YouPlaceIt!: a Serious Digital Game for Achieving Consensus in Urban Planning

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Abstract

The main goal of this paper is to discuss serious digital games in urban planning. We focus on an example of a game that aims to support a process of consensus finding in a diverse and complex urban planning. The game is titled YouPlaceIT! and extends the concept presented in B3 game Design Your Marketplace! With additional complex human behaviour models. The players taking on relevant roles mirroring real-life stake-holders aim to achieve a consensus related to urban planning issues. The consensus can be achieved by negotiations or financial trade-offs. The scoring will be based on analysis of rating of social interactions and financial status. The complexity of the model lies in engineering human behaviour motivated by perceptions, factual information and socio-political implications. The case study is the largest low-income area, called Dharavi in Mumbai, India.

Keywords: serious digital games, urban planning, public participation, consensus.

1 Introduction

Urban planning involves inputs a variety of stakeholders with different interests in the use of space and distribution of activities in the city. These stakeholders can include the residents of the planned area, various government departments, real-estate developers, industry, and non-government organizations (NGO's). Reaching a consensus among different stakeholders is a challenging task which involves negotiations and compromises among all involved parties. The biggest challenge faced by urban planners is to bring all stakeholders to an agreement. How can this be done? This paper suggest to use a serious game which could involve a variety of stakeholders and enable them to discuss urban planning issues with the help of the game. A game in this case would serve as a common platform, which enables all involved stakeholders to participate constructively in a dialogue about urban planning issues.

We are interested in the use of serious games in urban planning which would enable to support the process of achieving consensus. Urban planning games, are particularly interesting for their social relevance and intriguing for their complexity. In this project we consider an area, Dharavi in the city of Mumbai, India, as the setting for a game requiring a cooperative effort to develop it into a habitual area. The 557-odd acre of land, is home to one of largest low-income residences, also called a slum. The residents are usually unregistered, daily wage earners engaged in the service industry to the bustling city of Mumbai, many of them residing in shacks with little or no civic utilities. Close to 300,000 people reside here, many of them having no land rights. A long tussle continuous between governments, NGO's and the residents to find a solution to the problems faced by the residents and the development plans of the government. Dharavi serves as an example of a complex urban planning situation in which a consensus among different stakeholders is needed. Testing for transfer of knowledge is one of metric for effectiveness of the game as a medium for learning and also analytic of the game design itself. The effectiveess of participatory urban planning games for learning and transition to real-time decision making processes has been studied extensively (Cecchini and Rizzi, 2001; Mayer, 2009).

This paper concentrates on the YouPlaceIt! Game which aims to support consensus finding in a selected urban planning situation. It aims to enable stakeholders to interact, make cooperative decisions and resolve issues. The research question of interest is: Can game like environment provide an effective platform for decision making and conflict resolution when representing real-life scenarios?

2 Previous Work

2.1 Digital serious games

Serious games are games that aim to support and facilitate learning (Gee, 2003; Lemke, 1998) and problem solving processes (Abt, 1970). They can be "any form of interactive computer-based game software for one or multiple players to be used on any platform and that has been developed with the intention to be more than entertainment" (Ritterfeld et al, 2009, page 6). Very often they focus on real-world problems and can be also defined as "entertaining games with non-entertainment goals" (Social Impact Games, 2008). Learning with the help of

digital serious games can be facilitated with the help of experimentation (Lemke 1998); several alternatives can be tested in the game environment without serious consequences which would happen in the case of a non-game, real-world experience. The players can learn in the order that suits them and at the speed and pace that can be optimal for their own personal experience.

2.2 Urban planning games

Urban planning and cities in general have often been selected as the main topic in games. Examples of such online games are SimCity and PlastiCity (Fuchs, 2007), or City One (IBM, 2014). Their main goal is to entertain; they cannot be categorized as serious games. One of the first serious games for urban planning was described in the book titled Serious games written by Abt (Abt, 1972). A few years later Sanoff (2000) published a collection of games which focus on urban planning issues. These are spatial, non-digital games, and some of them could be categorised as "serious". Recently several digital serious games for urban planning have been developed. Gordon and Manosevitch (2010) describe a pilot project "Hub2", that took place in Boston, Massachusetts from June to August 2008. Devisch (2011) focuses on the Second life and its possible use for urban planning. Poplin (2012, 2013) introduces the NextCity and B3-Design your Marketplace! games, which aim to facilitate public participation in urban planning.

2.3 Behavioural models

One of the most interesting output from any game play is the human behavior in decision making processes, conflict resolution and cooperation by social interactions. Some of the behavior models that can be applied are the Nash equilibrium, QRE-quantal response equilibrium (McKelvey and Palfrey, 1995), and cognitive hierarchy (Camerer et al., 2004), or the level-k (Costa-Gomes et al., 2001; Nagel, 1995). The level-k model model strategic thinking which adopts a best response to beliefs about other players. This model relates the closest to real-life conditions and situations. It is based on some traditional or simplified models of other players, but it captures the essence of each role the player has in the game.

2.4 Physical vs. virtual space

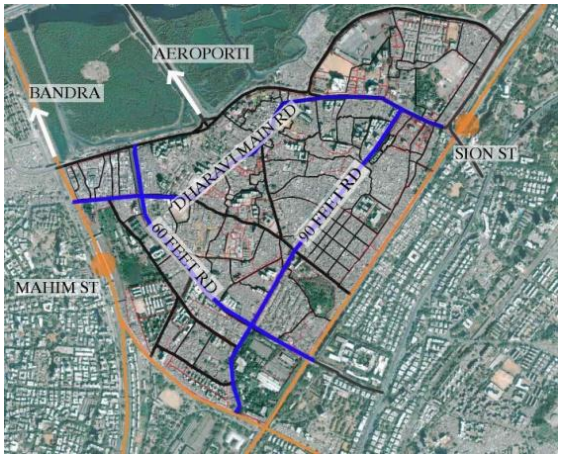
Urban planning games can be of relevance in assessing whether certain spatial configurations (physical vs. virtual) can support collaboration better than others so that communication and knowledge exchange is facilitated. It is important to take into account how virtual activities influence new conceptions of physical layouts and the impact that this new vision of the physical space has on the innovation process. More specifically, it becomes possible to analyze whether there are differences in the nature of the interactions that arise in the physical urban space vs. the 3D representation of the digital game. While physical space plays an important role in triggering socialization, it might be the case that in online urban games this role is taken over by language. The style of communication used or the vocabulary adopted can be a relevant indicator of a community and identify cultural differences (Monachesi and Markus, 2010). Language can play a similar role to spatial order in identifying cultural differences between one social formation and the other. This seems to be the case also for digital games in which social roles are created through language with the support provided by the dynamics of the game while the identities one has in the real world play a marginal role (Rusaw, 2011). Players come together mainly because of their interest in the game and the game with its 3D representation constitutes the shared space that sets the basis for the emergence of communities and their language.

3 Case Study

This case study for an urban planning game that supports finding consensus among stakeholders focuses on one of the largest slums in India, Dharavi. Its populations is estimated to more than 1 million inhabitants. It is located in Mumbai and was founded in 1880s during the British colonial area. It is a very diverse, poor and multi-religious settelment. It currently covers an area of about 230 hektares which is about 557 acres. Figure 1 shows a bird's eye perspective of this area. This area represents a very complex urban area with complex interactions among stakeholders involved in designing the future of this area.

Figure 1: The bird's eye on the study area.

Figure 2: The satellite image of the study area.



4 Serious Digital Game: YouPlaceIt!

The game will extend the B3 Game: Design Your Marketplace! (Poplin 2012, 2013). It will include many spaces like business districts, industrial estates, residential complexes and hospitals, with the possibility of creating new types of spaces and places. The representation will be in 2D and/or 3D with an implemented walk-through option. The objects included will be the residential structures of different types, utilities, industrial structures, schools, hospitals, benches, trees or lights. The players will be able to select a common area of their interest. They will be able to negotiate and develop their own design of this place within the limited budget available. The interactions among the players will be enabled by multi-lingual text-chats and representational icons. The scoring for each converged decision will be calculated on a development and financial ratio. Factual knowledge related to each object, as well as about material, geological conditions like soil type and ground-water, will be presented to the players. In the following we describe the main game mechanics as described in the current game design document.

Space/Environment. The space represented in the game will be the actual geographical area of Dharavi. The topography will be taken from the Indian satellite images Bhuvan. The 2-D representation will be a top view with ability for a tilt to get a depth perception enabling feature depictions. Colours as per natural conditions will be used and lighting will be daylight representation. Sub-space or discrete spaceslike market-place, hospitals or schools will be designed with customised rules. Physical barriers like weather conditions will be introduced as a random effect to test for validity of a plan proposed by a player.

Objects, attributes and states. In this role-playing game, the objects accessible to the players will be the following: a) commercial buildings, houses, flat lets, trees, school buildings, roads, hospitals, market-places, civic facilities like water treatment plants, garbage recycling units, parks, water bodies, and religious structures. Each of these will have attributes attached to the graphical representation. The attributes will describe each object with factual static or dynamic knowledge. This knowledge will be provided either by the game engine or by the players.

Actions. Actions of the players in the game will be modelled as their reaction to natural conditions which are random events. They will be rule-based and will be checked in the game algorithm against a given set of predefined responses. For example: the player representing a resident cannot undertake to build a road, as this falls into the government body's responsibility. An NGO's cannot build a commercial building, but can raise objections against its placement in a certain location.

Rules. Rules form the basis of the game. They include the operational rules of the hardware and/or graphical interface of the game and the official rules based on real-life conditions. The rules for game tokens – like budgets, finances, costs, and defining the player's goals - like the need to finish within the sanction budget, reward mechanisms and achievable targets.

Game play. This game is a cooperative game. Disagreements can be resolved by negotiations, financial, social and political benefits. The goal is that each player, depending on her or his role in the game, can accomplish a task with minimal conflict. All information is accessible to all the players and can be acquired upon request. The game starts off with a budget for development and a social index goal. The scoring for each player will be related to the cooperation index and payoffs.

An example of the game play process:

- Resident representative proposes a plan and he/she places the proposed objects in the map space.
- The government representative raises restrictions and regulations in addition to calculating the costs.
- The real estate agent brings in the commercial aspect to off-set some of the costs in rebuilding the space.
- The NGO's (environmental, rights activists etc.,) check balances for each object and the interlinks between the objects.

The game engine will calculate the costs and provide the financial sheets for every object selected by the player.

Communication. Multilingual text chats and icons will be used as a way of communication among players and reaching consensus. This corpus can be analysed to assess how language and dialog are employed to build social roles and social groups within the game. In particular, we will analyse whether the mechanics of the game and the identities of the "real world" have an impact in determining social roles. Furthermore, we will investigate whether there are difference and similarities within the digital and the physical urban context setting.

5 Conclusions and Future Work

This article introduces a game that aims to support consensus finding in a complex urban planning situation. The study case is taken from India and focuses on a very diverse slum area Dharavi. The complexity emerges due to the variety of different stakeholders' interests and their specific visions about how this area could be developed and renewed.

In the process of development of the game we will also discuss the issues of consensus, whether it can be achieved with the help of a game and how the results of the game play can be used. We are now in the phase of discussing the presented concept, details of game mechanics, and the models used to support the main ideas and concepts.

In the next phase we plan to acquire a substantial amount of human behaviour data, which will be optimized into artificial intelligence engines in successive iterations. Extension can also include children as one of the role-play options, and provide rules or expectations from children. We also aim to capture human cognitive behaviour. The player's data at every move will be analysed by fitting to graph theoretical models. A substantial testing is planned after the completion of the first version of this game. The tests will be executed in India, Germany and Holland. The results of this testing will have an impact on further development of YouPlaceIt! game.

References

Abt, C. C. 1972. Serious Games. New York.

Borries, F. von, Böttger, M., and S. P. Walz. 2006. Ausweitung der Schießzone. Computerspiele im urbanen Raum. In: Archithese, H. 4, S. 43.

Camerer, CF., Ho, TH., and Chong, JK.2004. A cognitive hierarchy model of games. Quarterly Journal of Economics, 119(3): 861–898.

Cecchini A. and P. Rizzi. 2001. Is urban gaming simulation useful?, Simulation & Gaming, 32(4) 507-521.

Costa-Gomes, M., Crawford, V.P., and B. Broseta. 2001. Cognition and behavior in normal-form games: An experimental study. Econometrica, 69(5): 1193–1235.

Devisch, O. .2011. Sollten Stadtplaner Computerspielespielen? In: Bauwelt 24.11, Seite 26-30. Hasselt.

Engagement Game Lab. 2013. Your Community. You Future. Your Move. Accessed: https://communityplanit.org, on March 10, 2013.

Fuchs, M. 2007. Plasticity. In: Space Time Play – Computer Games, Architecture and Urbanism: The next level. Editors: Borries, Friedrich von; Walz, Steffen P.; Böttger, Matthias. Page 370-371. Basel.

Gordon E. and E. Manosevitch. 2010. Augmented deliberation: merging physical and virtual interactionto engage communities in urban planning, *New Media and Society* **13**(1) 75–95.

Gordon E, and S. Schirra. 2012. Playing with empathy: digital role-playing games in public meetings, in: *Proceedings of the 5th International Conference on Communities and Technologies* (ACM,New York) pp 179–185.

Gordon E., Schirra S., and J. Hollander. 2011. Immersive planning: a conceptual model for designingpublic participation with new technologies, *Environment and Planning B: Planning and Design***38** 505–519.

IBM. 2014. City one. Real World Game, Real World Impact. accessed from: http://www-01.ibm.com/software/solutions/soa/innov8/cityone/. January 2014.

Lemke J. L. 1998. Metamedia literacy: transforming meanings and media, in *Handbook of Literacyand Technology: Transformations in a Post-typographic World* Eds D Reinking, L Labbo,M McKenna, R Kiefer (Lawrence Erlbaum Associates, Hillsdale, NJ) pp 283–301.

Mayer, I. 2009. The Gaming of Policy and the Politics of Gaming: A Review. In: Simulation & Gaming: 40 (6) 825–862.

McKelvey, R.D. and T.R. Palfrey. 1995. Quantal Response Equilibria for Normal Form Games, Games and Economic Behavior, 10(1), pp 6-38.

Monachesi, P. and T. Markus. 2010. Using social media for ontology enrichment. In 7th Extended Semantic Web Conference (ESWC 2010) LNCS 6088 and 6089, Springer. Berlin Heidelberg.

Nagel, R. (1995). Unraveling in guessing games: An experimental study. American Economic Review, 85(5), pp 1313–1326.

Parlett, D. 1980. Card Games for Two – Hodder and Stoughton 2nd edition, pp 97 – 101.

Poplin A. 2011. Games and serious games in urban planning: study cases, in *Computational Science and its Applications—ICCSA2011, Part II*, Eds. B. Murgante, O. Gervasi, A. Iglesias, D. Tanier, B. O. Apduhan, Springer, Berlin, pp 1–14.

Poplin A. 2012. Playful public participation in urban planning: a case study for online serious games, *Computers, Environment and Urban Systems* **36**(3) 195–206.

Poplin, A. 2013. Digital serious game for urban planning: B3 – Design your Marketplace!, Environment *and Planning B: Planning and Design*, Volume 40 (3), doi:10.1068/b39032.

Ritterfeld, U., Cody, M. and P. Vorderer (Eds). 2009. *Serious Games: Mechanisms and Effects*, Routledge, New York.

Rusaw E. 2011. Language and social interaction in the virtual space of World of Warcraft. Studies in the Linguistic Sciences: Illinois Working Papers 2011: 66-88.

Sanoff, H. 2000. Community Participation Methods in Design and Planning. Canada.

Sanoff, H. 1979. Design Games. California.