Gaming Entertainment Assessment: Case Study Using Jump & Jump Game and Mafia Game

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In recent years, the development of applets and the concept of meta-verse has been evolved in our life. As time goes by, there are always new ideas are revolutionizing our understanding of life constantly. And the game element has become an integral part of these new ideas. In December 2017, at the beginning of the development of the applet, there was an arcade game based on the applet which is called Jump & Jump used to be all the rage. And in this paper, we will introduce the Jump & Jump game and the Mafia game respectively, as a summary of the research results during the master research.

About the Jump & Jump game, what is an arcade game launched on the WeChat platform (a social software in China) at the end of 2017 by Tencent company. It is a game on the WeChat applet platform for smartphones, which is operated via a touch screen. The purpose of this game is straightforward. The player controls an "i"-shaped villain, always jumping towards the box in front of it to accumulate more points.

There are two modes in this Jump & Jump game. One is the single-player mode, and another one is the multiplayer mode which supports up to 8 people. In single-player mode, the game performs according to the usual rules. In multiplayer mode, all players control the same "i"-shaped villain to jump, each player jumps for one time. Once a player fails, they can only watch the game. The next player can continue from the box where the previous player failed and persistently jumps to the end. The final player is the winner. After the game, the number of jumps will rank the players accordingly.

Since December 2017, the game has been released on the WeChat platform in China. The game was all the rage shortly after it was launched and became a hot topic for both users and media, which then later loses such spotlights just after a few months. It is found that the player's number has been exploded in the short term. This caught our attention. We also found that the Jump & Jump game is an endless game. If the player does not fail, the game can go infinitely. Previously, based on the game refinement theory, there was no relevant research on this game. This aroused our interest. Hence, we decided to do major research with this arcade game. And our objective is to reveal the reasons for the Jump & Jump game to be phenomenal and downfall while finding its possible enhancement.

The entertainment assessment of the Jump & Jump game is performed by using the game refinement (GR) theory. The game refinement theory

has been proposed earlier to determine different levels of sophistication of games. Furthermore, it was proposed based on the concept of game progress and game information progress. It bridges a gap between board games and sports games. Many previous works on game refinement theory have shown that it is a reliable measurement tool for evaluating the game's entertainment where the sophistication of games can be determined. In our paper, we will briefly introduce the applications of the game refinement theory in different contexts.

After realizing the game progress model of the game refinement theory. We will apply the game refinement theory to analyze the game progress of the Jump & Jump game. It is believed that the Jump & Jump game is a kind of sports game, while it differs due to neither being time-limited nor score-limited sports. According to our investigation of GR's measure of different level players (the level of players is expressed by $L \in [0.1, 0.9]$), we can consider this game as the case where the task's difficulty level is fixed for players with various levels. And in each game of Jump & Jump, each jump attempts players made per game is considered as an independent experiment. Hence, it is assumed that there is a probability of success for each jump where p is the probability of successful jump action. Conversely, the probability of failure, equivalent to the risk rate of the player takes, is denoted as $m = 1 - p$. Then, a Binomial distribution is utilized to simulate the successful probability of the different states of the players' performance.

We simulate the Jump & Jump game progress through a program that is written in JavaScript. A cyclic Binomial distribution for simulating jump in the game is utilized with $= 0.2$ (standard deviations). The simulation is conducted 1000 times, and the process repeats for every player level. Since each jump of players is a random independent experiment, another Binomial distribution is used to generate random probability to represent a realistic simulation of risk rate (m) and success probability (p).

Through analyzing our data based on the game refinement theory, we can realize that if players reach the $Lv7$ after some practice. They can feel strong engagement in this kind of situation. Such a situation implies that the game becomes easy to win and potentially becomes effortless. This result implies that if a player can reach this level quickly, it is easy for the player to feel dull in this game. And also, the game becomes fair in a subjective sense, which suggests that prolonged play at such a level could potentially cause addiction.

The game rule is given so that the game immediately fails once the player fails to jump to the next box. Such a situation resembles a kind of training because it does not allow failure in the game. Hence, it can be concluded that the Jump & Jump game is a game that gamified sports training. We can

also get the result through the analysis from our data with game refinement theory. Similarly, it can also explain the reason why the Jump & Jump game is a phenomenal game.

For improving this kind of situation, some possible enhancements have been proposed by us based on the game refinement theory from the aspect of entertainment. It mainly includes two aspects: adding puzzle element and adding time limit. From these two aspects, the possible enhancements are established to improve the game as well as the potential design direction of an arcade game.

In the Jump & Jump game, we analyze the entertainment aspect of the Jump & Jump game for different levels of players by applying the game refinement theory. And it also identified the reason why players at earlier levels tend to be more exciting than higher-level players. Then we proposed potential enhancements to improve such drawbacks. It is believed that such improvements may provide further advancement in the design of arcade games and possibly maintain the popularity of the Jump & Jump game.

After introducing the Jump & Jump game, we will also introduce the case study on the Mafia game about the dynamics of minority versus majority behaviors. The game 'Mafia' is a logic puzzle that has been a top-rated party game played worldwide. Many studies have been dedicated to determining the best character combination to keep players engaged while analyzing the overall death toll. Although it has only two-sided plays, there are multiple combinations of characters in which each character's rules are different.

The Mafia game study explores the game's sophistication using the game refinement theory and motion in mind model while measuring the entertainment of each character's actions. It then focuses on the dynamics of minority versus majority behaviors during the game process. Computer simulations were conducted to collect the data of each character and assess the entertainment impacts. Moreover, the energy value of each character was computed based on the motion in mind model.

The results show that when the number of 'mafia' and the number of 'sheriff' are equal, the sophistication of each character is maximized. In addition, the data indicates the player engagement in the following order: $Mafia > Sheriff > Citizen$. Thus, it can be concluded that the actions of the Mafia character are the most complicated and significantly impact the game. It is expected that the results in the Mafia game study enable game designers to improve each character's perspective and examine possible enhancements from the viewpoint of entertainment.