

Zombies vs Humans

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ABSTRACT

Location based games offer opportunities to change an area familiar to users that has particular connotations (e.g. a university campus with its associations of learning) into an unfamiliar space in which the inhabitants are pitted against each other in a game. With the purpose of investigating the impact of pervasive gaming on the campus inhabitants and the design implications of a pervasive game targeted towards this environment, we designed a game whose theme would be familiar to most game players and movie goers: Zombies vs. Humans. It is a location based game that can be played on any Bluetooth enabled mobile phone. . Zombies vs Humans is unique in the respect that it is not played as a separate activity or a break from normal activity but is integrated as part of a players activity. There is little distinction between gaming time and non-gaming time.

INTRODUCTION

Wireless technologies such as mobile phones offer a huge potential to exploit the possibilities of location in order to enhance game play. However, currently most mobile games are miniaturised copies of their PC or game console counterparts. Some research projects have started to investigate the possibilities offered by wireless technologies, for example:

- Pirates!^[2] set indoors it uses a wireless network to engage participants in a variety of activities such as islands and taking part in sea battles.
- Bot Fighters ^[4] uses cellular positioning and SMS to provide indoor and outdoor location based information for a combat game.
- ArQuake^[12] is an extension to the desktop game Quake, that creates an outdoor and indoor mobile augmented reality game environment that utilises GPS, digital compass and vision based tracking.

There are also many more (see: [6,10,1,2,7]) that have experimented with such technology in a similar

way. We had two research questions that we wanted to investigate:

- How do people react to a familiar environment being changed from one based on learning to one based on game play?
- What is required in order to successfully manage such a mobile game given that we want to allow people to join and leave the game whenever they like?
- What issues may arise from a game that is integrated as part of daily activity instead of a separate activity?

Overview of Game

The game is inspired by a game of tag, of the same name, played on some American university campuses [14]. The basic principle of the game emulates an outbreak of a zombie plague. Zombies “infect” human players turning them into zombies who go on to infect other players. The aim of the game for zombies is to infect as many players as possible, humans simply have to survive.

The game is intended to be used in a campus environment. The reason we chose a university campus was that it would provide us with a location familiar to its users, the necessary mass of people who are within the same area for most of the day and a set of people familiar with mobile phones and multiplayer games. All interaction between players takes place via Bluetooth.

In order to play the game each player must first register via a web page and download the game to their device. We wrote the game using J2ME to ensure compatibility with the diverse range of devices used by the student population. One (or possibly a small number depending on the number of players available) person is nominated as the original zombie at the start of the game.

Our game interface is simple: a player scans their environment for other game participants, using

Bluetooth. A list of the players found appears on their screen, along with their current status (human or zombie).

Zombies can infect humans by selecting a human from the discovered player list and choosing the “infect” option. Once a human has been attacked, they are warned and have a short period of time (approximately 20 seconds) to get out of Bluetooth range of the zombie. Multiple zombies can team up to infect a human. The more zombies attack a human, the less possibility the player has of escape.

To defend themselves, humans can select to “shoot” a zombie from their discovered player list. This action will have the effect of stunning the zombie for 30 minutes, during which they will be unable to participate in the game and infect other humans.

The game can end in two ways: The zombies can successfully infect all the humans so that all players are zombies or all the zombies can starve to death. If a zombie does not infect a human every 48 hours they will starve.

Points are used as a way of encouraging players to participate in the game. Points are awarded for successfully shooting a zombie or successfully attacking and infecting a human. Points and other statistics are recorded and uploaded on a web server, where they can be viewed. Statistics can also be on the players’ mobile devices. The latter is an optional feature that allows players control over the connectivity (many students are conscious of the costs of mobile data connectivity). Points recorded by players’ devices are not uploaded to the server until a player decides to connect to the server and view the latest statistics.

GAME DESIGN

The main goal for the game’s mobile user interface was to create an easy to use and interact with game which had a unique feel but was also able to scale to a large number of different screen resolutions. Scalability was achieved through image resizing and the implementation of scrolling lists for the discovered players and game options (Figures 1 & 2). While the application running on players’ devices is exactly the same, we wanted it to be quite obvious who was a Zombie and who was a human and we did this by providing a different color scheme depending on whether a player is a zombie or a human as well as providing consistent style information to each.

Furthermore we wanted to make shooting a zombie or infecting a human as easy as possible. We therefore implemented a scrollable player list which displays

other players in range. The player can then easily infect or shoot the other players by selecting them from the list. We chose the number five button because this button is in the centre of most users’ mobile keypads.

Although the game was originally developed on a device with a relatively good resolution (quarter VGA 240 x 320), we wanted the game to be playable on as many devices as possible and we therefore implemented a dynamically sizable user interface with customized vertical scrolling facilities, so that even if the user had a very small screen they would still be able to effectively take part in the game. The game was tested on various screen sizes and we found the menu was still functional on screens as small as 128x160 (Figures 1 & 2).

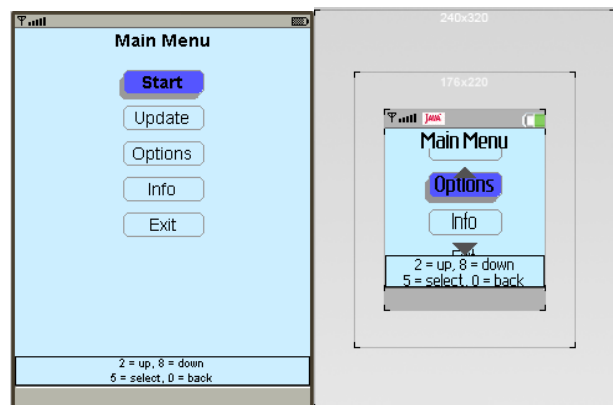
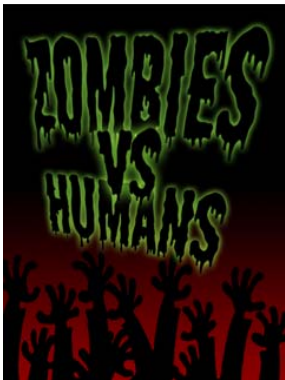


Figure 1: The User Interface is self-scalable to fit various resolutions. The emulator instance in the middle shows a Zombie Player (note the colour scheme differences).

As mentioned previously, the game actions of “Shooting” and “Infecting” are central to the gameplay. These actions can occur through the discovered player screen (Figure 2). When a human shoots a zombie, a dedicated information screen depicting this action and including an appropriate text message is displayed on their mobile. At the same time, another information screen appears on the shot zombie player’s mobile, depicting the event that has just taken place and an appropriate text message. During the “infection” action, humans and zombies see exactly the same screen, depicting a human being bitten by a zombie and with a status bar along the bottom. The status bar is updated with the humans current level of infection giving them the chance to run away.



Figure 2: Three instances of the game on various resolutions showing the discovered player list. The middle player is a Zombie.



Start up screen



A Zombie attacks a human (status bar shows progress of attack)



A Human attacking a Zombie



A Zombie being attacked by a Human

Figure 3: Screenshots of the game in action

Discovery of Devices and Other Players

The core functionality of the game revolves around discovering nearby devices that are also running the application. A Bluetooth device discovery is initiated by using the appropriate option in the game menu. Discovered devices are then checked for services matching the Zombies VS Humans UUID (Universally Unique Identifier, used by the Bluetooth protocol to allow devices to advertise services and applications

available to other devices). Remote devices advertise the Zombies VS Humans service and accept any incoming connection requests.

Connections, whether initiated by the local or a remote device, are set up via a dedicated class in our J2ME program. When the connection is set up between two devices a message is transmitted containing the players name and whether they are a zombie or a human. The devices are then able to exchange Infect or Shoot messages

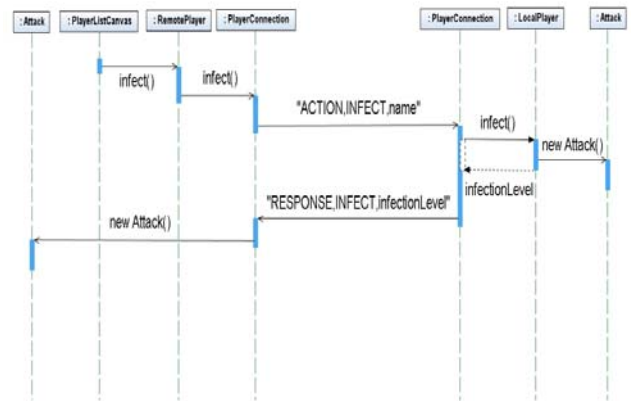


Figure 4: Sequence of events showing how the Attack screen is displayed

Managing the players

The information on the players is logged in their mobile device. The data logged contains the player name, password, their current status (human or zombie) and points earned. The logging is initiated when the application is started using a J2ME record store as a method to maintain platform independence across devices. If the record store does not already exist on the player's device (e.g. when the game is started for the first time), the game loads some default values including a player name with a random number on the end e.g. "Player79". If the recordstore does exist the fields are read and saved to the appropriate variables in memory.

We further implemented a web server as part of the game, which has the main purpose of recording the statistics of every player of the game. These statistics can be viewed by the players and administrators, to see how the game is progressing. One of the features of the game is that the game can run without the web server services. As mentioned previously, we included this as part of the design to address user concerns over mobile internet costs.

Testing

The game was tested on different mobile phones with

different makes and technical aspects to make sure that the game could be played on them.

We recruited five student users who were normally on campus on a particular day. The students were classmates of the designers and as such were quite knowledgeable about games and computing devices in general. They took some classes together but also took some separate classes. They agreed to play the game for a whole day on campus. We did this in order to test the game in the setting in which it was intended to be used. We selected the users we did because we knew that they were unlikely to stop playing the game if they encountered a temporary technical problem such as lack of connectivity. Due to these requirements all the test users were computing students, male and had an average age of 25. From the testing we hoped to find:

- How people reacted to a familiar environment being changed from one based on learning to one based on game play? The way we assessed this was through logs and interviews at the end of the day's play.
- What is required in order to successfully manage such a mobile game given that we want to allow people to join and leave the game whenever they like? In order to assess this we logged the number of errors and failures to follow through tasks, such as killing and with a usability questionnaire. We also asked the users to walk us through the application making comments about the design as they went.
- What issues may arise from a game that is integrated as part of daily activity instead of a separate activity? We assessed this through the end of the day's play interview.

We also asked them about what they thought of the Bluetooth connectivity. We did not test the security aspects of the game as this was not the focus of our research.

We conducted an introduction to the testing in which we demonstrated to each user how they could register to play the game, login, shoot or be attacked. We then asked them to carry out these tasks and we checked the log to make sure it was picking up their actions

Results

The testing went well with all of the users being able to play the game. The first main finding was that the communication between devices is currently problematic and its implementation is not particularly

elegant this is something that other researchers have also had problems with [13],[10]. As others [3] had highlighted connectivity as being a problem with such games we included a question on this in our interviews. We discovered from this that whilst the players agreed that this was annoying they had also started to hypothesize how they could use these outages to their advantage, but had concluded that they could not see a way to do it with the current game. We therefore agree with [3] finding that players should be shown breaks in coverage and we are investigating ways to improve this. However we would have a different focus from them in that instead of undertaking this to improve user satisfaction we would rather do it as a way of exploring players attitudes to this situation and see if they do indeed as hypothesized by the players above take advantage of this situation to win the game.

The second reported problem was that the user interface does not provide as much feedback as users would like to enhance the game play, this was a finding also made by [9]. Implementing alert messages or messages displayed via a ticker would improve this situation according to the users.

CONCLUSIONS & FUTURE WORK

We designed a game that could be played in a campus environment as a way for people to interact in a unique and interesting way. During a small pilot study we observed that players could follow the progress of the game and shoot and infect other players. One of our main findings was that given the location based nature of the game people wanted to be able to see tickers, chat and lack of connectivity in order to co-ordinate their fellow Zombies to undertake coordinated attacks located at other parts of the campus or to warn their fellow humans to flee.

The next steps that we are taking will a) improve issues with the game play and b) develop a framework that will allow us to monitor usage and game experience on the field with a more longitudinal study. For example:

- There is no incentive for players to make better use of location as a gameplay aspect, currently if you happen to be around enemies you might act, but there is no reward for actively seeking them out or luring them to key locations
- There could be a limited number of bullets that players possess to enhance the likelihood of them having to run or use team tactics to lure and kill zombies

- Once a zombie is shot they could be shot again with a rare “silver bullet” to kill them completely and take them out of the game
- A zombie might be taken out completely if shot a number of times repeatedly (this will only work if bullets are sparse)
- Items of great value (e.g. ammunition) can be “spawned” around certain locations to encourage humans and zombies to converge and fight
- Modes of gameplay such as “capture the flag” could be organized to offer alternative gameplay styles

With regard to how we evaluate the next evolution of the game we would like to investigate how we can encourage or give tips to players on how better to make use of environmental features to play the game (e.g. hiding near metal structures where Bluetooth cannot penetrate, sitting together for “safety in numbers” etc). In conclusion we plan to carry these issues forward into further more public trials that would encompass several locations across a city and also perhaps involve members of the public. We hope that by doing this we will be able to investigate further the social and technical issues that enabling location based games bring.

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