Gamifying the City: Pervasive Game Elements in the Urban Environment

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Abstract

After years using ICT to be connected with others, the world population average weight had tremendously increased. To face the rapid spread of obesity the World Health Organization (WHO) has leveraged the popularity of augmented reality games such as Pokémon go to force people out of their homes pushing them to walk. An application, namely Gamifying the City (GC), has been set up, immediately involving millions of users. Since then, the use of the application has pervaded many other aspects of people's city life, going beyond its original aim of making people engage in healthier habits. This paper focuses on understanding how the use of this technology is affecting our behavior in society.

Author Keywords

Gamification; Critical Design; Design Fiction; Pervasive Technologies.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

The game Pokémon Go, released in 2016, was an incredible success, promoting augmented reality (AR) among a broad audience. In less than few months

about 100 million downloads were recorded with 20 million daily active users [12]. The game brought all these users to real places to catch fantasy creatures (Pokémon), which were placed in public locations (as Pokéstops), or to battle for other players' Pokémon.

This was the first mass application fully overflowing the virtual dimension in the real one, affecting physical spaces as well as social relationships. It encouraged people walking up to 10 km in order to find such creatures with evident positive impacts on their health. Also, the interaction with other users supported socialization processes and the use of public spaces [13]. Even if there were some drawbacks in the use of the game (e.g. London teenagers who were robbed of their phones at gunpoint [6], or US players who had been involved in real shoot-outs [3]), there was a general enthusiasm for its potential. In particular, it was seen as a means to promote physical activity preventing obesity [8] and diabetes [11]. Given the success of Pokémon go, a new generation of augmented reality games emerged.

Understanding GC function

During the first century of XXI sec many scholars worked on the idea of the Smart City. However, making cities "smarter" implied also to involve people in the use of new complex applications, whose direct benefits for them were sometimes quite obscure. Engagement became a harder problem to solve than developing AR technologies. Therefore, the mass use of Pokémon go was inspirational to solve the engagement issue in a Smart City.
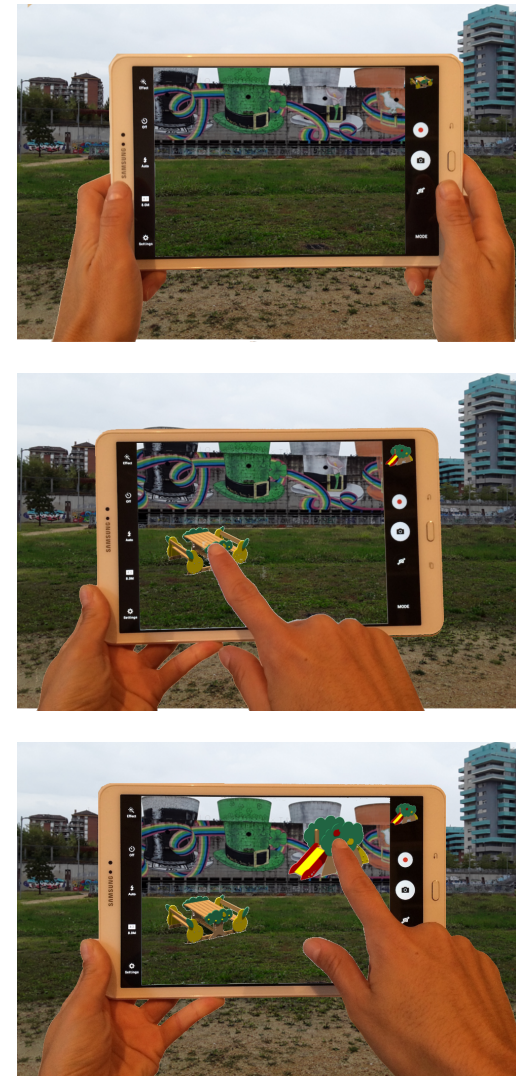
Figure 1: Adding urban elements to a selected area.

Gamifying the City (GC) represented the successful answer to such issues, being adopted at national level in many countries. GC aims at improving the people's general wellbeing within cities making them play while performing virtuous activities. Tests on GC prototypes demonstrated that the mix of augmented reality and gamification elements has a positive response on users making them feel involved and amused. Nowadays, GC is based on two main axes: health and public life.

Gamifying the City for health
Within GC a variety of information needs to be stored in order to start the game. For example, pressure, heart rate and weight should be recorded every morning by players. Then, a personalized set of objectives for the day are established. For example:

- **Make the right meal**: the system recognizes the image of what the player cooked comparing the amount of kilocalories it has with the optimal one). It gives her a score depending on how close she is to the optimum.
- **Go catch the ingredients**: to improve her score and reach the top level of the game ranking the player needs to have the right ingredients in her receipts. Then, she will find them only after having covered a certain distance by walking
- **Do sports take gadgets**: a number of gadgets are available in GC, like a gold ball for football, or a giant racket for tennis. The player can obtain them by letting the system recognize her movements when she is doing physical activity through the use of the proper support.

Gamifying the City for public life
Another crucial aspect of GC is the definition of game stages addressed to produce a more ethic and collaborative behavior in society.

In particular, we can mention three game stages aimed at supporting the citizens engagement in defining their own urban environments:

- **Regenerate**: space regeneration is an important task in urban planning. In recent years it is become much more participative than in the past. However, engaging people in such a task is not easy. Thanks to GC, people can participate in a game frame to add new urban elements in the spaces to be regenerated. In this, way citizens can give a design idea to the city council (See Figure 1).
- **Collaborate**: the regenerate game stage can be supported by the collaborate stage. In particular, in some cases it is crucial to come up with a common design. As a consequence, teams are created and arenas are set up. In the end, the urban design is the result of a negotiation process which gives to the participants different scores depending on the collaborative attitude they had. An automated moderation system is in charge of giving space to minorities.
- **Volunteer**: after a design is created users can also volunteer to support the realization of the design. Even if a player did not participate in the previous game stages, the design can be directly displayed on the real spaces by using a mobile device. Therefore, everyone can contribute to build the new space structure. Users are also provided with instructions and explanatory videos. These three stages generate

a virtuous circle aimed at involving citizens in the public life while playing. Also, it promotes social interaction since players can also physically meet.

GC design principles

GC follows the design principles introduced by Walther [9] who developed a theoretical framework for pervasive gaming by specifying four axes as pervasive game preconditions (See Figure 2).
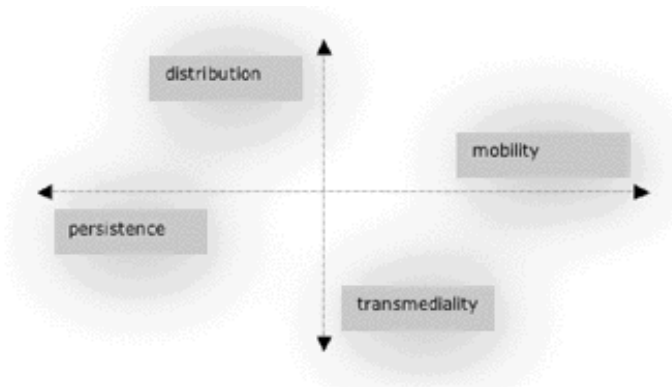
Figure 2: Walther's design principles [9].

- **Distribution**: Pervasive computing devices are more and more embedded in the physical environment and linked together thanks to an increasingly ubiquitous network infrastructure composed by a wired core and wireless edges. This combination of embedded computing, ad-hoc networking, and information sharing clearly affects and strengthens the distributed computing paradigm.

- **Mobility**: Mobility is a challenging aspect in pervasive computing, i.e. computing/network/user mobility or context awareness and device heterogeneity. In particular, for pervasive games are the developments in mobile 3G/4G/5G technologies, WLANs and wireless ad hoc networks.

- **Persistence**: Persistence means having a total availability all the time to play. It needs to keep existing even after the participant has left. This affects the way people interact with the environment as well as with other users.

- **Transmediality**: relates to modes of media consumption that have been profoundly altered by a succession of new media technologies, which enable citizens to participate and media content.

GC Social Implications

Inspired by these principles GC has been designed to involve every aspect of the user's live. It is characterized by the Game Flow eight elements that has been suggested in [10] as crucial to make games highly enjoyable:

- **Concentration**: the player should be able to concentrate on the game.

- **Challenge**: games should match the player's skill level.

- **Player Skills**: games must support players' skill development.

- **Control**: players should feel a sense of control over their actions in the game.

- **Clear goals**: games should provide the player with clear goals at appropriate times.

- **Feedback**: players must receive appropriate feedback at appropriate times.
- **Immersion**: players should experience deep but effortless involvement in the game. To this regard, the use of two-dimensions map and augmented reality shows great potentials.
- **Social interaction**: games should support social interaction among people.

Achieving the eight Game Flow elements [10] brings users to a totalizing experience. Therefore, motivations behind their urban behavior will be found in the game objectives rather than on their free choice on how to live the city.

Conclusion

This design fiction [1] shows the two faces of technologies based on pervasive game elements in the urban environment. In particular, it focuses on the potential social impact they have. The opportunity to address people behavior, indeed, has possibly positive and negative outcomes.

Therefore, without taking extreme position on a side or on the other, in our view it is important to underline that the balance among them it is not easy to be identified. Research on such technologies should start considering a scientific way to assess these applications also on a social basis. As a post-modernist geographer, David Harvey [4], highlighted "the question of what kind of city we want cannot be divorced from that of what kind of social ties, relationship to nature, lifestyles, technologies and aesthetic values we desire".

Also, the right to the city he claimed stands in the collective power we can exercise to make and remake

our cities. At this point, a question arises: how much do urban-based applications support or interfere with our freedom to shape the cities?

As underlined in [7] the use of technologies in governing urban systems is never neutral. Distribution of power among the actors of a city is strongly correlated to control of the technology itself. In the case of introducing pervasive game elements in contemporary cities, as it has been seen with Pokémon Go, users are only driven by the objectives of the game without being aware that it is an algorithm which decides where they must be to play. Who has control of these types of technologies can critically influence people spatial behavior. This could led to an unequal distribution of power within cities, which is mainly concentrated and determined by the interests of who develops the system as discussed in [2].

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