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Location-based game to enhance player's experience in survival horror game

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Abstract

This paper aims to explore the possibility of implementing location-based game using the smartphone's GPS to enhance the player's experience. With the GPS technology, the player can play in a real world as well as in the virtual game world. We postulate this thus will enhance the player's experience. To test the hypothesis, a horror game genre with location-based features was developed. The game was evaluated to thirty participants. The results demonstrate the game allowed the participants to explore a new place with fun. In addition, the participants claimed that the game allow them to enjoy a new experience in playing horror game. The participants described that playing the game was giving them more tension compare to playing a conventional horror game. Moreover, the participants claimed that they feel more familiar with the place they've explored during the game. Finally, some improvements could be done to improve the experience enhancement to the game. First, more variation in the storyline, quests and the enemy. As the game evaluated in this paper is served only as a prototype, the variation of the storyline, quests and the enemy (i.e. the ghost) is limited.

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1. Introduction

Technology has grown tremendously past these decades. It offers convenience in many our aspect of life, starting from when we wake up until we back to sleep again. Technology also supports us as humans when we are doing our activities, one of the technology is our smartphone. Smartphone has significantly re-shaped our way to live with the advance of its technology. Nowadays, playing in smartphone is quite popular past this years as people can play in anywhere and anytime with their smartphone. One of the key factor that make people keep playing games is their experience people have when they play the game¹. A number of techniques have been explored to enhanced

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the player's experiences such as: creating more natural NPC^{2,3,4}, creating more natural game world⁵, and using geo location to map the enemy, player and NPC's locations^{6,7}. This paper aims to explore the possibility of implementing location-based game using the smartphone's GPS to enhance the player's experience. In addition, a location-based game allows the players to explore the real world to interact with the objects in the virtual game world. Hence, the players are expected to become more aware and familiar with the area they have explored during the game. The game, hence, could be served as a tool to help people when they need to explore a new place they have never been with fun. From the questionnaire and short interview, the participants reported that the game allowed them to explore a new place with fun. In addition, the participants claimed that the game allow them to enjoy a new experience in playing horror game. They described that playing the game was giving them more tension compare to playing a conventional horror game. Moreover, the participants claimed that they feel more familiar with the place they've explored during the game.

2. Related Work

Game is considered as the most successful product in the entertainment industry. One of the key factor that make people keep playing games is their experience people have when they play the game^{1,3,8}. Recently, researchers in this field have been trying to find a new way to enhance the player's experience when playing the game. Some of them are trying to enhance the behaviour of the NPC in the Games, so the NPC can behave naturally like human being behaving in the real world given a specific situation. Some of the them are attempting to enhance the experience by making the game world more and more realistic. The others are trying to integrate objects in the real world with objects in the game world, one of the example is a location-based game, where the player is interacting with both real and virtual objects in the real and game world in same time.

2.1. Enhancing NPC in Games

One of the key success of the game industry is that the experience felt by the player during playing. The experiences generally generated by interacting with the game worlds and object, one of the key is the NPC or Non-Player Character. Hence enhancing the NPC's behaviour in games so they can behave more natural, claimed to be one of the important factor to enhance the player's experience³. Generally, NPC's behaviour is generated by a simple rule based script^{9,10}. The script contains all the information about the NPC's behaviour such as what events can trigger a particular behaviour. The problem with scripted behaviours is that the player can predict what the NPC will react given a particular event¹¹. This affects negatively to the player's experience. Moreover, this method requires significant amount of efforts to implements as behaviours are rather very complex to be manually hand crafted. The NPC's behaviour in the game is also commonly generated by implementing Finite State Machine technique. The NPC's behaviours are encoded into a set of states governed by a set of conditions which are generally defined in a transition table. A more advanced technique to generate the NPC's behaviours is using a dynamic behaviour such as computational models of behaviours^{3,4,12}, computational cognitive models¹³ or machine learning^{10,14}. Those methods give a good promise to the game developers to design NPC with more natural behaviours even though those techniques are still in a state of infancy.

2.2. Enhancing Game World

Enhancing the complexity of the game world also claimed enhancing the player's experience when playing the game. An open world such as Skyrim, Grand Theft Auto and Minecraft offers a unique experience to the players. The players are able to interact with the game world and the objects within the world¹⁵. Enhancing the game world requires enhancing the objects lies within the world, one of them is the NPC. A believable NPC also behave and react towards the environment (i.e. game word). Literature suggests the technology of the graphics has growing incredibly fast, however, the NPC behaviours often predictable and un-natural. This leads to a realistic view of the game environment with a shallow game experience towards the NPC¹⁶. Several research have been done to resolve this problem. The key to create more believable game world and NPC is to build a NPC that can behave naturally and proactively towards the external environment (e.g. player and game environment), in addition to create or design more realistic view of

the game environment. Some researchers offer sophisticated AI techniques to simulate the NPC's behaviours such as Finite State Machine^{14,15}, Architectural approach¹⁶ as well as machine learning^{10,14,17}.

2.3. Location-based Game

A location-based game exploits the capability of GPS to enhance the player's experience by combining real world and virtual game world. The early concept of location based game derived from a location-based mobile application developed by The Xerox PARCTab^{6,18} and Olivettis Active Badge system^{6,19}. A location-based game uses the player's position in the real world as part of a collaborative location-based game in the game world⁶. With this capability, the game designer can design a game that use two elements of worlds in their game. Recently there are a number of location-based games in the game industry, due to their popularity in enhancing the player's experience during the game. A location-based game also allows the player to explore a real world, while playing the game. However, not all players like to explore a real world. A number of players have been spotted to exploit the vulnerability of a location-based game such as: using location spoofing to cheat the real location of the players²⁰.

3. Methods

A pre-elementary questionnaire was conducted to university students to collect information about their interest and behaviour in playing game. The questions in the questionnaire were aimed to reveal the students' preferences and expectation when they are playing game as well as their knowledge and expectation about location-based game. The data collected are used as a baseline to develop a prototype of game. An agile method called Scrum was chosen as the software development method, as the idea of enhancing player's experience through a geo location-based game is relatively new and still a blue-sky topic. Development with Scrum allows us to quickly explore new ideas and approaches and learn quickly which solution is viable. There are a total of five sprints and product backlogs with twenty-six sprint backlogs in the development of this application. Finally, the game was evaluated with questionnaire and short interview.

3.1. Preliminary Questionnaire

A total of forty seven students in a university in Indonesia were participated in the preliminary questionnaire. The participants were majority male students (70.2%) with majority in their 18-22 (97.9%). Most of the participants (40.4%) spent more than three hours their time per day to play games. Moreover, all the participants have been played games in a smartphone and only 72.3% of them played location-based games before. Although majority of the participants played location-based games before, there were only 36.2% of the participants who are interested in playing location-based games. This is because, the participants who played location-based games before commented that sometimes the games become not interesting anymore as they encountered problem with their smartphone GPS. They argued that the main issues when using the GPS feature in a smartphone to play games are internet problem (35.72%) and the GPS's accuracy(28.13%). All those problems will also effect the internet data usage and battery problems.

More than a third of the participants (35.72%) prefer to play an Role Playing Games (RPG) genre. However, when they were asked which genre they like when they are playing games in a smartphone, majority participants (74.5%) prefer an action genre. The participants felt that playing an RPG in a mobile phone is not as convenience as playing in a computer. Moreover, more than third quarter participants (82.5%) go for a horror theme games. The results might be biased by the participants' gender as majority of the respondents were male students. Further research should be conducted to get a normal distribution of the populations preferences in playing games. Finally, the next step after this preliminary questionnaire step is the game design and development.

3.2. Game Design & Development

Scrum development method was applied to develop a prototype of game. There are a total of five sprints and product backlogs with twenty-six sprint backlogs in the development of this application. The story of the game is the

player is lost in a cave and the player should find the exit. The player will encounter various enemies (i.e. the ghosts). If they do, their life will be taken by the enemies. The player can restore their life by finding a restorative item (i.e. Herb) and use it by tapping the herb from the inventory. The player is required to finish several different objectives in each level to progress throughout the story. Before playing this game, the player has to enable the Global Positioning System in their smartphone as well as the mobile data (or Wi-Fi) for quicker and more accurate tracking.

3.2.1. Game Menu

The game consists of several menus, they are: Main, Help, and Level selection menu. Main menu is the one that always be displayed every time the player starts the game. In the main menu, there are four buttons, namely: Start, Help, Credit, and Toggle Sound button. The player is able to navigate through all the game's menus by tapping these buttons. Tapping on Start button will lead the player to the level selection menu. The Help button will allow the player to see the list of all the objects in the game along with its descriptions. The Credit button displays all the developers in this game project. Finally tapping on the Toggle button will toggle between on and off (mute) the game sound. On the Level selection menu, the player is able to choose the level they want to continue to play. If the player is a first time player in the game, there will be only one button available to tap (i.e. Level One). As the player cleared each level, the level selection button for that particular stage will be opened and available to the player in the Level selection menu. Each level has different objectives and difficulty allowing the player to have more diversity in the gameplay.

3.2.2. Game Control

In the game, player can move the character by moving their real body in real life (e.g. walk, jog, or run). The GPS in the smartphone needs to be turned on in order to retrieve the players location and calculate the character movement. When the player start the level, a cut scene is displayed to show the story and the dialogue of the main characters (see Fig 2 (a)). The cut scene will also contains the first clue about the game objective or quest information. The player is required to find several of notes spread throughout the game location. Once the player finds the location, another cut scene will be appeared and the player can go to the next part of the quest. In the second part the player is required to search for another clue hidden some where in the game to find a key. The key is required to open a door located hidden somewhere in the game world (see Fig 2 (c) and Fig 3 (a)). Once the player finds the door and open it with the key, the game is finished and the next level is available to be explored by the player. Two possibilities of the game, they are: game over and game completed. Game over means the player has failed to survive and died in the cave and the other one is game complete which indicated the player has successfully escaped from the cave.

3.2.3. Game Mechanics

Fig 1 illustrates the algorithm for the core game mechanics. When a player starts a game, the system will automatically sent the player's location data through their smartphone's GPS. The system then will get a responses depending on the player's geo location. There are three possibilities of events. First condition is when a player's location is the same with the location where the ghost is hiding. This event will trigger the ghost suddenly appear with a horrifying sound effect (see Fig 3 (b-d)). The ghost appearance will be randomised between two version prepared in the game (see Fig 3 (c-d)). Once the player is encountered the ghost, the player's Heart, indicating the player's life, is reduced by a point. If the player's Heart hits zero, the game will be over, and the player has to restart the quest or objective over again.

The second condition is when the player's reach the game objective's or quest's location. When it happens, the system will trigger the next storyline to reveal the clue for the next objective or quest. The player wins the level if all the objectives are completed before all the player's Heart hits zero. In addition, the player also can find a healing item called The Herb. The player can use the item they picked up anywhere and anytime in the game. The item has effect to recover the player's Heart, the item has no effect when the player's Heart hits the maximum number (see Fig 3 (a)). Finally, the prototype of the game was evaluated to students in a university in Indonesia. A total of thirty participants filled a questionnaire and were asked several questions in a short interview after playing one level from the game prototype. They were asked to explore a particular place in Indonesia while playing the game. The results is discussed thoroughly in the next section.

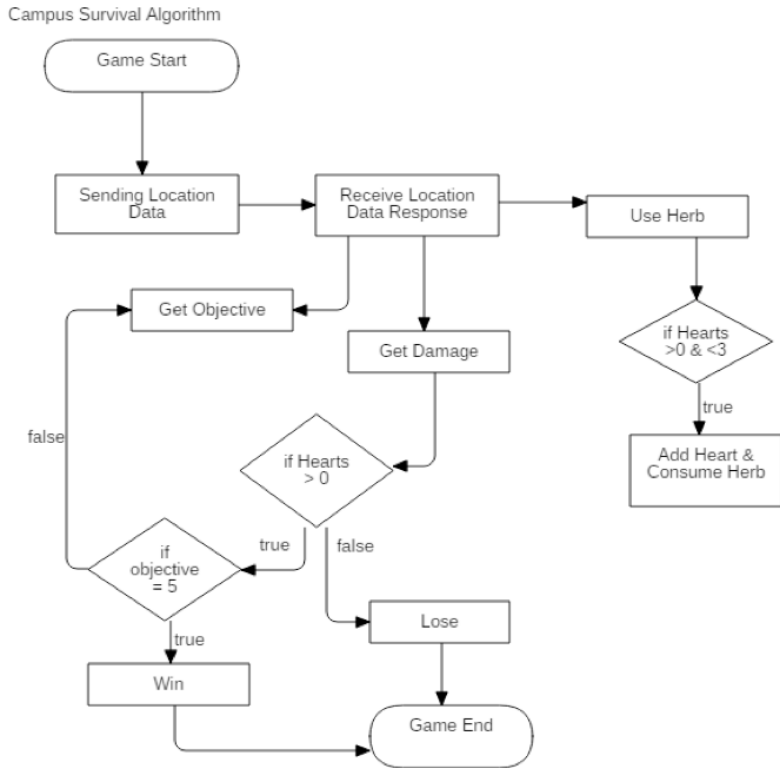


Fig. 1. The Game Algorithm

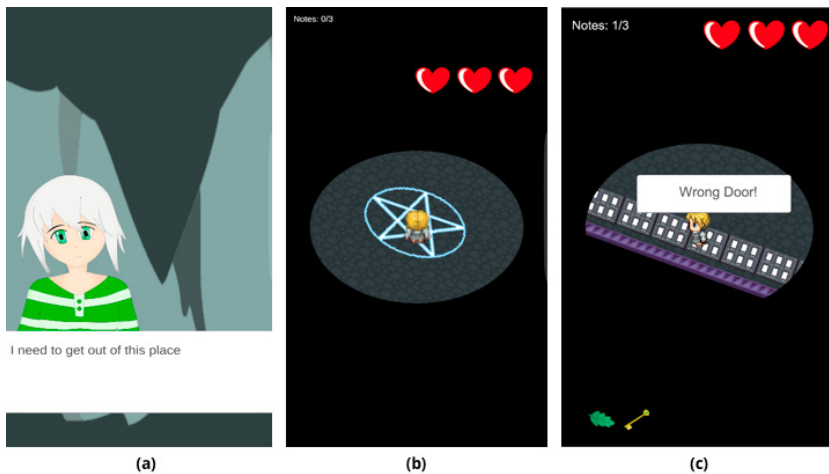


Fig. 2. The Game: (a) Cut Scene, (b) Game Play (c) Opening Door

4. Results

The game prototype was deployed to an Android based smartphone and evaluated with a total of thirty students from a university in Indonesia (93.3% Male). The students were asked to go to a specific place and finish one quest. They were required to move around the place to play the game. After the participants finished the quest, they were asked to fill in a questionnaire and participated in a short interview to evaluate their experience when they were

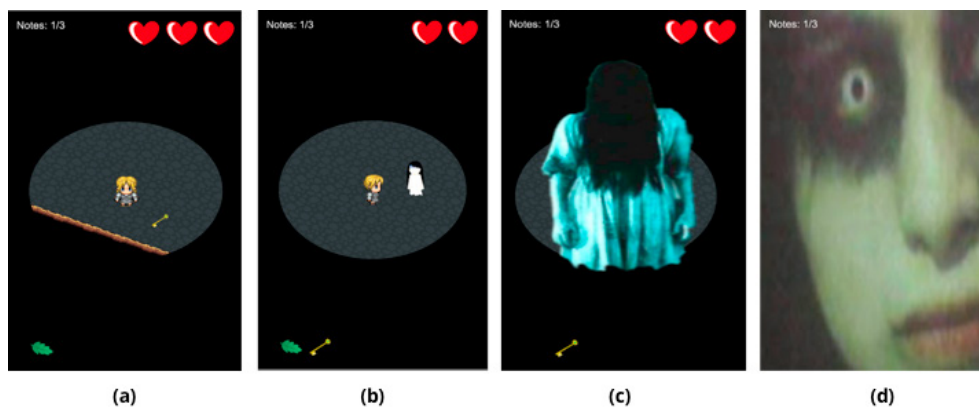


Fig. 3. The Game: (a) Item Found, (b) Ghost Encountered (c) Ghost Touched V. 1 (d) Ghost Touched V. 2

playing the game. Table 1 demonstrates the summary of the after game questionnaire. There are seven questions regarding to the game experience that were asked to the participants. The first (Q1), third (Q3), fourth (Q4), sixth (Q6) questions were intended to know the player's experience towards the game while playing the game. While, the second (Q2), fifth (Q5) and last questions were designed to understand the player's experience towards the user interface and game features. Some questions implement Likert-scale, where 1 is the worst score, 2 represents moderate scale and 3 represents the best score.

The participants were divided into two groups when we are talking about how scary the game is. Fourteen participants (46.7%) rate the game is quite scary (score 3) and another fourteen participants (46.7%) rate the game scariness as a medium one (score 2). While the rest (6.6%) rate the game is not scary at all (score 1). While the game was played ranged from 10 AM. to 5 PM., the majority of the participants suggested that the level of scariness will probably goes up if they play it on a night time. In addition, more than half of the respondents (56.7%) enjoyed the game music while playing the game. The participants felt the tension while playing the game due to the game music and background effects. Almost three third of the participants (73.3%) felt that the game is kind of a repetitive one. This leads to half of the participants (50%) only rate the performance and enjoyment while they were playing the game as a medium one (score 2), though the other half (50%) claimed that they really enjoyed the game (score 3).

More than half respondents (56.7%) rate the game interface as the best one (score 3), while the others (43.3%) rate it as a moderate good (score 2). Fourteen participants (46.7%) consider the game instructions given during the game help them a lot in playing the game. Another fourteen participants (46.7%) see the game instructions can be improved with a tutorial in the game, before starting the real quest. Finally, the most interesting feature in the game goes to the game storyline (66.7%). The participants consider the storyline is quite unique combined with the experience of playing in a real world. This leads to the experience when playing the game was chosen as the second best features in the game.

From a short interview, the participants reported that the game allowed them to explore a new place with fun. In addition, the participants claimed that the game allow them to enjoy a new experience in playing horror game. They described that playing the game was giving them more tension compare to playing a conventional horror game. However, they quoted that the game designer should add more "scary" element in the prototype game. Moreover, the variation of the Ghost's appearance could be added to provide more variation on the game. Finally, the participants claimed that they feel more familiar with the place they've explored during the game. More than three third of the participants have been to the place before playing the game. However, during the game, they realised that apparently there are several rooms or spots they did not realised that it was there before. In addition, there were couple of technical problems related to the GPS during the game. The GPS locations was sometimes off and not accurate, resulting inconsistency of the player's position in the game world. However, this problem is quite common in a location based application using GPS.

Table 1. Post Questionnaire

Question	Range	Percentage
Q1: How scary is the game?	3	46.7%
	2	46.7%
	1	6.6%
Q2: How would you rate the game interface?	3	56.7%
	2	43.3%
	1	0%
Q3: How would you rate the game music?	3	56.7%
	2	43.3%
	1	0%
Q4: Is the game repetitive?	Yes	73.3%
	No	26.7%
Q5: How clear is the game instruction?	3	46.7%
	2	46.7%
	1	6.6%
Q6: How would you rate the performance of the game?	3	50%
	2	50%
	1	0%
Q7: Interesting feature in this game (checkbox)	Experience	43.3%
	Storyline	66.7%
	Music	40%
	Gameplay	40%

5. Discussion and Future Work

This paper aims to explore the possibility of implementing location-based game using the smartphone's GPS to enhance the player's experience. In addition, a location-based game allows the players to explore the real world to interact with the objects in the virtual game world. Hence, the players are expected to become more aware and familiar with the area they have explored during the game. The game, hence, could be served as a tool to help people when they need to explore a new place they have never been with fun. From the questionnaire and short interview, the participants reported that the game allowed them to explore a new place with fun. In addition, the participants claimed that the game allow them to enjoy a new experience in playing horror game. They described that playing the game was giving them more tension compare to playing a conventional horror game. Moreover, the participants claimed that they feel more familiar with the place they've explored during the game.

Some improvements could be done to improve the experience enhancement to the game. First, more variation in the storyline, quests and the enemy. As the game evaluated in this paper is served only as a prototype, the variation of the storyline, quests and the enemy (i.e. the ghost) is limited. The storyline, quests and the enemy can adopt the local horror tales. Moreover, mini puzzles can be added to provide more variations to the game play, to reduce the repetition feeling the participants had during the game. Finally, a technique implementing indoor location based (e.g. using gsm tower cell or building Wi-Fi) to improve the stability and consistency of the player's location in the game world.

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