following way:



If SumP = 0, the stakeholders are neutral and can be described as 50% satisfied. If SumP is higher than or equal to 50, they are 100% satisfied and very happy. If SumP is −50 or higher, they are 0% satisfied. The number 50 was selected by the game designers and resulted from numerous internal tests within the designer group and external tests with students and professors.

Fig. 6 illustrates the computational model of the NextCampus game and demonstrates the impact of the selected strategy and unpredictable events on the budget available to the player and the satisfaction moods of the involved stakeholders.

5. Experiments and testing: preliminary results

5.1. Testing the prototype of the NextCampus game

The first test phase included testing the main concept of the game, the usability of its physical prototype, and the usability of the calculation model implemented in Excel. The NextCampus game was simulated on a computer and supported by the physical model of the game. The first test users were undergraduate urban planning students from HafenCity University Hamburg who were,

in the same semester, working on a student project entitled Playful Public Participation, creating their own online serious game.

The following three scenarios were included in the first test phase:

- *Complete move*: In this scenario, the university campus moves from the current location at Rotherbaum to the new planned location at Kleiner Grasbrook.
- *Demolition and new construction with partial reconstruction*: In this scenario, the university buildings are almost completely demolished at the current location in Rotherbaum. New buildings are built and a minority of the university buildings is reconstructed at the current location.
- *Renovation*: In this scenario, the university buildings currently in need of renovation are renovated; the university remains in the same location.

The test began with a short introduction to the goals of the NextCampus game. The animated PowerPoint presentation provided a dramatic introduction to the situation in the city of Hamburg and the current issues intended to motivate and inspire the player, describing a difficult political situation in which many problems are part of the game story. After the introduction, a game player can start the game. One of the main decisions was which scenario the player would choose to play. The possible choices were the three scenarios listed above. The player was able to physically move the buildings and immediately observe the consequences of her decision. Three game guides assisted in the test phase and simulated an online version of the game. One of the guides provided detailed information about the buildings on the 11 cards describing the buildings and their status. The second guide assisted the player in moving the buildings. The third guide inserted the player's decision into the Excel-based computation and reported the current moods of the other stakeholders, such as students, small businesses, university staff, and inhabitants.

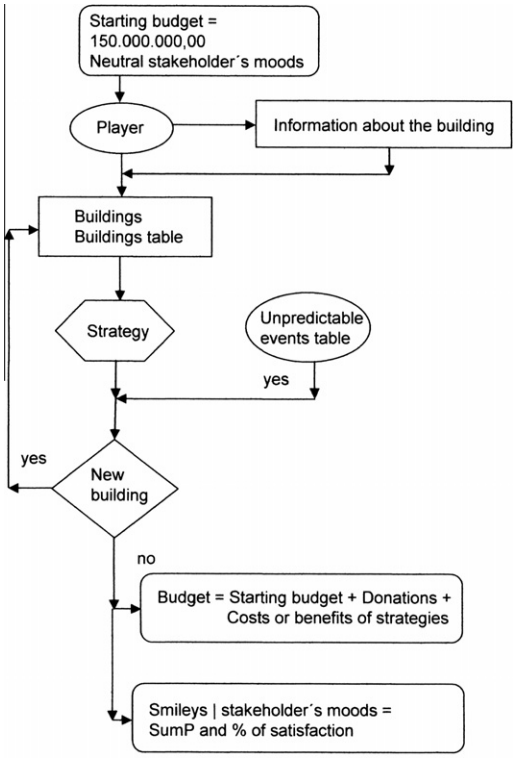


Fig. 6. Influences on the budget and stakeholders' moods.

When the mood changed, the second guide chose the correct level of satisfaction and changed the emoticon, selecting the new, calculated version. One of the goals of the game was to keep a satisfactory level of happiness for all involved stakeholders. While playing the game, the players learned about the current situation of the university campus and possible consequences of changes in the environment.

The second test phase included testing the game with students from Florida Atlantic University (FAU) who were involved in the student project entitled Playful Public Participation (Fig. 7). The test phase with these students brought in a new dimension: the students were from the USA, spoke another language and came from a different cultural environment. The testing environment was the same as that used in test phase 1. In addition, the game designers had developed the design of the user interface of the online NextCampus game and used it within the second test phase. The user interface was very well accepted and is still under development.

Both tests resulted in an improved understanding of the possible problems facing the proposed game concept if it were implemented online. In response, some minor improvements were made to the Excel-based calculations, and the authors decided to discuss the concept of the game and the possibilities of online implementation with some external experts.

5.2. Interviews with experts

The prototype of the game was presented to three experts who provided comments on the concept of the NextCampus game, its usability and the feasibility of its implementation. Detailed interviews with two experts were completed and recorded. The first is a game designer working at the private computer company spotsonfire GmbH, and the second is a project manager at TuTech Hamburg who is involved in a series of national and international research and implementation projects focusing on e-participation. The experts were selected based on their many years of work experience and international expertise. The interviews were open-ended and were based on a set of prepared questions that were the same for both interviewees. The questions used in the interviews were as follows:

- What is your opinion about serious games in general?
- What is your perspective on serious games and their implementation within e-participatory processes in urban planning?
- Have you experienced demand for research projects on or implementations of online games?
- Do you think that the NextCampus game could bring pleasure, fun and joy to game players?

Fig. 7. Testing the NextCampus game with the students from FAU.

- What is your opinion of the NextCampus game?
- How successful, in your opinion, could the NextCampus game be?
- What are the technical requirements for a successful online game?
- How many people in your company are involved in the development of similar research or implementation projects?
- How long does the development process last for a similar project and how many phases does it usually have?

To date, these interviews and their results have not been tested in further experiments. They represent the opinions of the experts and can be used for further research in the area of serious games and online public participation. The majority of their comments are included in the following subsection.

5.3. Results of the evaluation: summary

The main results of all three test phases are presented in this subsection. They include the positive aspects of creating an online NextCampus game as well as criticisms that need to be considered prior to the implementation of an online version. They are based on open-ended interviews with the test subjects and are presented in the form of qualitative descriptions. The main results are as follows:

Positive aspects:

- The idea of the Next Campus game is ambitious and interesting as a concept.
- The joy and playfulness that the concept of the NextCampus game may invoke were evaluated positively. This aspect was not quantitatively tested or measured, but qualitatively described by the test subjects, i.e., the players of the game.
- The game has further potential in the area of simulation of scenarios and consequences of decisions. Additional attractive visualizations could be implemented in the next version of the game.
- One of the experts offered the inspiring idea of connecting a discussion forum already implemented by the institute TuTech Hamburg with the NextCampus game.
- The general principle of motivating the citizens through the use of the NextCampus game was also evaluated positively. The citizens become involved with the urban planning situation in a playful way while receiving specific information about the area under discussion, dealing with the current situation and improving their understanding of the possible consequences of their opinions.
- One of the experts suggested that we implement the concept for educational purposes. Education presented in a playful way on the current situation, buildings, and opinions of involved stakeholders, such as students, university staff, and small businesses is a potentially powerful concept.

Critiques:

- One of the main critiques was the complexity of the game. The presentation of the physical model and the demonstration of its functionalities appeared rather complex, likely too complex, to our experts. One of the experts suggested reducing the game elements, which could bring a simplification and a clearer structure to the game; this could result in an even more playful and satisfying end product.
- Another issue is the question of what to do with the results of the game. Can these results be considered the serious opinions of the players, or just results of the game? For example, a choice of the demolition of the majority of the buildings and reconstruction of a few could be viewed as the playful approach of a player trying to test a more extreme possibility or classified as his opinion and wish for a solution to the current situation. One possible solution would be an option at the end of play that gives the player the possibility of marking the result as actual intent or playful possibility.
- The issue was raised of the calculation of the consequences of the activities. How realistic are the calculations? This issue brings us closer to the purpose of a serious game: how serious and close is the game to reality and how playful and close is the game to fiction?
- Prior to the online implementation of the NextCampus game, the cost of its implementation and the benefits of using it would have to be specified. One of the experts expressed concern that implementation in a 3D environment might be too expensive and complex for the planned use of the game.

This critical discussion of the NextCampus game is as important as the discussion about the positive aspects of the game. It is significant to note that the interviewed experts come from specific, practice-oriented environments. In case of an implementation of an online NextCampus game, these factors would have to be considered seriously. These analyses can also aid in similar projects and future research.

6. Conclusions and further work

Playful Public Participation (PPP) aims to bring satisfaction and pleasure to the process of interaction between citizens and planning experts. The new, re-engineered planning processes can support the utilization of creative narratives in the process of planning (Foth, Bajracharya, Brown, & Hearn, 2009), new technical possibilities such as chatbots (Boden et al., 2006), or the integration of virtual and real worlds (Pflüger, Selle, & Sinning, 2003). The research presented in this article builds on the assumption that games and play can bring satisfaction to players, as well as new ways of motivating them, for example, to participate in urban planning processes.

In this article, we concentrated on games and play. The design of an online serious, non-competitive and public participatory game turned out to be a challenging task for the game designers. The issues involved questions such as the following: what are the possible rewards for the participants? How can one create a pleasant virtual environment in which citizens learn about current situations? How can gaining information and learning about planning possibilities and current situations be simulated and created in such a way as to result in pleasurable participation? How can urban planners use the results of the online public participatory process?

Research has shown that for a serious game to be successful, the overall structure of the game and the instructions provided to play it should be kept simple to minimize the time spent learning the rules of the game (Mitchell, 2001). Such an approach also ensures a clear route through the game with constant access to information that aids in navigation. The nature and levels of challenges and the methods of scoring need to be varied. Effective serious games must provide feedback to encourage focus on the process at hand as well as the performance achieved. A constant cycle of hypothesis formulation, testing and revision needs to be built in, giving the user a chance to correct and learn from errors made. And, most importantly, the structure of the game must suit the learning objectives and outcomes set out during the planning stage.

Specific to the NextCampus game, we can summarize the following possible problems: (1) high investment costs and complexity of creating an online version; (2) unclear borders between a

serious game and an entertainment game, especially as viewed from the urban planner's perspective when considering the results of the game and the player's submissions; (3) availability of digital data necessary for the development of the game environment so that the situation is represented as closely to the real-world situation as possible; (4) uncertainty about the number and profiles of the possible users.

The potential use of serious games in online public participatory processes estimated in our test experiments lies in the possibility of new ways of motivating people to participate and learn about the environment and current projects that might impact them and their communities. This potential has not yet been exhausted. In future work, we will strive to implement one of the already developed online serious game concepts in a digital medium and test it with a selected focus group. We will continue exploring the playfulness and playful elements that can potentially be integrated into the serious processes of public participation in urban planning. We are also interested in a quantitative measurement of the players' responses and emotions and the usability of the results for urban planners.

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