

Interactive 3D VR Content Design for Close Encounter of Social Issue

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Abstract

The government has defined domestic violence as one of the four major social evils and tried to prepare laws and systems to prevent it. Nevertheless, domestic violence has emerged as a serious social issue, and compare to the number of domestic violence cases that are constantly increasing, the report rate of domestic violence is significantly lower. This suggests the need to improve citizens' perception of domestic violence as the issue to solve it together in society, not as a private matter at home. Most of existing contents for preventing domestic violence and improving awareness are simple viewing forms of video contents, which have little effect on recognition. We aim to confirm the possibility of improving social awareness about domestic violence by producing Virtual Reality (VR) contents that have great features of user's immersion and empathy. In this VR content, the user can interact with various objects in the virtual reality of domestic violence and directly or indirectly experience the victim's position. Users who view the violent environment from the victim's point of view can have a subjective empathy for the problem, which is expected to induce more active awareness about domestic violence.

Keywords: *Virtual Reality Content, Immersion, Empathy, Domestic Violence, Improving Awareness*

1. INTRODUCTION

As the recognition has emerged that domestic violence is not a problem within the family but a social structural problem that must be resolved by the state and the social community, our country has continued to make systematic efforts by enacting the Act on Special Cases Domestic Violence to prevent domestic violence. However, domestic violence in our society has not decreased, but rather continues to increase. According to the statistics of domestic violence cases in Seoul, the number of domestic violence cases in 2016 was 7,700, which is about four times higher than in 1,726 cases in 2010. Despite the fact that the Domestic Violence Exception Act has been in force for more than 20 years, the reason this crime continues is that there is a problem of social awareness of domestic violence. In fact, if you look at the rate of domestic violence reported in 2016, the rate of marital violence was 41.5%, but the number of police reported by wife who is violent victim was only 2.8% [1]. According to a survey conducted in the same year, about the reasons for not reporting in the event of a domestic violence, in case of violence caused in their own homes, 49.7% said they did not report it 'because it was my family'. And in case of violence caused in neighbor's, 51.9% said 'because it's someone else's business' [2]. These results suggest that there is still a great deal of misconception that domestic violence is a private and minor problem at home. In addition, problems caused by lack of awareness are also

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revealed in the police response stage. In many cases, the police were not properly involved because of the unreasonable social perception that 'families should be maintained' rather than protecting the victims first [3]. This shows that the domestic violence problem in the present society is difficult to solve by the institutional method alone. The effective and active intervention of the state in domestic violence requires a change in social awareness along with policy efforts in the right direction [4].

In response to this trend, the government selected education and content development to raise awareness as one of the important tasks to prevent domestic violence. Currently, the contents provided by the government are mostly educational videos for information delivery, and such simple viewing type video contents doesn't have a significant improvement effects in recognition due to one-sided information transfer. However, for virtual reality, the user can feel the virtual environment abundantly with visual, hearing senses in the first person view, which is advantageous for conveying stories and experiences to audiences rather than the other media such as text or video. Therefore, this study aims to find effective ways to improve awareness of domestic violence by producing VR contents with strong immersion, presence, and interaction than video contents. Through VR content, users can experience the emotional environment of victims in domestic violence environment directly or indirectly, which is expected to contribute to active awareness improvement than the existing content by inducing emotional immersion and empathy of users.

2. RELATED WORK

2.1 Immersion of Virtual Reality

According to Janet Murray, Virtual Reality features immersion, empathy, agency, and transformation. In particular, the dimension of immersion is a key feature that distinguishes VR from other forms of media [5]. The types of immersion you can experience in VR can be divided into physical and emotional immersion. Physical immersion is a state in which a person participating in a virtual space perceives that it exists in that virtual space using all of its senses or parts of the senses [6]. It is also perceptual immersion, this is done by replacing all the sensory organs of the user with input and output devices, completely blocking the physical environment [7]. Head Mounted Display (HMD) is the most optimized output device that can realize physical immersion in the current virtual reality market, and it provides a sense of reality that can disconnect the time and space from the outside and allow the user to perceive the environmental change caused by the interaction. Emotional immersion is psychological immersion, in which the user feels real in virtual reality, even if there is no technical device surrounding the sensory organs [7]. In other words, it is the immersion that a user can feel and empathize with contents while enjoying it. And the storytelling of contents has a great influence on this emotional immersion [8]. In VR content, these two immersions occur at the same time, providing a strong immersion to the user.

So what can we gain from immersion in VR contents? When VR users are immersed in virtual reality, they can become main characters of content and have a viewpoint of others. To be someone else is to 'empathize', and to share the feelings of others' experiences. The philosopher Karl Popper says that the most useful way for a person to gain new understanding is to 'be sympathetic intuition' or 'empathy'. By being someone, you do not understand the problem objectively from the outside, but rather you know how to understand the problem internally [9]. In 2013, Professor Sun-Joo Ahn of the University of Georgia conducted an experiment to see if the experience of red-green color blindness through virtual reality influenced the empathy about red-green color blind people. They explained to participants the red-green color blindness and conveyed a task that was difficult to carry out if the red-green color blindness. Half of the participants wore HMDs with color blindness filters, and the other group wore normal HMDs and asked them to imagine themselves in color blind.

Afterwards, in the name of volunteering, not in experiments, they delivered the task to the participants, and the participants who experienced color blindness had twice as much time to help color blind people than other groups. Also participants who experienced color blindness along with low Interpersonal Reactivity Index (IRI) changed to more favorable attitude toward people with color blindness [10]. This shows that indirect experiences in virtual reality go beyond psychological empathy and bring about changes in human perception and behavior. Virtual reality is a media that can change people's perception by implement the 'empathy', and there is a difference that existing media does not have.

3. CONTENT DESIGN

3.1 Interface

HMD as output device was used to help the physical immersion environment of the users, and controller and Leap Motion as input device were used to help interaction and control. Users interact with various objects in a virtual domestic violence environment. This content basically follows Euler angles introduced by Leonhard Euler to describe the orientation of a rigid body with respect to a fixed coordinate system. When the VR experience begins, the user moves through the controller. Leap Motion draws active behavior by visualizing physical interactions, such as stroking a dog or opening a door. When the user looks at a specific object that appears in each scene, the corresponding function is automatically executed. These interaction elements induce user participation and create a sensory immersion environment.

3.2 Scenario

The scenario focused on experiencing the psychological change of victims of domestic violence, Scene is divided into before experiencing domestic violence and the space where violence occurred and after experiencing violence. To emphasize that domestic violence is not a special place but a crime that is happening around us, the first scene produced a bright and peaceful atmosphere around the home (Figure 1). If a user encounters a dog before entering the house, the dog approaches the user and expresses a friendly feeling (Figure 2). At this time, the work plays the laughter of the child to let the user know that it is the viewpoint of the child. The bright audio and environment make the user feel good thing.





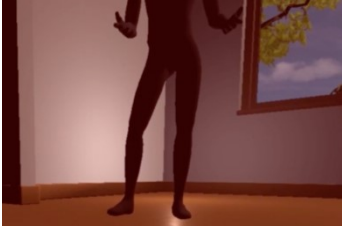
Figure 1. Bright mood around home in first scene



Figure 2. Dog that express friendliness

As the user enter the house, a second scene begins. The user encounter family members and are subject to domestic violence. Without considering the possibility of using two different conventions for the definition of the rotation axes (intrinsic or extrinsic), there exist twelve possible sequences of rotation axes, divided in two groups. At this time, a sound of crying 'Mom' was played, remind the user again that this was a domestic violence situation. Domestic violence is divided into physical violence, psychological and emotional violence, sexual violence, economic violence, neglect and control, depending on the type of violence. And in this work tried to express physical violence, psychological and emotional violence and neglect. And in Korea, the second-highest type of domestic violence is through drinking, it is expressed as the scene that the person is throwing bottle [11]. Table 1 shows the scenes that are represented the type of domestic violence in the work.

Table 1. Type of domestic violence in Second scene

Object	Type of domestic violence
 <p data-bbox="395 1029 620 1066">Family member 1</p>	<ul style="list-style-type: none"> <li data-bbox="762 772 1313 838">■ Psychological, emotional violence and physical violence <li data-bbox="762 844 1313 1012">■ Member 1 throwing the bottle. Domestic violence caused by drunk family members is the second most frequent in Korea. At the same time, swearing voice is played. It means verbal violence.
 <p data-bbox="395 1376 620 1412">Family member 2</p>	<ul style="list-style-type: none"> <li data-bbox="762 1189 1007 1225">■ Physical violence <li data-bbox="762 1232 1313 1293">■ Member 2 approach the user and commit violence.
 <p data-bbox="395 1681 620 1717">Family member 3</p>	<ul style="list-style-type: none"> <li data-bbox="762 1481 1313 1547">■ Neglect and psychological and emotional violence <li data-bbox="762 1553 1313 1655">■ In this scene, voices are played to request help to family. But this member 3 ignores the user's help.

After that, the screen goes dark and the scene switches to the third scene. The user is left alone at home, and lonesome and dark audio flowing out. When the user open the doors and step out, user face the dark environment unlike the first scene (Figure 3). In the first scene, the dog, who was friendly for user, barks fiercely toward the user (Figure 4). Through the dark atmosphere that is completely opposite to the first scene, the user can feel the depressed and helpless feelings of the victim.



Figure 3. Dark and gloomy outside in last scene



Figure 4. Barking dog to user

4. CONCLUSION

There has been a variety of policy support since the enactment of the Domestic Violence Act, but the awareness of domestic violence is still weak. As a result, it is hard to expect that not only victim's report but also witness'. In order to solve the domestic violence problem, all of member of the society needs to make efforts based on the care and understanding of other people. A common problem is to find the Euler angles of a given frame. The fastest way to get them is to write the three given vectors as columns of a matrix and compare it with the expression of the theoretical matrix (see later table of matrices). Hence the three Euler Angles can be calculated. Nevertheless, the same result can be reached avoiding matrix algebra and using only elemental geometry. Here we present the results for the two most commonly used conventions: ZXZ for proper Euler angles and ZYX for Tait–Bryan. Notice that any other convention can be obtained just changing the name of the axes. We aim to improve the awareness of domestic violence by producing contents that can experience domestic violence from the victim's point of view using virtual reality that can empathizes through the immersion. This is significance because through VR, it allows people to feel the pain of others in the realm of sensation and sympathize with the other's pain. In the survey response to the users who experienced this work, it was confirmed that users were commonly able to sympathize with the feelings of depression, loneliness, etc. experienced by domestic violence victims. However, because of the relatively short length of content, the interaction time with the objects appearing in the work is generally short and the CG-based virtual environment, which is not specific, does not lead to deep empathy.

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