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게임의 가상공간 환경에서 사용자 인터페이스 속성에 따른 재미와 몰입감 차이

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Differences of Fun and Immersion according to Game User Interfaces in the Virtual Space

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[요 약]

본 연구에서는 다양한 장르를 가진 디지털 게임의 영역에서도 1인칭 시점에 머물러있는 가상현실 게임 콘텐츠들의 한계에 대해 선행연구와 사례를 통해 고찰하고, 이를 바탕으로 가상공간 게임에서의 시점(1인칭, 3인칭)과 햅틱 피드백이 가져다주는 게임의 몰입감과 현존감 및 재미의 차이를 실험을 통하여 알아보았다. 실험 결과를 살펴보면 게임의 시점은 3인칭일 때보다 1인칭일 때, 햅틱 피드백이 제시될 때 몰입감과 현존감 및 재미가 증가하는 것을 알 수 있었다. 그러나 가상공간 환경과 게임 시점 간의 상호작용은 발견할 수 없었다. 이러한 결과로 가상공간 게임들은 1인칭을 시점으로 하여 햅틱 피드백을 사용하는 것이 적절하다고 할 수 있으나 게임 시점과 가상현실 환경이 무관한 점, 1인칭시점 게임보다는 3인칭이 더 인기를 끄는 점 등 을 빌어 가상공간에서의 3인칭시점 게임의 가능성을 시사한다.

[Abstract]

The purpose of this study is to investigate the limitations of virtual space game contents staying in the first-person viewpoint in the field of digital games with various genres through precedent researches and case studies, and to investigate the differences of immersion, presence, and fun based on the user interfaces, such as the viewpoints (first-person, third-person) and haptic feedback. The experimental results show that when the game is the first-person with the haptic feedback, the immersion, presence, and fun increase. However, the interaction effect between the virtual space environment and the game viewpoint was not found. As a result, it is appropriate to use the haptic feedback and the first-person viewpoint in the virtual reality games, but the fact that the game viewpoints and the virtual space environment are not huge relevant, and the third-person viewpoint is more popular than first-person viewpoint game, therefore the possibility of a third-person viewpoint game would be suggested.

색인어 : 게임, 햅틱 피드백, 몰입감, 뷰 포인트, 가상공간
Key word : Game, Haptic Feedback, Immersion, Viewpoint, Virtual Space

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Ⅰ. Introduction

1-1. Viewpoint of Popular Games

The higher the immersion in game, the more time the user enjoys the game [1]. In order to increase the immersion feeling in game, visual elements are important. In order to recognize such visual elements, a viewpoint element is required, and thus the viewpoint of the game is also closely related to the immersion feeling [2], [3].

According to previous studies, despite the fact that the immersion feeling of the first-person viewpoint is higher than that of the third-person, there are a lot of third-person games than the first-person among the popular games. The first-person is a good viewpoint to immerse in the game, but it is because the various factors affect on the immersion of the game, not only the viewpoint of the game. The choice of point of view is influenced by the content of the game, which is different depending on the task provided by the game or the manner of battle. In some cases, the third-person or omniscient viewpoint is advantageous to observing the overall content of game [3]. In addition, since the genres of games are varied and the weight of major fun elements is different according to genres [4], it is not possible to concentrate solely on the merits brought by first-person viewpoints.

1-2. Game Viewpoint in Virtual Reality

Most of the virtual reality games currently on the market are first-person viewers. The immersion can be measured by the immersion into the complete game environment and the lack of awareness or escape of the real space. In the case of VR devices using HMD (Head Mounted Display), audiovisual information of the real world is blocked and audiovisual information of the virtual world is presented, leading to high immersion [5]. It is natural that the first-person viewpoint is a content of the virtual space, since the viewpoint of the game character coincides with the viewpoint of the user and the visual and auditory information in the game is limited within the visual range of the character [6].

Fig. 1. First-person viewpoint, ‘Counter-Strike’(left) and third-person viewpoint, ‘Starcraft’(right)

The reason why the third-person viewpoint is avoided is that the viewpoint in the VR image contents may increase the interaction with the contents and the immersion feeling, but there is a possibility that the information necessary for the storytelling may be missed or distorted [7], this disadvantage can be reflected as it is when implemented with third-person viewpoint.

However, as shown in the study by Ryu et al. [3], even if the popular games are not the first-person viewpoint games all and HMD is a display device specialized for the first-person viewpoint content, the limitations of the VR content ecosystem concentrated on first-person viewpoint are obvious on the side of the variety of game genre. This is because it is a constraint to produce a variety of fun elements of a game with only one viewpoint.

1-3. Research Questions

In this context, the present study investigates how playing third-person viewpoint games in virtual space affects the intrinsic factors such as immersion and fun. If the choice of third-person viewpoint in VR negatively affects immersion and fun, then this development method should be avoided. On the contrary, if the difference of viewpoint in VR does not affect game immersion and fun, it can suggest the usefulness of third-person game development in VR.. Also, in order to improve the immersion feeling of game in addition to the difference of game viewpoint in VR, the relationship between the viewpoint and haptic interface is explained by confirming whether the conventional vibration feedback method interacts with the game viewpoint [8].

In the experiment, we evaluated the immersion, fun, and presence of the game as the dependent variables for three independent variables (game viewpoint: first-person vs. third-person, display method: monitor vs. VR display, vibration feedback: haptic vs. no haptic), respectively. In the general environment of the monitor, not the virtual reality, the research design (2x2x2) was added to the display method to confirm the effect of the game viewpoint (first-person or third-person viewpoint).

Fig. 2. Oculus Rift device (left) and vibration wrist band (right) for the experimental settings

Fig. 3. An option screen for setting each independent variable in the experimental environment (left) and an evaluation test for each condition (right)

II. Research contents and method

The experiments were carried out through a simple computer game in which eight conditions were combined with the display method of the game (HMD and monitor), the viewpoint of the game (first-person and third-person), and haptic feedback presence as three independent variables. The dependent variables were surveyed using the 7-point scale, dividing the participant's subjective assessment of presence in addition to the main measurement variables immersion and fun with 15 items. The participant played a simple exercise game after listening to the experiment explanation, and the researcher played the game set by the independent variables for 2 minutes, and wrote the questionnaire at the end of each game session.

A 24-inch LCD monitor was used for the monitor display, and the OCULUS RIFT was used for HMD (Head Mounted Display), and a vibrator composed of ARDUINO-kit and Xiaomi Wrist-band (Fig. 2). This device operated the same direction vibrator according to the direction of the event which is output when attacking the enemies on the left and right side during the game.

To provide the sound of the same volume, the sound output was limited to the PC speaker without using the headset mounted on the HMD, and the experiment was conducted in the same sound environment. The game uses a Unity 5 game engine as a simple 3D game that defeats enemy characters appearing on the left and right sides of the screen in two directions. The score was scored when the participant correctly scored the enemy character and subtracted when he or she was hit by an enemy. In order to encourage the participant's sincere participation, he or she was asked to aim for the highest score update for 2 minutes of the game progress time.

A total of 26 participants (13 males, 13 females, mean age 23.8 years) participated in the experiment. Before the experiment, participants were asked to write a preliminary questionnaire asking about the tendency of immersion.

In the case of the game viewpoint, the third-person is directed by the camera that illuminates the game screen and looks down from the back of the play character. In the first-person, the camera is placed at the eye position of the character and glove only the fist which was put on was seen. The position of the camera is changed only when the difference between the viewpoints (first-person, third-person), and both the monitor and the HMD are fixed to the same place if the viewpoint is the same.

Fig. 4. Scenes of playing virtual environment game at different points of view as an independent variable

The camera that illuminates the viewpoint of the game is fixed at one point in the 3D space to exclude the VR sickness that may occur in the vertical and horizontal movement. However, the rotation (pitch, yaw, roll) change was reflected, so that the participants can see the space in the game naturally while wearing the HMD.

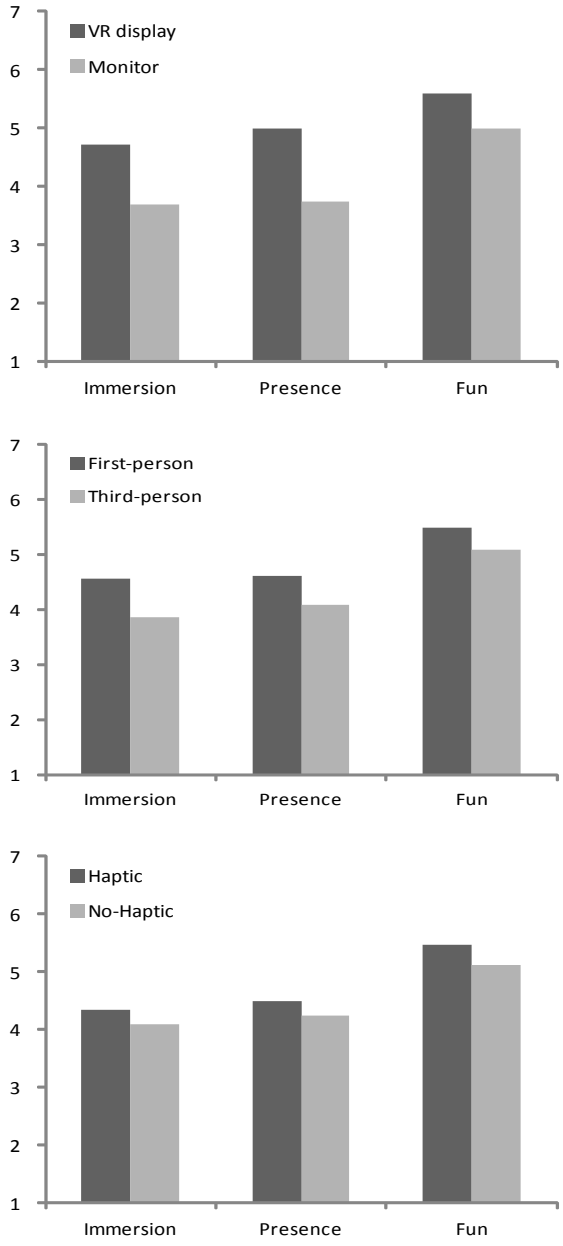

Fig. 5. Analysis of differences of immersion, presence, and fun according to each independent variable (display method, game viewpoint, haptic feedback)

Ⅲ. Results and Analysis

Three-way repeated measures ANOVA was explored how dependent variables such as immersion, presence, and fun change according to differences in three independent variables (game viewpoint, display method, and haptic feedback).

In the case of immersion, the display method was higher in VR than in the monitor ($F(1,23) = 47.49$, $p < .01$) and higher in the first-person viewpoint than third-person viewpoint ($F(1,23) = 40.79$, $p < .01$), respectively. Haptic feedback was found to lead to a higher level of immersion when presented ($F(1,23) = 11.00$, $p < .01$).

Presence was higher in the VR than in the monitor ($F(1,23) = 56.01$, $p < .01$), and was higher in the first person than in the third person ($F(1,23) = 42.32$, $p < .01$). When the haptic feedback was presented, it showed a higher immersion feeling ($F(1,23) = 10.01$, $p < .01$). There was a main effect among three independent variables but no interaction effect.

In addition, fun score of the display method was higher in VR than in the monitor ($F(1,23) = 11.74$, $p < .01$), and fun score of the viewpoint of the game was higher at first-person than at third-person ($F(1,23) = 14.38$, $p < .01$), and when the haptic feedback was presented, the feeling of immersion was higher ($F(1,23) = 12.39$, $p < .01$). There was a main effect among the independent variables but no interaction effect as same as above.

The results of the above analysis show that the highest score is obtained when the display method is the same as VR in all dependent variables (immersion, presence, and fun), when haptic feedback is presented, and when the game is first-person viewpoint. However, there was only the main effect of independent variables, and no interaction effect between independent variables was found. In other words, it is more advantageous if the VR game is designed as a first person viewpoint. However, the fact that the third person game is virtual reality does not drop the fun of the game itself. Also, it does not get much better if you are playing first person games in virtual reality.

Ⅳ. Conclusion

The point of view of the game is a very important factor in determining the game form and manner. Among the various viewpoints of the game, the first-person and third-person viewpoints are mainly used, and the immersion feeling of the game is higher in the first-person game, but the third-person game is more popular than the first-person game. However, in the VR

game content market, only first-person games are released with the first-person game becoming natural to be VR. Game genres and fun elements vary, but because the types of games that can be expressed by specific viewpoints are limited, virtual reality content ecosystems, which are concentrated only in the first-person game, are limited in terms of genre diversity none. Although it is pointed out that the content market is insufficient even though the VR industry has grown rapidly, the VR content market is expected to become richer by creating VR games by applying the advantage of third-person games rather than first-person viewpoints. An attempt to develop a game with various viewpoints may be necessary.

In this study, In this study, we investigated the effects of game viewpoint (first-person, third-person) and display method (VR, monitor) on immersion, presence, and fun, and how the haptic feedback, which is traditionally used to enhance the immersion sense of the game, plays a role as a mediator between the VR and the game viewpoint. The results of the experiment showed that the scores of fun and immersion of the first-person viewpoint were higher than that of the third-person, and that the VR environment using HMD in the display method were higher than in the monitor. And when haptic feedback was presented higher immersion and fun scores were evaluated. However, only the main effects of each independent variable exist and interaction can not be confirmed.

These results show that VR game using first-person viewpoint and HMD is advantageous, but since VR environment does not interact with game viewpoint, it is not necessary to restrict game viewpoint to first-person when developing VR game contents. As we have seen in the previous study [3], we can apply the advantages of the third-person viewpoint to the VR games, considering that the game of the third-person or omniscient viewpoint is more popular than the first-person game which is more immersive. Developing games with various 'fun' elements and genres in virtual reality can be presented as a solution to the problem of lack of content in VR industry.

The limitations of this study are based on experimental games that only change game viewpoints, so they do not fully reflect the characteristics of digital games with various genres and 'fun' factors. In addition, since the position of the camera is fixed in order to exclude VR sickness, there is no measurement of the fatigue or comfort feeling, which is a main factor of VR satisfaction [9]. In addition, it did not provide a proper example of how the third-person viewpoint of VR game might be better than the first-person viewpoint, only suggesting the possibility of the third-person viewpoint in the VR game. Therefore, in the following study, it is hoped that the study of various game viewpoints in the VR game will be conducted by supplementing the limitations of the above issues.

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