Games and Serious Games in Urban Planning: Study Cases

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Abstract. In this article we focus on online games and serious games in urban planning. At the beginning we provide some definitions of games and serious games and discuss the potential of serious games. We overview the urban planning games available online and give some examples of the game stories and concepts. The main goal of the article is to explore the potential of serious games in public participatory planning. To this end, a group of students at HafenCity University Hamburg designed and implemented a serious game. The game was entitled B3 Game and applied on the case of a market place in Billstedt, one of the city districts in Hamburg. The game enables the players to design their marketplace and discuss their suggestions with other citizens and urban planners. It aims at supporting playful public participation in urban planning. We conclude the paper with a discussion and further research directions.
Keywords: online games, urban planning, public participation, serious online games, study cases

1 Introduction

Online games and especially serious online games are a novel research field in urban and regional planning. Game industry has for many years concentrated on play and fun and produced games which served these goals. In several cases, the game designers used urban planning as one of the main topics of the game. One of the most famous examples of such a game is SimCity. This game, first published in 1989, immediately turned into a success. It was successful commercially, but also won several awards including Best Entertainment-, Educational-, and Simulation Program, Best Consumer Program awarded by the Software Publisher's Association, Most Innovative Publisher awarded at Computer Game Developer's Conference, and Best PC Game, to mention only some of the accolades. Many game players were attracted by the exciting game story, which included possible dangers and disasters like fires, volcanos, earthquakes, etc. The concept of urban planning as the main topic has been used in various other games such as PlastiCity, Super City, The Grepolis game, and others. All these games were designed for entertainment purposes.

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Serious games have a different goal; they are designed for other purposes than solely play and entertainment [1]. In recent years serious games became a growing field in the game industry. Researchers and developers investigate a variety of possibilities for their implementation in several areas: in organisation management, education, health care and the military. Game-based learning became a challenging research field in education. Development of serious online games in urban planning is in its initial stages. Thus, there is a very limited amount of literature available in this field. We are interested in gaining a more profound knowledge about the possibilities of serious games in urban planning.

In our research we concentrate on the concept of serious online games. We are particularly interested in public participatory situations in which citizens contribute their opinions about the urban planning changes in their environment. Our broader research agenda, not completely answered in this paper, includes the following research questions:

- Can serious games improve citizens' learning about the environment;
- Can game-based learning in urban planning add more enjoyment to citizens who participate;
- Which game stories are appropriate for serious games in urban planning;
- How should public participatory games in urban planning be designed in order to attract many citizens?

This article represents our first step towards a more profound research agenda. It provides an overview of the games and serious games that include urban planning as a part of their game story. We demonstrate our first experiences in trying to create an online serious game titled B3 Game, which aims at supporting public participatory processes in one of the selected city districts in Hamburg.

This article is organised as follows: In section 2 we provide some selected definitions of games and serious games and discuss the potential of serious games. In section 3 we demonstrate examples of computer-based urban planning games. Section 4 concentrates on our case study of a serious game. We present the B3 Game designed at HafenCity University Hamburg in the process of research on serious games in urban planning. We conclude the article with a discussion about how serious a serious game in urban planning can be, and we end the article with potential directions for our further research.

2 Games and Serious Games

2.1 Games: Definitions

There are many definitions of games available and it is not possible to list all of them in this article. We selected those that are relevant for our research. Parett [2] makes an important distinction between the formal and informal game. According to him, an informal game is basically undirected play. A formal play has, according to Parett [2], a twofold structure based on ends and means. Ends represent the contest to achieve an

objective. Means is an agreed set of equipment and procedural rules that can produce a winning situation. Abt [1] defines it as follows: “Reduced to its formal essence, a game is an activity among two or more independent decision-makers seeking to achieve their objectives in same limiting context. A more conventional definition would say that a game is a context with rules among adversaries trying to win objectives”.

2.2 Serious Games

The term serious games refers to games designed to support other functionalities than solely for entertainment [3]. According to Zyda [4] “applying games and simulations technology to non-entertainment domains results in serious games”. He also provides a definition for serious games, claiming that they 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.”

When comparing serious games with computer games, Zyda [4] argues that serious games have more than just story, art, and software. It is the addition of pedagogy, or activities that educate or instruct that make games serious. He also stressed that pedagogy must be subordinate to story and that the entertainment component comes first. A problem with the term “serious game” itself is that there appears to be a contradiction between its constituents; the terms “serious” and the term “game” may seem to be mutually exclusive [5]. According to Prensky [6], games should be fun first and then they should encourage learning. Fun has also been described as a side effect of learning something new [3]. Michael, D and S. Chen [3] also argue that the main point of serious games is to get players to learn something, and, if possible, have fun doing it.

2.3 The Potential of Serious Games

Today’s “serious games” is a serious business; as stated by Ben Sawyer, co-founder of the Serious Games Initiative [5]. The market of serious games was in 2006 estimated to be worth of $20 million, and digital gaming is a $10 billion per year industry [7]. Serious games are becoming more and more important in the global education and training market [3]. This market was, for example, in 2003 estimated at $2 trillion [5]. Examples of implementations include games used in cultural heritage [8], military applications and training [9], policy and management issues, public participation [10], health care, and change management.

The potential of serious online games for urban planning and especially in the phases where public participation is needed has an enormous potential. The research in this area is very promising, novel and still in the initial phases. It is based on a hypothesis that games can potentially enable easier and joyful learning processes and bring playfulness into the process of public participation, sometimes referred to as playful public participation [10]. In the next section of this article we provide an overview of the urban planning games currently available online.

3 Online Urban Planning Games

Urban planning is a topic in several commercially available games. All of them were designed for entertainment purposes. The examples of games, described in this section, include the famous game titled SimCity, followed by PlastiCity, Urban Plans, City Creator, and Super City. The list of other urban planning games, not described here, includes The Geopolis game, Dumptown or Recycle City, Face Your World, and Urbis' Create Your own Supercity.

SimCity is perhaps one of the most famous games related to urban planning. It is a simulation game in which the player can found a city, take care and maintain it in the framework of the given budget available for a variety of activities. The main objective of the game is to build and design a city. In the first stage of playing the game, the player can change and alter the terrain of the city before building on it. She can mark certain parts of the terrain and change them into different zones. The player can add buildings, select and vary the level of taxes, build transportation systems and enhance the city in many other ways. The game includes possibilities of disasters such as floods, fires, volcanoes, meteors, earthquakes, tornados, and damages caused by monsters or extra-terrestrial vehicles. Depending on a variety of factors, such as land value, demand, and different levels of taxes, the player can achieve a certain wealth level in the city.

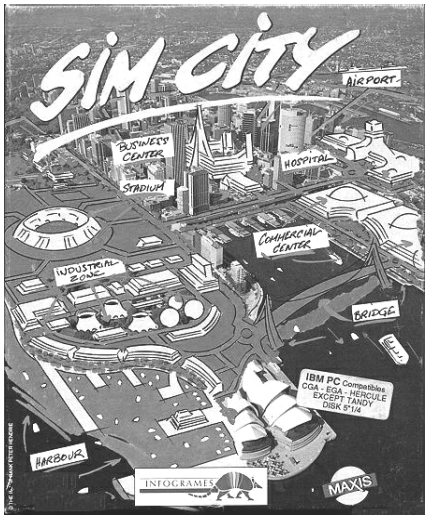

Fig. 1. The original cover of SimCity Game released in 1989

The game can be played by one person at a time and thus annuls the traditional "win or lose" focus of most games. Instead, the initial objective was to make the citizens of the simulated city happy by creating an optimal environment. There is no way to win the game and it is therefore an open-end game. The player can use her imagination and has unlimited possibilities for the creation of her own city.

The game was first released in 1989 (Fig. 1). It was commercially available for $50 [11]. The first version of the game was designed by Will Wright in 1985 under the name Micropolis. Later, it was introduced by Maxis Software in Lafayette, California

[11], for the computer Commodore 64. According to Maxis' view, a good city was simply one that worked [11]. The game included two different games. The first one offered eight scenarios of disasters both real and imaginary. For example, one of the cities was San Francisco in 1906, just before and just after the great earthquake. The challenge was to rebuild the city. Another scenario was set in Boston in 2010, where a nuclear meltdown is imminent.

The success of the first version lead to the development of further versions SimCity 2000 in 1993, SimCity 3000 in 1999, SimCity 4 [12] in 2003, SimCity DS, and SimCity Societies in 2007. The original SimCity was later renamed SimCity Classic. In January 2008, the SimCity source code was released as a free software GPL 3 license under the initial working title Micropolis, used in 1985.

3.2 PlastiCity

PlastiCity is a computer game based on the architectonic visions and controversial suggestions of British architect Will Alsop. Alsop's controversial vision for the redesigning of Bradford's city centre led to an uproar in the media. It initiated intense discussions among the public about how far a 'masterplan' for urban reconstruction could go. Alsop's suggestion to replace two of the most prominent buildings in the geographical centre of the city with a lake sounded like a joke to many of the inhabitants of Bradford [13].

Fig. 2. 3D representation of the buildings in PlastiCity [13]

The game PlastiCity is focused on the Bradford city centre. The players can build, demolish, repaint, rescale and rotate buildings in the city centre. The representation is done in a 3D environment (Fig. 2) and supports complex interactions of the player and the game environment.

The game was created by Mathias Fuchs (Senior Lecturer at University of Salford) and Steve Manthorp (Special Project Manager, Bradford). The authors of the game claim: "Led by Alsop's statement that "the absence of joy is the biggest threat to our

society" we have attempted to emphasize the playful, joyful and ludic elements in urban planning and question the more serious, technically 'sane' approaches [13]".

The first phase of the project was carried out with the support of the Lightwave partnership: a Bradford based organisation run by the National Museum of Photography, Film and Television, Bradford University, the City of Bradford and a regional development organisation [13]. It is based on careful research of the city planning institutions, such as the City Council for Planning, the city centre master plan [14], and the wishes and demands of the local population. It included investigations of the current, past and possible future of urban structures and the history of visions of "cities of the future" related to the visions provided by some well known thinkers and architects such as, for example, Charles Fourier and Le Corbusier.

The game PlastiCity includes realistic architectonic models, basic game-play, and a set of functions developed for the purposes of creating and changing the buildings. A significant amount of time had to be spent on taking photos of the buildings and modelling major buildings. In the second phase of its development, the creators also included different possible urban planning strategies that can be used by the players, and implemented some ethnic and gender specific game elements.

3.3 Urban Plans

Urban Plans [15] is an urban planning simulation game in which the main objective is to reach the highest possible population for the city. It can be classified as a non-competitive game and is in principle a very simple game created in the Adobe Flash environment (Fig. 3).

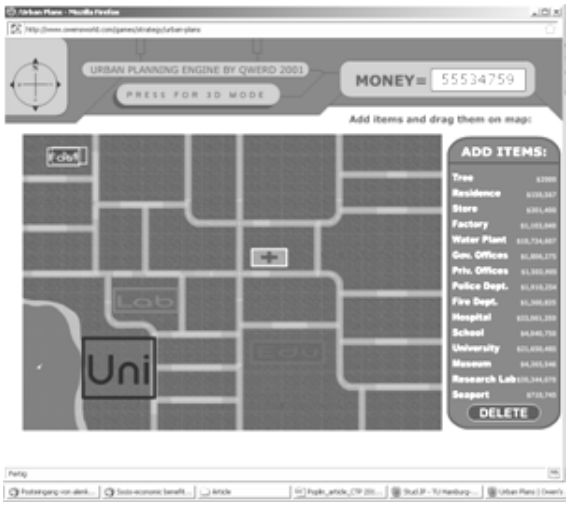

Fig. 3. Urban Plans user interface [15]

The basic city structure includes streets, green areas representing lots, blue areas representing water, in a simple layout predefined by the game. The player can insert

buildings and trees with a simple drag and drop functionality. The buildings are classified according to their functionality such as stores, factories, universities, museums, governmental and private offices, police and fire departments, hospitals, research labs, and seaports. The player can chose between 2D or 3D representations and can easily earn game money. A relatively high amount of money earned can be used to create buildings, factories, universities and other elements of the environment.

3.4 City Creator

City Creator [16] is somewhat similar to Urban Plans and also represents a non-competitive kind of a game. It is available for free online. The game starts with instructions on how to use the elements and how to play the game. These instructions are displayed on the first page of the game; see the left field of the game on Figure 4.

Fig. 4. City Creator user interface (©2002-2011 Denise Wilton & Cal Henderson)

After reading the instructions one can start playing the game entering one of the four possibilities displayed in the right field of the game. The player can drag and drop the elements of the city in the environment of the game. The elements are not labelled with their function as in Urban Plans; instead their function can be determined by the user's perception of the icon. The icons represent different kinds of buildings; they are colourful and represented in 3D. There is no score or competition involved with this game. The player can conclude the game when she feels satisfied and desires to send a copy of the created town to someone via email.

3.5 Super City

Super City [17] is a game created in Adobe Flash and can be played online for free. The player can build homes and shops and gain money and population. The economy is involved as well. The player has to pay the bills; in some versions of the game, the player has to pay a bill of $800 every five days. The enemies sometimes attack the city and the player has to fight the enemies. The enemies appear without any influence or provocation by the player. The player has to fight them as soon as they appear on the screen without having a possibility of avoiding the conflict with them. Every fight costs $500. The player is stimulated to continue playing the game with messages that appear on the screen. Sometimes the online citizens will complain about the high level of pollution in the city, which also happens just suddenly. Solving the problem of the pollution costs $200. Some other times they complain about the low level of security and the player has the option to add another police office in the city. A possibility of a tornado represents another danger for the citizens. The city can be surprised by a UFO and the citizens get freaked out by the aliens. Bottom line, the player has to take care of the security of the populace. The traffic is represented by moving cars which gives a realistic feeling and brings additional dynamics into the game. The game comes with sound, which can be turned off by the player.

Fig. 5. Facebook version of the Super City game

Super City claims to be the first city building game on Facebook (www.apps.facebook.com/supercity). In November 2010 they celebrated their first anniversary. They also plan to include some radical changes and improvements including the option of selling the buildings.

4 Serious Games in Urban Planning: the B3 Game

This section summarizes our experiences and starts with our research goal, a description of the game environment taken from a real-world example, the implementation of our own serious game, B3, and concludes with a discussion on comparable, recent projects.

4.1 Research Goal: Playful Public Participatory Game

Our research was motivated by the idea of playful public participation initially presented by [10]. How can public participation be playful? What are the elements of playful public participation? Krek [10] suggests using games in order to create a playful learning environment in which the citizens enjoy participating in urban planning. Our main research goal was to concentrate on the design of a game which could possibly result in playful public participation and to implement the game in the form that can later be tested with the help of potential users. The game has been developed at HafenCity University Hamburg as a part of a student research project. The project lasted one year and included an exchange with Florida Atlantic University, which helped to improve the concept of the game.

4.2 The B3 Game: Urban Planning Situation

The designed and developed game was entitled the B3 Game. The name B3 stands for Billstedt-Bürger-Beteiligung, which can be translated into Billstedt-Citizens-Participation. The game concentrates on the urban situation of Billstedt, located on the eastern side of Hamburg (Fig. 6).

Fig. 6. Billstedt on the east side of Hamburg (© Google-Map data © Tele Atlas)

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Billstedt is a culturally mixed section of Hamburg with about 70.000 inhabitants. It has a rather bad reputation, a high crime rate, unbalanced social structure, and high unemployment rates; 23% of the inhabitants are foreigners, and there is an extraordinary high number of children. Because of this situation, the government decided to initiate a new urban planning programme titled “Schau nach Osten” (Look to the East). The B3 Game takes this framework and concentrates on a new design of the marketplace in Billstedt.

The marketplace in Billstedt is surrounded by a shopping centre on the north-west side and some shops and coffee houses on the east side (Fig. 7). The centre of the marketplace could potentially be used for pleasant activities such as enjoying a coffee, playing with children, reading, etc. Currently, the marketplace does not offer these possibilities. The inhabitants of the city entering the Billstedt shopping centre pass by some old benches which are rarely used, and some neglected trees.

Fig. 7. Billstedt centre (© Google-Map data © Tele Atlas)

The marketplace has a great potential to become a very pleasant place where the citizens can meet friends, spend some time with children playing on a playground or just rest and enjoy a pleasant shade under the trees. The government, with their vision of “looking east,” wanted public input: What are the wishes of the citizens? How would they like their marketplace to be designed? The B3 Game aims at encouraging the citizens to contribute their opinions about the marketplace and learn about the current situation and issues of this part of their city. If the marketplace could be revitalised, then the B3 Game could be expanded to include other areas, as the game itself is rather adaptable.

4.3 The B3 Game: Implementation

The user interface of the game was designed and visualised with the help of the software Adobe Flash. The B3 Game aims at enabling the citizens of Billstedt to concentrate on the marketplace, which is the subject of public discussions. In the current version of the design, the players can view the current situation on the marketplace in a video, choose between 2D and 3D visualisation of the marketplace, and design their own marketplace, adding different spatial elements such as benches, trees, lights, playground for children, etc. Fig. 8 shows the user interface of the game with the selected 3D environment. The elements of the environment, such as benches, trees and lights, are placed on the top of the user interface. The monkey was selected by the player among several different icons representing an electronic help, guiding the players through the game. The player is now ready to select the elements, drag them into the 3D marketplace and essentially redesign it until she is satisfied with her creation.

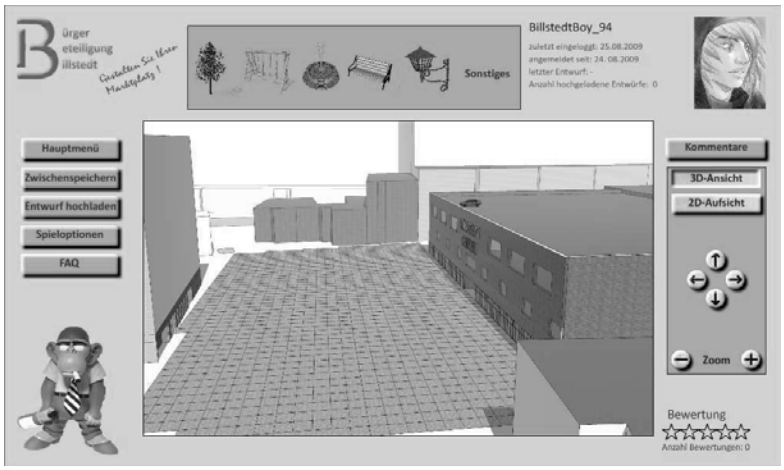

Fig. 8. The B3 Game user interface [18]

The B3 Game was user-friendly and afforded the citizen not only the possibility of creating a new town square, but the created vision could be immediately included in the participatory process. Once the player designed her preferred market place, and inserted or placed the elements she would like to have on the marketplace, she can send her vision to the urban planners via E-Mail. The citizens can view the contributions of other citizens and vote for the one they like the most. The top three contributions appear visible to everybody and the citizens can view the contributions of other players. They can get involved into a chat with other citizens discussing the visions of further development of the marketplace, or with urban planners asking for their professional view about possible further developments of this district.

4.4 Comparable Recent Developments

Serious games in public participatory urban planning are a novel topic, as well in research in the game industry. We can report about three projects which can be compared with the B3 Game project.

The earliest comparable project was designed in 2004 at the University of Wisconsin-Madison. The researchers entitled it Urban Science. In Urban Science, the game designers explored how innovative technology-based learning environments support students in improving their understanding of ecology. The players learn about different topics related to ecology, develop self-confidence and presentation skills, and start to see the world through the eyes of a problem-solving urban planner. In the test phase, the researchers challenged some Riverside University High School students to reshape State Street, a main street in Madison, Wisconsin, by taking on the role of an urban planner [19]. The game was run through Riverside's community learning center and coordinated by Milwaukee Recreation. In the role of urban designers, the students had to consider issues such as affordable housing, parking, ecological issues and crime while balancing the desires of special interest groups such as businesses, a cultural preservation organization, and other community advocates.

In 2010, several projects appeared in which the game designers aimed at implementing the concepts of serious games in urban planning. Participatory Chinatown and CityOne are at the moment the most well known commercially available applications.

Participatory Chinatown [20] is a 3D game developed by Newburyport-based Muzzy Lane Software in partnership with the Asian Community Development Corporation (ACDC), Emerson College, and the Metropolitan Area Planning Council (MAPC). It is a game which aims at attracting young residents. It combines games with virtual interaction in order to help residents of this district in Boston to better shape the future development of their neighborhood. The game runs on Muzzy Lane's "Sandstone" platform, which allows the game to be played on locally-networked computers reserved for community meetings or directly available from the web at http://www.participatorychinatown.org/. The results of the community meetings supported by Participatory Chinatown Game fed into the 2010 Chinatown Master Plan.

The second example is IMB game CityOne [21]: A Smarter Planet Game. It was first introduced on May 4th at the IMPACT 2010 conference in Las Vegas. IBM has labelled CityOne as a "serious game" in which the players learn how to apply technology in new innovative ways. IBM hopes that the game will allow players to "discover how to make their cities and their industries smarter." It aims to target urban planners, students, academics and those who are curious about the serious aspects of urban planning.

5 Conclusions and Further Work

In this article we first provided some definitions of games and serious games and showed examples of online games that focus on urban planning as the main topic.

These examples include online games such as SimCity, PlastiCity, Super City, City Creator [22], Dumptown or Recycle City [23], Face Your World [24], Urbis' Create Your own Supercity [25] and others, which were designed for entertainment purposes. Serious games, on the contrary, aim at supporting other, more serious processes, such as online learning or strategic communication. In our research on games and urban planning, we aimed at exploring the possibilities of a serious game design. Our interest is in creating serious games which can support the concept of playful public participation.

The process of game design and implementation of the B3 Game lasted one year. It included the following phases: a. an initial idea about the urban planning process we would like to support with the concept of a serious game, b. selection of the test area, c. design of the game, d. test implementation of the game and e. usability testing. The process resulted in a final design of the B3 Game done in Adobe Flash and, the project report describing the process of the design and the main results [18]. The B3 Game was designed for a young generation eligible to vote and to take on an active role in public participation processes; some playful and irreverent icons will attest to this. In spite of this fact, we were interested in testing the game with elderly people. The usability tests were designed and executed in 2009 and published in 2010 [26]. The results were very encouraging; elderly people were enthusiastic about learning about their environment and especially about learning in a new, game-based way.

One of the very important questions, often discussed within the design group, was how serious can a serious game in urban planning be. This is an important parameter that needs to be clarified for every urban planning game developed to support public participation. It is related to at least the following issues:

a. Environment: How close to reality should the environment be presented in the game; shall the maps and 3D representation be geo-referenced or simply presented as a non-georeferenced space?
b. Urban planning topics discussed: Shall they be taken directly from the current discussions about the changes in the city, or can this bring additional misunderstandings between the urban planners and citizens?
c. Results of the participatory process: What should happen with the results of the game-based public participatory process? Should they be sent to the responsible urban planners or just saved on the server? Should urban planners take the responsibility for answering and commenting on the opinions submitted by the citizens? If this work is truly participatory, then yes, the results should be made available to the planners – but in which formats and applications?

Designing a serious game for public participation in urban planning opens up a whole range of questions which cannot be answered superficially. They depend on the potential users of the game, the main goals of the game, as well as the public participatory process in which the game is used.

In our further research we will investigate other possible elements of playful public participation such as sketching and drawing. Can they be combined with a game or rather used as a separate tool? We are further interested in gaining additional experiences in designing serious games for urban planning, focusing on different user groups and their specific requirements. We plan to continue working with elderly as

well as young people. We believe that game-based public participation can bring enjoyment and information about the environment in which we live and can encourage citizens to become more active in urban planning participatory processes.

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