Interpreting Behaviors of Mobile Game Players from In-Game Data and Context Logs

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***Abstract*— Human behaviors can be interpreted based on its routine activities. Since, mobile phones are very common now-a-days, the activities performed on a mobile phone can be an effective tool to judge the behavior of an individual. In this paper, we interpret the behavior of different individuals playing a mobile video game. For this purpose, we developed a "Shoot them up" android based video game and maintained in-game data and context logs for each player in a database. Then, we attempted to analyze the player's position and the skill level based on the data recorded during the game play. We believe that this work will be a good initial study to understand mobile game players.**

Keywords—Player behavior; Mobile Video Game; Shoot Them Up; Game Data Analysis;

I. INTRODUCTION

Smartphone is one of the important modern day inventions which has completely changed the life style of human beings and it is anticipated that there will be more than 2 billion smart phone users by 2016 [1]. Furthermore, with the proliferation new upcoming applications on these smart devices, an individual is using smart phones in almost every aspect of life including education, health and entertainment Thus, the analysis of the routine activities performed by an individual on smart phone can be used to predict the behavior.

Recently, mobile game is one of the most rapidly growing entertainment applications. Therefore, assessing the behavior of an individual can be more effective by analysis of the data collected through the mobile games. Moreover, the games data is more suitable for predicting the behavior of an individual than other entertainment applications because of their interactive nature [2]. In this work, we present a foundation study that the behavior of an individual can be interpreted by observing the in-game and context logs while an individual is playing the game. To proceed further, we developed a Shoot Them Up android based video game, and collected the data from accelerometer and touch screen sensors from three players. Based on the accelerometer data, we interpreted the positional state of the player that is either static or dynamic. While from the touch data, we interpreted the knowledge (expertise) of the player about the game.

II. THE SHOOT THEM UP GAME

The shoot them up is an android mobile based video game developed using retro pixel graphic concept with easy control [3]. The main objective of the game is the survival of the game player for forty days and the careful resource management. Initially, the player is provided with 6 arrows to shot, 10 woods to make new arrows and 10 units of food to survive. At the start of the day, the player has been given four task options which are hunt, wood, arrow and rest. Each act consumes the health of the player (HP). The player can decide what to do base on its resources. If the player wants to collect more food, the task is to hunt the monsters. The wood task is required to collect the woods and arrow making task is selected if the player has not enough arrows to hunt. Rest task is to reconcile the HP. These tasks can be selected by clicking at the character image in the game and then execution as can be seen Figure 1.

Figure 1 Selection of Player's Action

For the hunting task, the player is provided with sixty seconds time to hunt. In the hunting ground, the monsters are walking and flying while the obstacles are also placed at various locations. The player has to shoot the arrows to kill the monsters. Each monster is killed by one arrow shoot but the food quantity obtained by each monster is different based on its size as seen in Figure 2. After hunting, the quantity of killed monsters is transferred to HP. Based on the resources; the player can choose to add another member in the group. These members can also perform the same four tasks. However, the main character is responsible for the decision making and resource management.

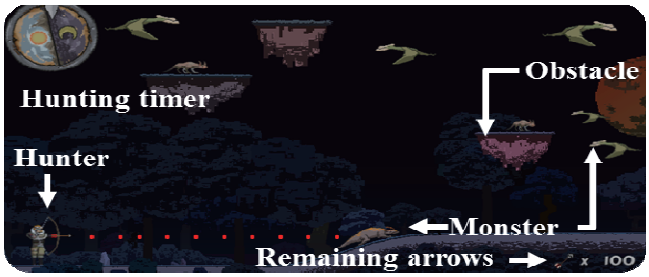

Figure 2 Hunting Ground

III. LOG DATA COLLECTION FROM THE GAME

To collect the data, we have developed the tester version of the shoot them up game. This version is similar to the traditional version of the game. However, it also maintains the record of the players in the form of data logs in the directory of the mobile phone. Different data log files stored during the game can be seen in Table 1.

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Table 1 Storage of the log data for tester version of shoot them up game

File Name	Storage
Log_Time	Current time of the device
Log _Acc	Accelerometer's value
Phone_Info	Smart phone model name, resolution and memory size
Log_Location	Player's location
Log_Touch	Player's touch position on the screen
Log _Gyro	Gyro sensor's value
Log_Status	Food, Wood, Arrow, HP, Score and Members

The data in these files is of two types i.e. in-game data and context logs. In-game data refers the actions chosen by the players and resources which are available and being utilized. Action includes hunting, arrow making, wood collecting, and rest. Available resources include a number of arrows, foods, woods, remaining HP and joint members in the group. The resources being utilized includes a number of shoot arrows, consumed foods, consumed woods, and passed days. Based on in-game data we can figure out the strategy used by the player for efficient resource management.

The context logs refer to the outer environmental conditions of the player and the mobile device. These variables include the starting and ending time of the game, location of the player while playing the game, position of the screen being touched by the player and movement of the mobile device. Based on the data, we can figure out the expertise level, interest in game, time and location of the player as when and where the player used to play the game.

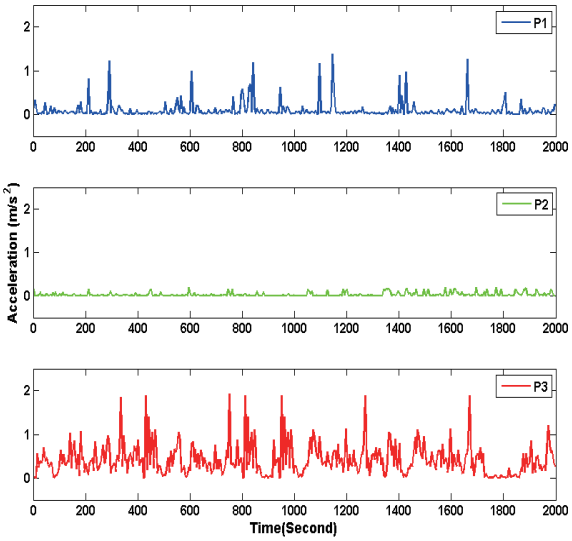

Figure 3 Player's Movement while Playing the Game.

IV. Data Analysis

In this work, we interpreted the behavior of the game player based on context logs. First, we analyzed the data of the accelerometer. Accelerometer records the position co-ordinates (x, y and z) of the player. Given the co-ordinates at two time instants, we can calculate the distance covered by the player using Euclidean distance formula. The resultant distance can be analyzed to interpret the player's movement. Second, we analyzed the data of the touch screen sensors during the game play. Observing this data, we can deduce the understanding of the player about the game.

Figure 3 shows the acceleration (Euclidean distance) for three different players. It can be seen that P2 shows very less variations in the acceleration. It reveals that the player is playing the game in static position. P3 shows large variations revealing the fact that the player is playing the game while traveling. However P1 shows static as well as dynamic behavior. Figure 4 shows the understanding of the player based on touching the screen of the mobile device during the game. P2 seems to be well aware of the game that touches the screen at exact points while P3 is a novice player that tries to explore the other options in the game. P1 in more aware than P3 but still it seems to have moderate level of understanding.

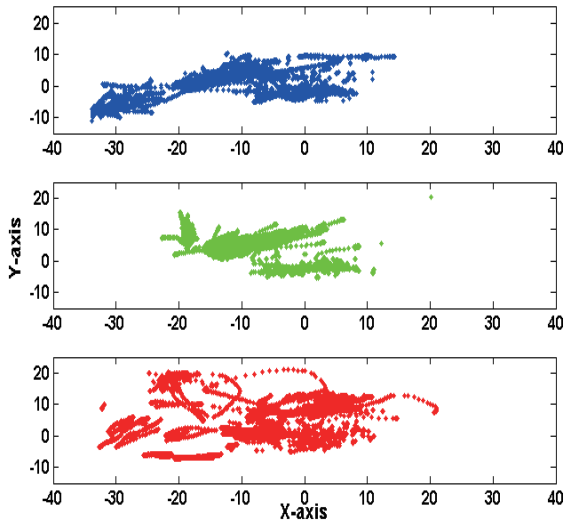

Figure 4 Player's Touch Points on the Mobile Screen during the Game Play

V. Conclusions and Future Work

In this paper, we have shown the significance of the data logs collected to interpret the behavior of the game player. In addition, it can also be used to develop good quality games and improve user interface. The initial analysis reveals that we can interpret the position of the game player and understanding of the player about the game. In future, we will also in-corporate in-game data to interpret the behavior of the mobile video game players.

Acknowledgment

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