Analysis of Immersion Effects According to the Level of Map in Adventure Game

Myung-Ju Kang *, Chan-Il Park **, Jong-Won Lee ***, Hyoun-Ju Oh ****, Sang-Jung Kim *****

Abstract

In this paper, we analyze the immersion effects according to the level of map in adventure game. Computer games are actively enjoyed by many people around the world. Game players have frequently experienced the immersion which is an important aspect to be attained from games. However, it is not clear what immersion is and what kinds of factors influence to immersion. Nonetheless, in recent many researches, the elements of humanities and fun were found as factors of immersion in various digital contents such as game, virtual reality, cinema and etc. Therefore, today's games are developed on the basis of the humanities and fun theory that many researchers have been studied for a long time. In games, the balance of the level of map is related with immersion. Hence, it is important to know how the map patterns of game affect immersion of players. In this paper, we developed a 3D survival adventure game named by "1 Hour" using Unity3D in order to simulate how map patterns affect immersion of players. We also analyzed the relationship between the level of map and immersion using the game.

▸ Keyword : immersion theory, level of map, fun theory, adventure game

I. Introduction

In general, game developers try to find out fun elements when developing game. Fun is an important element in game because it induces players immersion. In this reason, studies about fun and immersion have been done for a long time.

Fun theory was proposed by Raph Koster. It is that game is a learning tool based on human brain activities that tend to find information patterns and change them to images. Hence, game consisting of images is easily accepted by human brain. According to the theory, the process of pattern recognition is the process of practice and learning, and the learning of fun is the process to play game[1].

Immersion theory was proposed by Csikszentmihalyi. It is that immersion is the mental state of operation in which a person performing an activity is fully immersed in a feeling of energized focus, full involvement, and enjoyment in the process of the activity[2,3]. That is, immersion is an activity of play for a goal. Hence, if the level of difficulty is suitable to a person's ability, immersion activities are available. While doing immersion activities, a person can obtain good experiences and challenge to the more difficult tasks. That is, a person can get his skills from fun obtained by solving problems(tasks) suitable to him[4].

According to the above two theories, the level of difficulty in a game is a basic principle to maintain fun. A player can obtain his skills from various patterns created according to game rules.

When designing a game based on the fun and immersion theories, the main considering elements are as followings;

- To simplify the structure and rule of the game to maintain the appropriate level of difficulty that can induce interest and immersion to a player.
- To upgrade the learning patterns trained before while playing the game.
- To use the upgraded patterns continuously.

In this paper, we developed a survival adventure game named by "1 Hour" to analyze the relationship between the level of map(map patterns) and immersion.

The paper is organized as follows. In section 2, we describe the related works on the studies of immersion. In section3, we focus on the game that we developed for analyzing the immersion effects. The results of our studies are presented in section 4. We then conclude the paper.

II. Preliminaries

1. Related works

The studies about immersion have been done by many researchers.

H. I. Kwon et al. tried to see how people interact with 3D stereo through the empirical study. They measured how different people got immersed while playing game in 3D stereoscopic and 2D using Jannett's questionnaire[5].

J.H. Jung et al. studied about the evaluation of user immersion experience using eye responses such as pupil size, the frequency and duration of blink. The games that applied in the study were puzzle game, point tracing game and coloring game. In the study, they found that the pupil size and the frequency of blink were the important factors of user immersion experience as psychological and physiological indicators[6].

Paul Cairns et al. studied about quantifying of the experience of immersion in games. They set out two hypotheses for experiment on immersion. The first hypothesis is that the level of immersion in playing the game will higher than the level of immersion in the control activity. The second hypothesis is that the improvement in task performance will be less in the experimental condition than in the control condition. At the experimental results, using regression to consider the effect size, the effect is appreciable on the range of immersion scores found. But when divided into the two conditions, the correlation between immersion and task time difference was not significant in the control condition[7].

B.C. Nam et al. studied about a method of the quantitative analysis of immersion through World of Warcraft(WoW) in MMORPG. In the study, they proposed the method of skill-capacity analysis based on level and skill[8]. In the study, the character's skill is a factor to analyze immersion effect in game.

S.J. Yoon studied about the multimedia data quality evaluation metrics that affects the immersion of the game[9], and M.K. Chung et al. proposed the factors of learner's flow in MMORPG for education. In the study, they developed 6 factors, 16 subfactors and 48 items to evaluate the learners' immersion[10].

III. Level Design and Pattern Elements of the Game "1 HOUR"

1. Overview of the game

In this paper, we developed a survival adventure game named by "1 Hour" to analyze the relationship between the level of map and immersion.

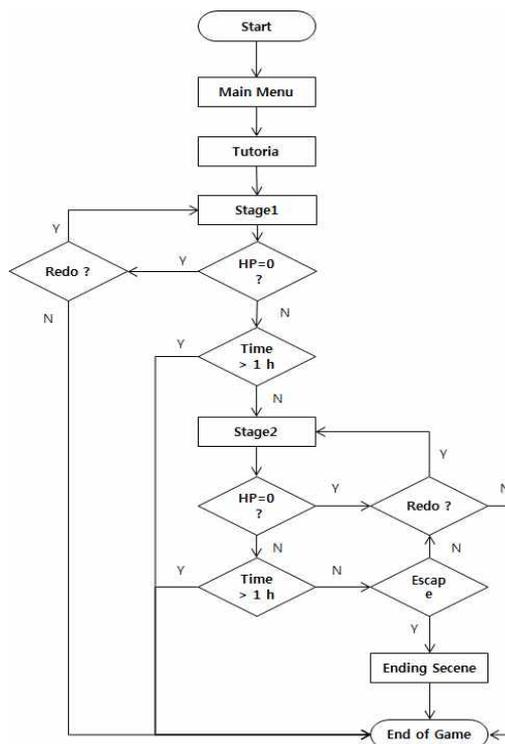The figure 1 is described the overall game logic.

Fig. 1. Flow chart of game

In the game, the player should escape from the game map within 1 hour. Also in order for the player to survive , the

HP of the player character should be greater than 0(zero). The game has 2 stages and a player should clear the stages one by one within 1 hour for each stage.

The figure 2 presents the relationship of inventory, combination and set-up classes. Inventory class has item objects and methods such as addItem, deleteItem and findItem. The construction class is a parent class of compund class rendering in game scene. MaterialType class is a super class of item information and MixDB is a database for item informations.
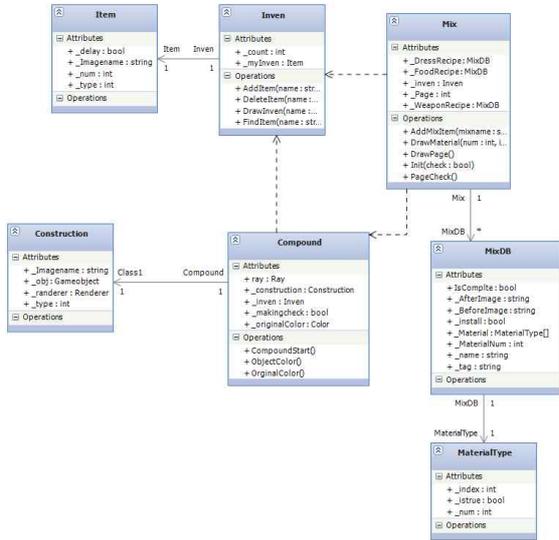

Fig. 3. UI of inventory

Fig. 2. Relationship of inventory, combination and set-up classes

	Sticky leaves trap	web (2)	Red leaf (2)
	Sticky branches trap	Web (2)	Branch (2)
	Fatal leaves trap	Sticky leaves trap (1)	Snake venom (1)
	Fatal branches trap	Sticky branches trap (1)	Snake venom (1)

Fig. 4. Examples of combination

These patterns are also applied to combat system in the game. A player fights with animal NPCs called by "Creature" while moving to a target place. In the beginning of playing, the player can hunt the NPCs easily. But after then, the player has to hunt them using the combination system, because the level of difficulty is getting higher.

2. Combination and combat system

In the game, there is a combination system that a player collects items through exploring game-map and makes tools for survival. As in figure 3, each item in inventory consists of a component and the number of it.

The combination system is a kind of learning pattern with which a player can learn how to make a tool for survival. The player clicks to select some necessary items in inventory and combines them to make a tool. The combination examples are as figure 4.

3. Level of game map

The game has two maps; a cave map and a jungle map. A player explores two maps in turn. The cave map is a map used in tutorial mode for beginner, in which the player can learn how to play game. The cave map was designed with unidirectional structure in order to be able to explore it easily. The figure 5 shows the cave map.
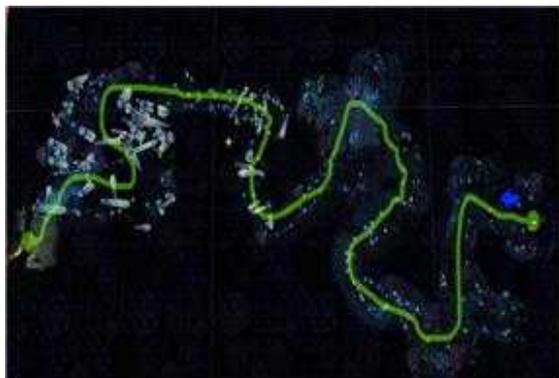
Fig. 5. Cave Map

The jungle map is complicated much more than the cave map. Unlike the cave map, there are traps and cross-roads in the jungle map. That is, the jungle map is multidirectional structure like figure 6.

Fig. 6. Jungle Map

In the game, a player can learn some patterns through combination system and game-map exploration. The difficulty level of the map is getting higher while playing game. Hence, it induces users to feel fun and immersion.

IV. Results

1. Hypotheses

In order to analyze the relationship between the level of map and immersion, we made two hypotheses as followings.

Hypothesis 1: The combination and combat system designed on the basis of the patterns of fun theory in adventure games will affect immersion of players.

Hypothesis 2: The game-map designed on the basis of the patterns of fun theory in adventure games will affect immersion of players.

For experiments, we developed two versions of an adventure game. One(Game-A) is a game developed on the basis of patterns of the fun theory and the immersion theory, and the other(Game-B) is a game developed without considering the two theories[11].

Game-A has the following characteristics;
- A player can arrange monsters that the player does battle with using the combination and learning patterns.
- It involves tutorial mode.
- It involves how to operate a game character.
- The level of difficulty is getting higher while learning patterns.

Game-B has the following characteristics;
- It is difficult for a player to arrange monsters.
- It does not involve tutorial mode.
- It has complicated map.
- The level of difficulty is too high to complete.

2. Experimental environments

In this study, 50 students were participated and separated into two groups(group A and group B). The students involved in each group played the Game-A and the Game-B respectively.

3. Questionaire

In order to manipulate the degree of immersion, we applied 6 factors that were drawn by Jennett et al.[12]. The factors and questionnaire are as followings.

Table 1. Factors of manipulating the degree of immersion

Factors	Questionnaire	Indicators
Basic attention	To what extent did you feel you were focused on the game	7
Temporal dissociation	To what extent did you lose track of time?	7
Transportation	To what extent was your sense of being in the game environment stronger than your sense of being in the real world?	7
Challenge	Did you find the task too	7

	difficult?	
E m o t i o n a l involvement	Did you care if you won or lost?	7
Enjoyment	Did you like the task?	7

4. Immersion effects for the combination and combat system

In this experiment, we conducted an experiment for the difference of immersion degree between Game-A and Game-B. As a result, the averages of immersion degree for Game-A and Game-B are 5.25 and 3.35 respectively. The average of Game-A is 1.9 higher than that of Game-B. Figure 5 shows the result.
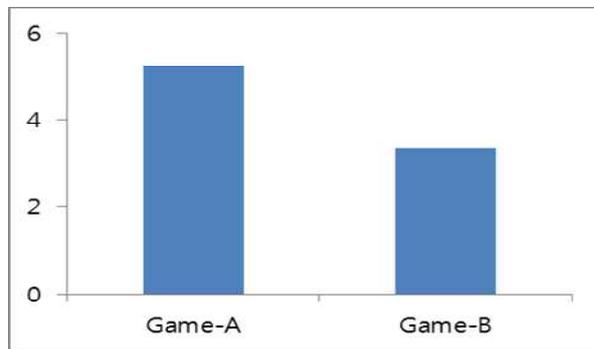
Fig. 7. Results of hypothesis 1

5. Immersion effects for the level of map

In this experiment, we conducted an experiment how a map designed on the basis of patterns affects immersion of players. The result is that the averages of the immersion degree for Game-A and Game-B are 5.35 and 2.95 respectively. The average of Game-A is 2.4 higher than that of Game-B. Figure 6 shows the result.
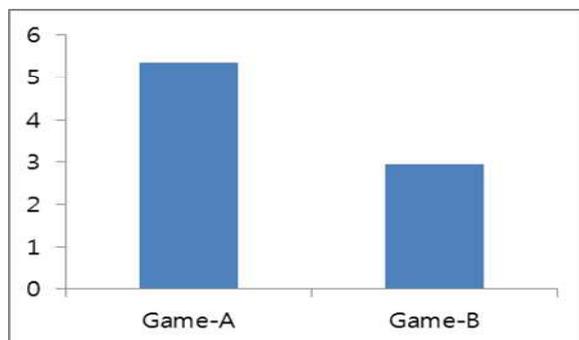
Fig. 8. Results for hypothesis 2

V. Conclusions

In this paper, we analyzed the relationship between the level of map and immersion in adventure game. To simulate how patterns affect immersion of players, we developed two versions of an adventure game. One(Game-A) is a game that was developed on the basis of patterns of the fun theory and the immersion theory, and the other(Game-B) is a game that was developed without considering the two theories.

As experimental results, we found that the immersion degree of Game-A is better than that of Game-B. Hence, it is important to apply patterns of the fun and the immersion theory when developing adventure games. Also, we found that the level of game-map is an important factor for a player to feel immersion when playing game.

In the future, it is necessary to study about the immersion effects from the relationship between the level of map and playing time.

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