Simple, cheap and quick: three urban games for common mobile phones
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Abstract

In this report we tell about our experiences during a project of designing and implementing three different location based games for mobile phones. The overall design principles for this project were: (1) design for device platform with wide penetration; (2) create an architecture that supports different types of games and services, scalability; and (3) aim for cost efficiency and quick application development. The resulted three games are different in nature, but each of them introduces a potential design approach for future pervasive or location based games. The gathered player feedback also supports further development of these three games. We see several opportunities for extending the ideas from gaming also to various other location-based applications.

Keywords: urban game, mobile phone, Bluetooth, game development

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1. **Introduction**

Location based gaming and pervasive gaming are novel forms of digital game entertainment. They take into account the physical characteristics of the real world as well as the computer-maintained virtual game environment. Also, they usually have a strong social aspect.

Today characteristics, features and technology platforms used in pervasive gaming are still often prototypes resulting from ambitious long-term research projects, and thereby complex and, quite likely, also expensive. Prototypes made for testing the ideas are often comprehensive and well designed from the game point of view. By mixing manufactured and custom-made devices together with advanced game logics, the result can be an immersive game experience breaking the bounds of traditional computer games. When the technologies intended to be utilized in later, preferably commercial, game realizations are still under development, they seldom are accessible to potential game adopters. Also the robustness of technologies in the making may be less than optimal.

The challenge is therefore to make game realizations that are actually adoptable by users with those devices they already have. The main obstacle is the use of multiple devices, and the one-purpose nature of the device combinations. Thus, we decided to ground our project on simplicity, low cost, and quick development. In this paper we will describe the case of developing location-based systems for three different games.

First, the background for our project is briefly discussed, and the design principles are outlined. Then the game development project and the technical architecture are introduced. The game realizations are analyzed briefly including feedback from the players. We conclude by discussing the strengths and weaknesses of our approach, ideas for future work and the business opportunities foreseen.

2. **Background and principles for game design**

Pervasive games often include location awareness or other elements from physical world. Also, the context of player and perhaps qualities of the environment are taken into account. Some, but not all, game objects may be physical. Some actions or game events take place in a virtual world, some in the real world (Magerkurth et al 2004). Access to the game world can happen with use of various devices. In pervasive games, the game experience can be trans-medial: inputs and outputs between a player and the game system can occur on multiple different media. This emphasizes the role of the player as an interpreter of information from various sources (Walther 2005). These approaches emphasize the technological as well as the social aspect of pervasive
gaming, originating from the concept of pervasive computing. Montola et al. (2006) use the classic definition of play by Huizinga (1938) as basis for defining pervasive games. Huizinga proposes that play is playful, not serious, voluntary action that is distinct from everyday life in terms of time, space and people. A game occurs in a magic circle of certain place, certain time with certain people. Montola et al. then define a pervasive game as a game that extends beyond this circle socially, spatially or temporally.

Our game development project was stimulated by the idea of expanding the game experience to be part of everyday life, not just a separate activity. Today, virtually everyone is carrying a device capable of running games and other multimedia applications – a mobile phone. When the game device is equipped with data transmission capability, a multi-player network game is one obvious development trend. Further, if the playing occurs when the players are mobile, their location could be used as a factor in the game state at any given point of time. Likewise, the game moves can be made dependent of physically visiting certain physical locations.

As key design principles we emphasize the following three:

1. **Design for a device platform with a wide penetration.**

   By designing applications for a device platform with a large user base, the applications are more likely to spread out and gain popularity. With the large user base, a multiplayer game gets a bigger social factor. Further, the threshold to try the game or other application is significantly lower if it does not need the purchase of a new device.

2. **Architecture that supports different types of games and services, scalability.**

   From the beginning, we saw it necessary to design a basic architecture that would suite different types of location based game models and other services, offering different kinds of experiences. Although the main idea was to design a model for a persistent multiplayer game, we found room also for solo gaming and event-based one-time experiences.

3. **Cost efficiency and quick application development.**

   The project team had previous experience in J2ME programming, so beginning with it was the obvious choice. We also wanted to harness the players own imagination in the game play experience. No expensive 3D modelling was implemented, and the users were provided mainly with textual information. The hardware infrastructure followed the principle of cost efficiency, consisting of standard mobile phones and battery powered Bluetooth beacons. Since the data transferred during the game play was mainly textual, the network rates were not a problem.

   Game play is a natural motivator to participate in something that is not immediately necessary or beneficial. A game that coordinates the public to do things with useful side effects would allow gathering large amounts of information from large geographical and
social space. By controlling game events and perhaps game logics and rules, the agencies that ultimately use the gathered data can steer the players to do tasks supporting their needs.

We agree with the suggestion of Capra et al. (2005) that pervasive games can be used to support research groups who use, for example, environmental data. With appropriate devices and networks, ordinary people could collect field data by means of game play. The game would keep the lay people interested in a continuous effort. This game must be easy to participate in. The devices used should be either very familiar to the players (like their own mobile phones) or easy to manipulate. The game rules should not be overly complex, as the play will take place in a variety of environments. At the same time, however, it is crucial that the researchers do get the data they need from where they need it. The amount of data received in this way could be very large. Even though the experts would guide – via the game rules and feedback – the players, there is still a likelihood of getting less than optimum quality data. The data would need cleaning, but the replicated data items can help in this. For a future research project making use of this idea, we found it necessary to begin a game development project. However, the game project was soon considered a separate project.

3. Game design process

The idea of using game play as a motivation for players to participate in something not directly beneficial, or harmful, for them, guided the design of the first game. The aim was to create a game that would lead players to certain places repeatedly. The game system should be stand-alone, run the game and guide players automatically. Also, it should allow intervention by administrative personnel to redefine the important places in the game.

Ultimately, we designed three games based on the same basic architecture. Each design and development cycle started from a game concept idea.

3.1. Game logic design

The idea developed through a simple resource management game: Players should invest their game credits to physical places by actually visiting them. Then, the investment starts to pay back in form of interest. This interest can later be re-invested. The investment can be lost if another player pays more for the same place. To protect the investments made, the players need to once in a while visit also places they already hold, in addition to investing in a new place. Thas way the prices can be kept up and the investments secured. The players are organized in teams to ensure that even newcomers get similar resources to other players. A persistent game would then be a continuous battle of domination of most game spots.
In the first one, Turku-game, the original idea was left aside and the goal for the players was to solve a murder mystery, aided by a virtual private detective. The game narrative was based on the works of a local novelist. The game took place during the Arts Night in Turku, a medium sized city in South-Western Finland. The players visited a number of attractions during the evening. Once a player detected a hotspot, she or he received a question related to the site. After replying to the question, the player received a clue about the mystery. Each clue helped to get closer to solving the murder.

After the success of the Turku-game, the original game idea was implemented and named Conquer the Quarter. The game idea was to eliminate other players by conquering all the quarters marked by Bluetooth beacons or by buying them out. In the game, each Bluetooth-tagged hotspot had a certain value in the beginning and they were all distributed in corners of the game area. A player could freely increase the value when capturing the corner by investing in it. Other teams then had to pay this new value to capture it. The investment also paid back in interest. The longer the player owned the corner, the more money the team earned. By capturing corners and making wise investments, teams would soon have a property that earns quickly, ultimately enabling the team to conquer the whole quarter. Conquer the Quarter was played in Manhattan, New York as a part of the “Come Out and Play Festival 2006”.

The game concept for the third game, the Gnome-game, was designed combining the ideas of the earlier games. It was planned for the Christmas season of 2006. According to the plan, there are named hotspots on the map. The player first goes to one of them, and gets a short explanation or a story about the current spot. The player is then asked to take a picture, and finally receives a hint to find a nearby hidden spot. Once the player finds this hotspot, they either get a new hint, or they can proceed with the hotspots already marked on map. At each hotspot, they take a picture, and get short story that links to the current location. The aim is to visit as many hotspots as possible and document the adventure by taking pictures. Pictures are published in real-time on the web. The aim of this game was to work as a guide showing different paths between interesting places in the Turku city centre during Christmas time. Also, the players, by taking pictures, would produce material to the Web.

As in earlier realizations, the game spots were to be digitally marked using Bluetooth radio beacons. The player has to be in physical proximity of a particular beacon to make a move in the game. When in the location, the client application prompts the user with sound and vibration, and a context-based screen appears. The application suggests the player to make a game move that is possible at the current game state.

### 3.2. Software design

All the three urban games share the same architecture with five elements (Figure 1): Bluetooth beacons, mobile phones with game software (client) installed, service provider network (GPRS), the game server, and a database.
Each Bluetooth beacon consists of a standard USB Bluetooth adapter, wired up to a custom-made external power adapter that enables running them stand-alone. Beacons initially need to be activated while connected to a PC, and they can then be unplugged. From that point on, they will be running and transmitting the needed signal so that they can be detected by the phones.

Figure 1. The overall system architecture.

The client software runs on the mobile phone. The game platform is Java 2 Micro Edition (J2ME). The minimum requirement for the game to work properly is to have a Java-enabled mobile phone that supports J2ME MIDP 2.0/CLCD 1.0, Bluetooth API, multimedia API (for the camera) and a GPRS connection. The game uses the GPRS connection to communicate with the game server; therefore a service provider supporting this is needed. The game management is run on the server with the help of the database. The architecture is presented in Figures 1 and 2.
4. The game experiences

4.1. Turku-game

When playing takes place among other people in an urban environment, the players cannot be expected to have their focus only on the game and the game device. The first game realization, “Turku-game” was tied to events of the Arts Night. This gave a fruitful yet laborious approach to game design. We tied the narrative to the events of the night and aimed to design a mixed reality interactive story that would expand the overall cultural experience.

The Arts Night, when the streets, galleries, restaurants, bookstores and others were full of events, gave an ongoing atmosphere for the game experience. Deeper immersion in the game was reached when the game story and virtual events were tied to ongoing live events. Even if playing the game was for some players the main activity, they ended up to places and events they otherwise would not have found. So, in addition to the gameness, the game worked as a guide to the evening.

The enrolment form was available on the Web, and the public was informed in the local newspapers. The players were chosen in order of enrolment. Most players had seen the newspaper ad or heard about the game from their friends. The 17 players were both male (9) and female (8), and aged from 16 to 35. In the collected feedback, the players showed overall interest to this type of gaming. They also found this particular game exiting, and many said it gave an interesting new view to gaming. None of them had played similar games before. Two had played traditional LARP (Live Action Role Play) games, also in city surroundings. Thereby, they all were unprejudiced and were curious to see where the game would lead them and how it would work.

The players started all at same place, where they were given the game devices and briefed about the idea of the game. They also got a printed map, where the game starting points – the murder scene and the current location of some key witnesses – were marked. The organizers guided them how to receive a first hint and to get the hang of how to solve the murder mystery. Then, the players started the adventure at their own pace. Most of the players played in pairs or small groups and only a few players played alone. This was probably due to the nature of the Arts Night event, where people usually come with friends.

At the game hot spots, players got hints that helped them to build a big picture of the mystery, and to find new hot spots with new hints. Two of the 15 hot spots of the game were carried by actual persons, who then gave the required information to the players.
Some of the clues in the game required awareness of the other events during the night. The hints sometime referred to an event, not directly to a place. If they dead-ended in the game, they had a phone number for “private detective Vares” who would help them out. He was also helping in technical issues that were expected since the game was a prototype. During the game, “Vares” received about a dozen calls. Half of them were about game situations, the other half technical issues. During the game, players occasionally met other players, and talked about the game itself, as well as the technology. They shared information and helped each others with the application. After the game, when answering the questionnaire, twelve out of fourteen players said that they would have needed more technical counselling about the gaming device and the software.

In Turku-game, the overall experience was positive. As the organizers recommended before the game, the players enjoyed also other events of the night. A couple of days after the experience we approached the 17 players with questionnaire about the game event and received fourteen answers. The questionnaire was semi-structured leaving room for players to freely describe their experience and thoughts about it. We asked them to describe their thoughts about the game before the game, during the game and afterwards. Also additional comments were asked. The questions are presented in Table 1.

Table 1. Evaluation questions

<table>
<thead>
<tr>
<th>Before the game:</th>
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<tbody>
<tr>
<td>1. From where did you hear about the game,</td>
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<td>2. What did you expect the game to be like?</td>
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<tr>
<td>3. Was the guidance given prior to the game sufficient? If not, what was missing?</td>
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<table>
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<tr>
<th>During the game:</th>
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<tr>
<td>4. With your own words, describe how you game play went and what did you do</td>
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<td>5. How much did you communicate with other players during the game? Did you</td>
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<td>6. Did you play alone or with company?</td>
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<td>7. Did you talk about the game with non-players during the game?</td>
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<tr>
<td>8. Did you manage to immerse to the game? What affected this the most?</td>
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<tr>
<td>9. What kind of technical problems did you experience?</td>
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<table>
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<tr>
<th>After the game:</th>
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<tr>
<td>10. What are the most important things you remember from the game?</td>
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<td>11. What was the most fun thing in the game play?</td>
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<tr>
<td>12. What was the worst thing in the game play?</td>
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<tr>
<td>13. How did you experience this kind of combining mobile gaming with a</td>
</tr>
<tr>
<td>14. How would you suggest this kind of game to be developed?</td>
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<tr>
<td>physical playing environment?</td>
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</table>
15. Would you be interested to play similar, but further developed game in future?
16. Other comments

Many told that they found interesting events because the game led them to places they otherwise would not have found. On the other hand, some claimed that the game felt like just running from one place to another, and not true gameness existed. They yearned for more complex tasks or tricky puzzles to solve to go ahead. In the game, it was enough to find the right place, and the hint and a piece of the story was received.

The technical problems were another issue. A few players had continuous problems with detecting the Bluetooth beacons. This was really annoying, and made the experience nothing but trying to figure out why it does not work. This also reflected on the player-to-player interactions: most of the conversations between players were about the technology and the whereabouts of the hard-to-find beacons, not the game story or the experience.

In a few cases, the players were frustrated while they knew they were at right position, but the hotspot was not detected in the timeframe they expected. Some players were more sensitive to latencies in the system, while some others took it calmly and had a drink near the place they knew was a hotspot.

In one game location, the Bluetooth beacon had been removed by the Arts Night staff, because some person (not a player) had mistaken it for a bomb! In another case, the Bluetooth dongle was unplugged from the power supply, thus it stopped working. These incidents caused some players to dead-end in the game.

When asked about what they thought and remembered about the game afterwards, the most common answers were the game idea and story and the technical problems.

4.2. Conquer the Quarter at the urban game festival in New York

The players of Conquer the Quarter were participants of the Come Out and Play urban game festival and therefore quick to get the idea. The game begun with a briefing, where players were provided with a game device (a mobile phone) and a paper map with the 15 game corners marked. Similar information was also in electronic format available through the user interface of the game application, but due to the small screen size and bright sunlight, the paper map was found to be more comfortable.

The players were divided into three groups. One group had four players and the other two had three. All players were in their mid-twenties and obviously interested in this type of games, as they were participating in the festival. The game involved running competitions, spontaneous strategy meetings, and laughing. The fast-paced game got its culmination right after half the time was spent: the green team had lost all of its corners.
and most of the game credits. From that on, the blue and red teams were to fight for the domination of the Quarter.

The game parameters were fixed to support approximately one hour game. The adjustable game parameters are the number of game corners, interest rate and the length of the interest cycle. In this case, the rate was 10% interest plus 1% for each corner the team was holding. This rule was added, because in the early tests, some players ended up investing all the credits in one single corner in the beginning, and later buying everyone else out. That proved to be an unbeatable strategy in the long run, but there was not much of game and challenge left if this strategy was used (cf Juul 2005). The interest cycle was set to one minute. That way the teams had continuous credit flow (in case they had made investments), and the game pace was kept fast.

Conquer the Quarter encouraged the players to full time intensive game play. As the game was set up in an area covering a few city blocks, it was suitable for an intensive one hour game. The players, however, agreed that one hour was too short, and that the area was too small. They also would have preferred to play this kind of a game in a more populated area. The game was played in area that was mainly about garages and quiet art galleries. All the players had a very enthusiastic attitude, and as the teams were formulated, they liked the idea of leaving the communication between players on face-to-face basis. However, some players said that after a while, when the teams had begun to conquer the game spots, it felt that a little bit more complicated game logic would have given extra excitement to the game. One suggested a model of ability to build combinations of corners, like three in a row or similar and giving something extra if the team managed to do so. None of the players missed any graphics in the game, and also the information provided about the game state was extensive enough. Only the usability and small font size of the user interface raised some comments.

As we expected, in this type of a game, when the actual game events happened occasionally and the player did not need to stare the game device all the time, any further simulation would be unnecessary. Thus, the game could be defined as mental game (Nilsen et al. 2004) while players have to resolve all the simulation themselves. The connection between real world and the computer maintained logic was not tight in this game. One player suggested giving the virtual corners some qualities of the real world to strengthen this tie.

We were not able to play the Gnome game in public, but the prototype has been demonstrated to several audiences, with interested feedback. We are now working on several further projects with local partners to create urban games to suit their particular needs.
5. Challenges

A game as a system does not work without a sufficient number of players, or the game experience might not be as enjoyable as possible. A breakthrough of new forms of mobile content and new kind of games is not only a matter of how good and interesting the new big thing is. It is also about the usability and usefulness of the system. Being able to attract a large number of users is crucial for the success of the system, whether the business model counts on cash-flow from end users (Messerchmit & Szyperski 2004) or from a network of companies. Building the network of stakeholders is another critical issue.

The network of partnering organizations should provide additional value for the system in a manner that attracts potential users more than any of the organizations alone. From the system architecture and design point of view this requires careful concept-level thinking. The needs and demands of users – as in any information systems project - have to be taken into account. Further, if game-like content is to be provided, it is a challenge to tie together the game components and other content in the system. This tie is necessary if the business model builds on the network of partners who all expect to benefit from the system. A solution would be to base the system as a whole and the possible game logic on a generic architecture, without dependence on some particular components.

6. Conclusions

Current sophisticated computer games offer vast virtual worlds and deep multimedia experiences. The enjoyment in playing these games is founded on immersion into the audiovisual experience. Complex games with high computing capacity consumption, and need for long-term, intensive attention, are not ideal entertainment for all players. A growing number of players are so called casual players, who are not willing to spend neither much time nor money to games or playing. The age and gender of playing audience will diversify. It can be proposed that easily accessible and playable games with little need for time will gain in popularity. Furthermore, digital games could learn from traditional tabletop board games when it comes to the social domain of game experience. To take heed of this, an innovative approach is needed, and a current idea of what is a game is perhaps to be left behind.

In this article, we have briefly presented a game project and its results: three different location based games that offer one way to break the traditional boundaries of computer entertainment. Our aim was to design a location based game that would enable a mixed reality experience by using a common mobile phone as a game device. We had made it clear to ourselves that use of any combination of devices, such as palmtop computer and GPS (Global Positioning system) device, was not an option. The use of Bluetooth was chosen to make the location-based events possible. Bluetooth is a standard feature in
many mobile phones. With the project, we wanted to contribute to the pervasive games research from our own vantage point.

Creating a mixed fantasy (Nilsen et al 2004) experience with a combination of virtuality, reality and imagination, is not an easy task. When the qualities of physical surroundings are claimed to be tied to the computer-maintained game world, the players expect such a connection to exist. Latencies and technical issues might loosen this connection, and the immersion suffers. If the game events are in tight connection with real world properties, the player is eager to see this connection. On the other hand, if advancing in the game requires combining information from the physical and the virtual worlds, reconciliation of those two has to be smooth. A mixed-reality game environment would require a much more careful game design than we were able to evoke during the rather fast-paced development project. We claim that according to our experiences, a coherent mixed reality environment is not necessarily needed to create a game offering a new kind of interesting experience and even a model for mobile entertainment. Also, we argue that a location-based game can introduce a story, and the player can actually be part of it, contrary to what has been claimed earlier (Rashid et al 2006).

Pervasive games can be seen as socially, spatially or temporally expanded games. The game prototypes introduced here do not fully meet these challenges. However, we think that they have the potential to be either persistent in time or unlimited in the number of players. On the other hand, they already meet the challenge of spatial expansion. With a limited number of Bluetooth beacons to mark the spots meaningful in the game, the game area is by no means unlimited. Our model, we believe, could be scaled up to harness a wider area of physical space to game play. A future research question would then be how the Conquer the Quarter game would be set to a city centre in a persistent manner: would the popularity of certain places in the physical city affect the popularity and virtual price of the virtual corners? Also, in the case of a narrative-based game, the question is, could players be used as writers of stories and mysteries that others could then play?

A general issue concerning our approach is also how to create a design that reacts to the real world environment and causes a shift in the game in a manner that would guide players to new locations. Our three cases, we propose, give one example of possible direction for future game development. By creating simple, interesting and a little bit tricky games that give something extra to the players’ everyday environment, it might be possible to interest and engage them to a new type of gaming. This can be a starting point of creating new types of mobile services and business models.

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