

Location-based mobile games to experience urban destinations

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Abstract

Mobile game technologies can provide an important added-value to cultural tourism by supporting tourists in their direct field-experience. Given their ability to gracefully integrate computing power into the physical world, pervasive computing technologies are well suited to enhance the experience of the surrounding environment. This paper describes the GeoJoko project, which aims at offering a pleasant and useful tourist and cultural experience in the urban context of the city of Donostia-San Sebastian. The experience relies on active exploration of the city (streets, squares, churches, palaces, etc.), its people and their activities in order to have a better understanding and knowledge of its Cultural Heritage and collective memory. Several field tests have been conducted with tourists in late October 2008 in order to assess the impact of GeoJoko on users of a segway tour and to check its suitability as an edutainment tool for discovering a urban destination. The evaluation has been successful and valuable information for further developments of the prototype has been collected.

Introduction

While tourists in general choose to travel for many reasons, one significant market segment of them travel to learn about the places they visit. Specialized mobile guides are severely missing for this group of tourists. Anyone who has taken a high-quality tour from an excellent tour guide who uses narrative strategies to explain the environment knows the value of such an experience. However, many of the current electronic approaches have forgotten the narrative component to just present simple facts. This ignores the enjoyment of narrative comprehension of a location and its cultural background.

On the other hand, and in the recent years, there is a growing

interest among researchers about new ways of gaming which apply ubiquitous computing techniques. Extending game experiences into the physical world through mobile technology has stimulated the search for compelling applications involving tourist activities. Tourists equipped with handheld devices can move through the destination and receive information, record observations and so on. GeoJoko is an example of a new type of game based on wireless and ubiquitous computing technologies to create a transparent linkage between the physical world and Web resources.

A game structure that closely resembles a treasure hunt has been created, targeting people aged 18 to 60. The research focuses on investigating how a computer game can improve tourists understanding of the destination they visit. Passing from one stage of the game to the next one is a critical aspect of the game. In the typical treasure hunt, players make this transition by solving an enigma. GeoJoko, instead, exploits the visit to San Sebastian. Simply finding the right route to a given tourist Point of Interest (PoI) is a challenge.

When a stage is completed, GeoJoko clearly reveals the next PoI and shows a low-detail map that displays the main streets needed to reach it. While following a path, tourists can check the map to determine their current position and desired direction. Field tests have revealed broad user acceptance for such a solution because it combines a clear indication of the next destination with the challenge of finding the right path through the urban environment.

This paper includes the following sections. The second section describes a brief state of the art including several concepts related to games and their application in urban environments. The following section focuses on the GeoJoko project and its performance. Finally, the real evaluation of the prototype is described, including the methodology of the assessment campaign and the evaluation results.

Related work

A mobile game is simply a game that runs on a mobile device. Some mobile games use the environment as the playing ground, capturing information about the context of the players to deliver them an experience that changes according to their location. Perhaps, the most promising example of such games is location-based games. Moving beyond core information services, location-based experiences aim at providing the user with a richer experience that extends across a series of locations. These experiences extend digital media out into the physical world. A number of industrial and academic research projects have explored the idea of using geographical locations as a resource in a computer generated game.

On the other hand, Augmented Reality games integrate the virtual world of the game with environmental space at a perceptual level. Widely acknowledged examples of such games are, for example, Can You See Me Now and Uncle Roy All Around You. The former is a mixed reality chasing game where online participants compete or collaborate with mobile participants on the street (Benford et al, 2006). Both games are played via a traditional screen-based GUI. Participants can also collaborate by communicating via a real-time audio channel while moving through the streets. High bandwidth networks and digital maps should be available.

The latter (Flintham et al, 2003) is an experience that mixes online and street participants, physical and virtual worlds, and programmed game-play with live performance. Street players walk through a city, following clues on a handheld computer and trying to find the elusive Uncle Roy, while online players follow their progress in a parallel virtual model and try to help them.

Another example is Backseat based on the changing scenery and the

sense of motion during travelling. The real world passing by the vehicle acts as the world where the game takes place, and the gameplay and the narratives have clear connections to the roadside objects seen from the windows of the vehicle (Brunnberg and Juhlin, 2003).

Furthermore, in recent years, location-based pervasive games, where the physical location of the user in the real world is a key element, have increasingly become a research focus. Pervasive gaming has been extensively studied in the iPerG project. One example of this concept is Songs of the North, a persistent multiplayer game that takes place in a semi-fantastic reality created on the basis of Finnish mythology (Lankoski et al, 2004).

Another example is REXplorer, a mobile pervasive "spell-casting" game designed for tourists of Regensburg, Germany (Ballagas, Walz and Borchers, 2006). The game uses their location to create player encounters with historical figures associated with historical buildings in the urban setting. Waving a mobile phone through the air allows players to awaken and communicate with a spirit to go on with the game.

Finally, a more recent urban game created by Blast Theory, Rider Spoke, was implemented in Sidney in February 2009. Riders were invited to take a cycling journey through the street and lane ways of The Rocks. Equipped with a touchscreen computer mounted on the handlebars of the bike, riders searched for an undiscovered hiding place, recorded their thoughts and reflections in response to questions posed by the artists, and listened to intimate reflections from other participants.

The GeoJoko project

The main target of GeoJoko is to offer a pleasant and useful tourist and cultural experience in the urban context of the city of Donostia-San Sebastian (Figure 1). The project explores how

mobile gaming can help tourists enhance their experience of the city (streets, squares, churches, palaces, etc.), its people and their activities in an urban environment. GeoJoko is an example of a new type of game based on wireless and ubiquitous computing technologies to create a transparent link between the physical environment and multimedia contents.



Figure 1. Overview of the GeoJoko prototype, including the location of the treasures.

The experience has been designed as a game structure which closely resembles a treasure hunt game and targets young adults aged 18 to 60 years. Players are grouped in teams. The suggested team size is limited to two players, so that both of them can actively participate in the game considering the limited screen size of mobile devices. The game challenges players and stimulates competition by assigning scores that reward the activity of the players.

Participants are invited to go through a sequence of stages,

which are associated to tourist Points of Interest (PoI) distributed in the city. At each stage, a stage-menu is presented with some games based on multiple choice questions. This is an appealing and funny typology, since players can discuss among a small number of possible answers.

The game does not impose time limits as it seeks to invite a leisurely journey of discovery and appreciation of the destination. The winner is not the team which completes the path first, but the one which completes all the games best, gaining the highest score. Most games reward accuracy and effectiveness.

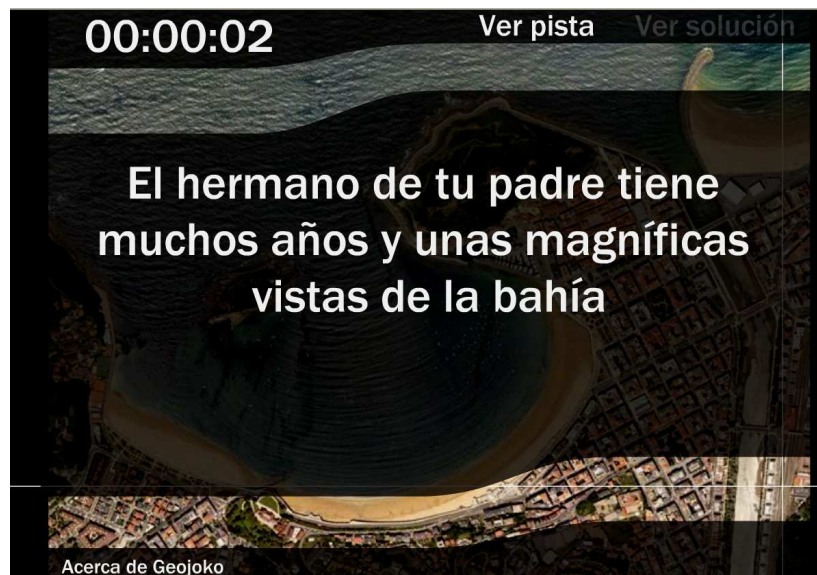


Figure 2. An example of the stage-menu, where the user is provided the question to find the treasure (The brother of your father is very old and has marvellous views to the bay).

Evaluation of the prototype

Several field tests have been conducted with tourists so that several critical features regarding usability and user-friendliness could be improved. An evaluation campaign conducted in late October 2008 assessed the impact of GeoJoko on users of a

segway tour and checked its suitability as an edutainment tool for discovering a urban destination. The experiment involved 19 participants in several sessions. 7 female and 12 male participants took part in the assessment, with an average age of 16-30 years. Most of the users were citizens of Donostia-San Sebastian, while there were also players coming from the nearby provinces and other regions and countries (Germany, France, Colombia, Slovakia).

Description of the experience

After a brief introduction of the performance of the segway, players collected a PDA with the GeoJoko software loaded. Although the game can be installed in their own devices, this approach simplifies the validation of the prototype. Given the limited bandwidth available for current mobile phone connections, all multimedia contents have been locally stored on the portable device to minimize data transfer. The HP iPAQ 214 was selected for the experience as it fulfils all the requirements except the GPS sensor. Thus, an external GPS was connected using the Bluetooth connectivity.

At the beginning of the experience, the screen displays the first stage and a map with the current position and the distance to the target point (Figure 3). Players have to decide in which direction to move. As further information to solve the stage, the system displays the distance to the PoI in real time. Thus, players can change their direction in case this distance increases. However, if after some time players do not know the solution to the stage, they can click on the solution button in order to retrieve the correct location.



Figure 3 Description of the performance of the system.

An alarm is activated when the player is near the target, so that the player can visualize the multimedia content associated with the stage. In order to simplify and make the definition of the stages uniform, several characteristics have been defined for each stage, such as the title of the stage, its location (GPS coordinates), texts for the audio, text visualized on a mobile device and multimedia content associated to each stage. Moreover, additional information is provided in order to synchronize the audio, text and multimedia contents that are visualized on the screen.

The following screen displays the question associated with the stage that should be answered in the correct way. If this happens, an avatar dressed on a traditional suit is displayed in

order to present the scores (Figure 4). Further pieces of the traditional suit are added to the avatar if the answers were correct.

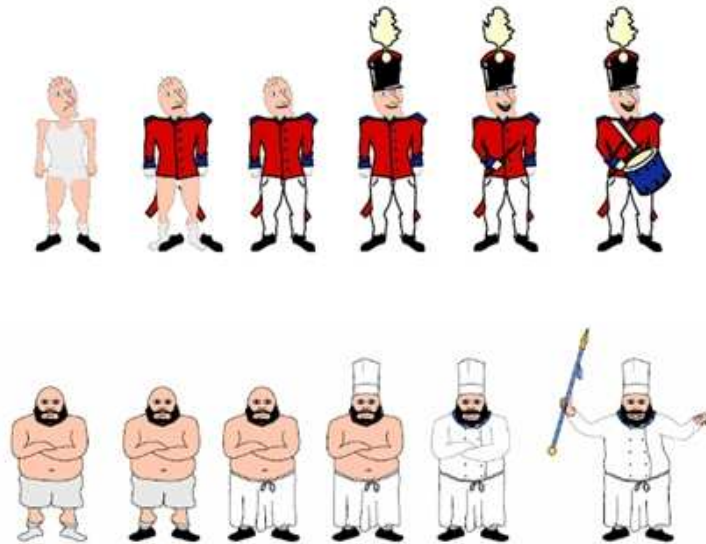


Figure 4 Interface with the scoring system.

Once the stage is over, tourists receive additional information about cultural and tourist aspects of the PoI and the following stage is presented. A map and the estimated distance to the target are presented again. It must be mentioned that the number of questions and the information provided are different on the basis of the PoI.

Evaluation results

A questionnaire was used to perform a qualitative analysis of user acceptance and satisfaction in real use conditions (Figure 5). This questionnaire includes 23 multiple choice questions and a free text comment section.

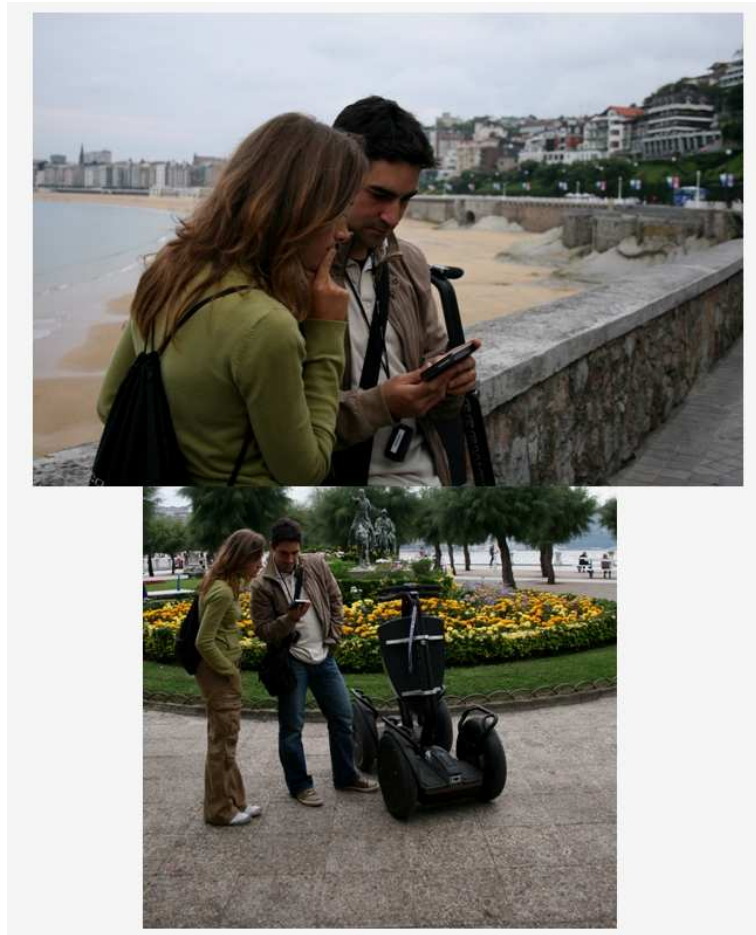


Figure 5 Users during the evaluation.

The evaluation has been successful and valuable information for further developments of the prototype has been collected. Although the overall impression about the prototype was positive, the following comments should be mentioned:

- How did you know about GeoJoko. Two third of the players knew about GeoJoko by the partners of the consortium. Our analysis reveals that user familiarity with new technologies has little correlation with the considered variables, suggesting the suitability of GeoJoko as a tool for the general public. Over 20% of the users use normally computers, laptops, mobile telephones and Internet. Finally,

the main motivations for using GeoJoko have been to enhance the knowledge of the players about the city (more than 60%) and to enjoy the visit to the city as it was free (nearly 25%).

- What did you think about the stages. Most of the users were very satisfied with the stages although a quarter of the respondents found the experience too long. Moreover, the number of stages for the prototype was also considered as correct by three quarters of the players. The optimum number of stages for most of the users was among 7 and 8, so the current number was appropriate for the 58% of the users. Regarding the complexity of the quizzes and questions associated to the stages, the answers were very different from each other. Although some of the players found the questions very difficult (32%), the level of difficulty was appropriate for the same percentage.
- Assessment of the multimedia content. Nearly three quarters of the players were satisfied with the quantity of the available information and content. Only 10% affirmed that there was too much information in each of the stages. A further question tried to measure the quality of the information. 70% of the users affirmed that the available content was quite interesting. Moreover, the user friendliness and attraction of the game was also evaluated. Two thirds of the players agreed with this statement.
- Assessment of the technical quality. One of the main aspects assessed was the speed for visualizing the multimedia content as the basis for the acceptance of the application. 68% of the players agreed on the correct rendering speed for the multimedia content. 60% of the respondents complained about the quality of the audio due to the environmental noise. Regarding the interface, more than 90% of the players were very satisfied with the user-friendliness of the Graphical User Interface of GeoJoko, so they did not recommend any changes.

- Assessment of the experience. Regarding the functionalities provided by GeoJoko, most of the users (60%) affirmed that the most attractive feature of the prototype was the new way of learning more about the city in an engaging way. 25% of the users mentioned the possibility of displaying the current location on a map. Other aspects such as the dynamics of the game or the use of the technology as a tool to improve the experience were also well assessed.
- Commercial exploitation. 95% of the users answered that they would use GeoJoko again. Regarding the most appropriate device for the experience, 60% of the players selected the PDA while 30% chose a mobile telephone. 80% of the users answered that they would pay for the experience. Regarding the price, most of the users (42%) would pay between one and three euros, and 26% of them between 4 and 6 euros.

Conclusions

This paper describes the results of the evaluation of the stand-alone prototype of the GeoJoko project. The project explores new ways in which technology can provide tourists with rich and engaging digital experiences while on the destination, including those related to Cultural Heritage and collective memory. GeoJoko is an example of an innovative approach to location-based serious games based on wireless and ubiquitous computing technologies to create a linkage between tourist destinations and new technologies.

The project is based on a game structure that closely resembles a treasure hunt. Instead of finding treasures, GeoJoko aims at finding the right route to a given Point of Interest when visiting a urban destination. Passing from one stage to the next one is a critical aspect of the game. In the typical treasure hunt, players make this transition by solving an enigma. In this case, when tourists are at a given location, they are provided

with some kind of quiz in order to find the next stage. While following a path, players can check the map to determine their current position and desired direction.

Moreover, the evaluation has been successful and valuable information for further developments of the prototype has been collected. Most of the users were very satisfied with the stages although a quarter of the respondents found the experience too long. Regarding the complexity of the quizzes and questions associated to the stages, the answers were very different from each other. Finally, most of the respondents answered that they would pay for the experience between one and three euros.

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