Using Player Proximity in Mobile Multiplayer Games – Experiences from Sandman

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ABSTRACT

In addition to using Bluetooth as a communication channel, it can be used to discover other devices nearby. In games, such information can be used in many ways, such as to group people or direct player to player interaction for instance. In this paper, we explore the possibility to use social proximity in multiplayer gaming using mobile phones. As an example, we describe Sandman, which is a context-aware game built on the Multi-User Publishing Environment (MUPE) platform. The game is available for mobile phones with an access to the internet, Bluetooth, and Java MIDP 2.0

General Terms

Experimentation, Human Factors.

Keywords

Context-Aware, pervasive game, Bluetooth, MUPE, multiplayer mobile games, proximity.

1. INTRODUCTION

Context-awareness refers to services' ability to react to changes in the environment [1]. A good example of context-awareness is proximity; many mobile phones have Bluetooth capability, which can be used to detect nearby devices by scanning for their BTUID (Bluetooth Unique Identifier) [2].

In this paper, we present a sample game that uses social proximity in player-to-player interaction. It is called Sandman, and it is based on people monitoring other players in the real world. The game is almost like tag game with digital scoring.

The rest of this paper is structured as follows. Section 2 presents background. Section 3 presents our example proximity game. Section 4 discusses things that effect how the game is played. In Section 5 we present the actual test games and results and Section 6 finally concludes this paper.

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2. Background

Many context-aware games use the real world as the gaming arena [3]. In player proximity based games, the device monitors the area around player and tries to find other devices nearby. In our case we used Bluetooth to sense proximity and MUPE (Multi-User Publishing Environment) [4] for implementing the game.

In our game the proximity has two states: another person is in the proximity, or is not. In addition to the two states, the transition from one state to another is important, that is, enter proximity, and leave proximity. With a more complex sensor than Bluetooth it would be possible to detect the distance also, but we are only focusing on discrete stages, and their transitions.

MUPE is an Open Source application platform for creating mobile multi-user context-aware applications. It has a client-server architecture, where the end-user uses client to connect their mobile devices to the MUPE server. External information can be added to MUPE server with context components. Client has an access to the most information supplied by the mobile phone; it can gain an access to Bluetooth, GPS, camera APIs, etc. The MUPE core connects the different parts of MUPE as illustrated in Fig. 1.

In comparison to traditional applications, MUPE applications are deployed differently. MUPE only requires a single client install, after which the user is free to browse new services, and use them with out any extra installations. Client-side of MUPE is build on top of J2ME, and therefore MUPE services are available for the majority of mobile phones.

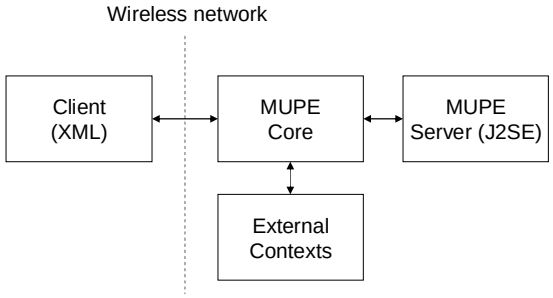

Figure 1. The MUPE application platform structure

3. Example game: Sandman

We aim at using the real world as the gaming arena. In previous attempt, Assassin [5], the players look at other players in the real world, and switch to the mobile phone UI only to take photos of other players. In our sample game Sandman, the players look for other players, and only a single button press is required. With games like these, the players are most of the time focusing on real world, and only occasionally focus on the digital device for short periods of time. Sandman uses the social proximity as the main form of game mechanics. Social proximity is very important in many children games, such as tag, hide and seek, police and robber.

In Sandman, every player acts as a Sandman who has the power to put others to sleep. Players are divided into two teams. The objective of a team is to put all the players in the opposing team to sleep. The state machine representing the different states for the player in the game is given in fig. 2. Sprinkling the sand into air (A and E) causes all the players nearby to fall asleep (C). Also the sandman who sprinkled the sand is affected, if he has not used stimulants to stay awake (B). Players can protect themselves by drinking coffee (D). If a player is drinking coffee while sleeping sand is sprinkled then caffeine protects him from falling asleep (E). Only limited number of coffee doses is available for a player. One dose effects one minute and counters all the sleeping effects.

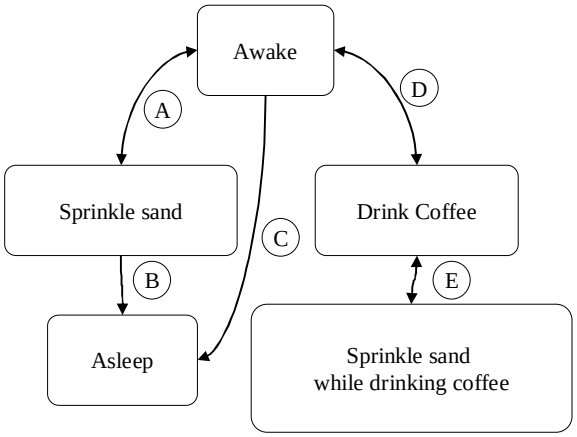

Figure 2. State machine of the game

When sand is sprinkling the phone scans all the nearby Bluetooth devices and sends their BTUIDs forward to the MUPE server. If the BTUID is recognized then the related player falls asleep. Bluetooth is only used for detecting nearby players; the GPRS connection is used to connect the client to the server.

Our tests showed that using BTUID detection is slow. The total time the scanning takes is related to the number of nearby devices. In average it takes about twenty seconds to collect all the BTUIDs nearby. Hence, it is not fast to put another player to sleep. We do not consider this a major problem; it might even make playing the game more interesting. Those seconds give the players a chance to try to escape if a situation is noticed. Running does not always help, since some of the BTUIDs are normally founded fast.

To summarize, the players are trying to minimize the group members and maximize the opponents in the "in proximity" state. The movement in the real world is reflected in the transitions. The simple idea of the game eases the design of a simple and intuitive user interface. In the game room a player has two actions: "Press to Attack" i.e. throw sand and "Press to Defend" i.e. drink coffee, which are enough to play (fig. 3). Lots of other little things are available in UI for making playing more interesting but the game itself is all about pressing two buttons and monitoring actions of the other players in the real world.

Rules should be considered before the session starts. They depend on players and playing area and, obviously change from session to session. The gaming area should be limited. The distance between people during the game has a great effect on how the game is played and how long it lasts. If the people who start the game are near each others, the tension is higher as the players are all the time in the border of the transition between "in proximity" and "out proximity". If the players are more apart there is no possibility for entering the proximity range.

The service itself can not provide strict rules because the game takes place in real world and the device only acts as a judge whether the player successes when trying to sprinkle sleeping sand. In bigger games something like armbands are mandatory for recognizing team mates.

4. Players and Environment

The two key aspects of Sandman are the players and the environment. Environment is a level of the game, and players are its characters. The game session is very different if it is played in large outdoor spaces with limited cover, compared to indoor game, where the players do not need to have visual contact at all during the game. Bluetooth reaches through walls so sometimes a player does not see who sprinkled the sleeping sand.

Lots of possible strategies are available. One strategy is to avoid other players and wait till most of them have fallen to asleep. Hiding player and his team mates win the session if other players play well and the player succeeds in hiding. Other strategy would be that a player actively tries to find a big concentration of other team players and then puts all of them to sleep. In this case, one quickly runs out of coffee and falls asleep soon but with help of his team mates, he can still win. All players rely entirely on their own team to win.

We hypothesis, that the environment has a huge effect on how the game is played. It gives lots of ideas to people what can be done. If we are gaming inside then it is natural that players act as they are supposed to act inside buildings. When playing outside at park players are more likely to run around and chase each others.

Another big factor is the effect of age. With young children the game can resemble a lot like the tag game. If the players are little older and are working at a same office, they can play the session while working. Session can be started at morning and can be played when ever there is enough time or convenient situations. Simple games like these can make the morning coffee break more interesting, and still not require the players to spend time playing the game – it is all about timing.

5. Test results

We have tested the game in different occasions with different people. Designing the game has been highly iterative process. At early tests we had lots of cruder graphics and not so many functionalities and game has slowly evolved to its current form. The main point of these test sessions has been to gain ideas and get some feedback.

In focus group session we had six students aged around 25. They tried out couple of applications and one of applications was an early prototype of Sandman. The interview was organized in a laboratory and it was recorded on a VCR. The players had no chance to escape from laboratory room and so they could not really chase each other. Instead that they tested the user interfaces and discussed about the idea of game.

The participants liked the game and gave some valuable comments for future work. It was also noticed that game was very easy to play. They also gave impression that game would suit better for little younger players and proposed new play modes. They also questioned why the player has to always fall asleep. We decided to introduce the coffee as a game element.

The participants also suggested that the non-player BTUIDs could somehow affect to the game. That kind of item is for example people not playing the game or other Bluetooth device, such as printer. It would be possible to for example use them as a coffee automates to refill ones thermos bottle or something like that.

Finally the game was tested with two test groups. First of them consisted of university students, whose ages varied around 25 years. The second group consisted of 11 years old elementary school students. In first group there were eight players and in second there were eleven. All test subjects were males. With elementary school students all phones were Nokia N95 and with university students there were a variety of Nokia N95, N70 and 7610 phones.

Many things varied between the tests. The gaming area and the age group were different. Students played in sauna compartment of Tampere University of Technology and children played outside, at the park nearby their elementary school. In the first test the players were asked to stay inside the building and in the second one they were not allowed leave from park.

Both of the tests took little over one hour. The first thing was to explain rules, then couple of test games were played in a single room, so that everyone has change to get used with user interface. After that the real games were played. Each game session took about ten minutes. Finally there was debriefing session with feedback forms and free conversation.

Test game with university students was organized in conjunction with a gaming evening of a game development course and there were a lot of games to be tested. Space was also very limited and it only consisted of couple of rooms and long corridors. Some of the players just sit and tried to play without moving. Winner was the player whose coffee lasted the longest. There was no time to plan strategies or other thing like that, because player had to constantly monitor if effect of coffee has ended and then drink a new one. Some players decided to keep distance from other players. When they come back, other players had run out of coffee and players hiding in corridor won the session because they still had coffee left.

Younger test group was much more willing to run and chase each others. It was lots more fun to test game with younger test group. Problems were opposite than with older test group. When explaining the rules there was constant swarm of questions and the participants were really enthusiastic about starting the game session. When game started they run wildly around the park pointing each others with mobile phones and shouting things like “I am sprinkling sand at you”, “I am drinking coffee”. With them it was more like a random thing who actually won. There were no strategies, just a constant chasing.

Figure 3. Example screenshots of the game UI

Even though the sessions were totally different, we can draw some conclusions on. As expected, the school children were very prone to run around whereas it is more of an effort as people grow up. The open environment was a totally different environment – where people had so many visible threats that the strategies were bound to be chaotic. On the other hand, the game session indoors was too small compared to the Bluetooth range, so the level was not optimal for game play. It would be nice to try to but things other way around.

In Table 1, we present some of the results from the questionnaire we made for both of the test groups. Answers are in a scale from one to five. The key finding from questionnaire was that both age groups told that game was fun to play. But in question "Would you like to play it again" only children told that they would like to play again. We are not drawing any conclusion why this is, as the environment, age or the game itself to name a few had an effect on the experience. Based on questionnaire it also seemed that children also tried more actively to get into situations where sprinkling the sand was possible while students played more passive way. This is probably partly due the environment, but younger group's habit to play games probably also influenced to the results. Children answered more positively to all questions. Younger players tend to answer 0.5 points more positive. From the 29 questions asked only in four the difference between groups was zero.

Table I

Aspect	11 years (11 participants)	25 years (8 participants)
Playing the game was fun.	5	4
I would like to play it again.	5	2
I would like to play other games with same battle system.	4,5	3
I actively tried to get situations, where I could sprinkle sand.	4	1

Commenting was voluntary and most comments came from elementary school students. There were comments like: "Game was totally great! It would be fun to play it with my own mobile phone too.", "Game should have faster pace.", "Coffee was too effective, texts were fun, it was hard to put people asleep.", "Simple but boring.", "Game was nice, but probably a bit too simple.". Most of the comments were positive. Negative comments mostly claimed that game was too simple.

We consider that with the normal tag game the results would be same. Basically we learned that digital scoring and mobile devices did not affect so much to adults, but it certainly made children run. Playing tag game is more common for kids than for adults as adults tend to prefer sports. It would be interesting to try to disguise this game to look more like sport than playing and then try to test if adults would like it more. A possible setup would be e.g. competitive orienteering where people would be bound to meet up in certain locations.

To test Bluetooth as proximity detector, we took different models of Nokia phones, and placed them in single room. There were seven phones and 25 tests for each, so the total number of devices to be found was 150. There were slight problems with the platform but no problems with finding BTUIDs. Tests were made in a single room, so it is possible that there are asymmetries between founding the devices if distance is greater. A bigger problem is the time the scan takes. Depending on the device and amount of other devices nearby, scanning can last from a couple of seconds up to almost a minute. It is not always the case that the oldest phone is the slowest; it is more like a random thing. Games that depend on Bluetooth as a proximity detector is definitely unfair to some of the players.

6. CONCLUSION

In this paper, we presented a case example how the player proximity in the real world can be used in mobile multiplayer games. A sample game implemented with MUPE works in most phones. Bluetooth is used to detect other players nearby. The game was tested with several groups. These groups had a totally different kind of a game experience, which was due to both the age and the environment they played in. Different kind of strategies and game situations were described. Moreover, an extended discussion was given to analyze the game.

Implementing other game modes from the first person shooter genre would make more variance to game play. Other methods to sense proximity like GPS and WI-FI could also be tried out. It would be interesting to test Sandman in events with high density and number of people.

Also some platform-related issues were discovered. With MUPE there is no way to invite other users to a certain service or to create groups of friends. If MUPE wants to be "the mobile Facebook", then at least these features should be included.

To gain a deeper understanding of the differences, further study is needed on the effect of the environment as a game level, and the effect of the age and the group dynamics.

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