

## A Study on Virtual Reality Contents Application in Broadcasting: Focused on KBS 3D History Documentary <Uigwe>

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### Abstract

History documentaries in Korea have developed various forms of production techniques to overcome the limits of insufficient historical records and videos, and dramatic elements that make the viewers immersed. Through diverse production techniques, history documentaries can maximize the factuality, vividness, and informativeness, allowing the viewers to understand and share the historical events. This paper analyzed the “immersion and experience” techniques of the programs that have been the main turning points of the history documentary so far and produced and realized the virtual reality through utilizing “Uigwe”, a 3D history documentary broadcasted on KBS which showed the possibility of applying the virtual reality technique as a new broadcasting contents format.

**Keywords:** 3D Documentary, Virtual Studio, Virtual Reality, Broadcasting Production.

### 1. Introduction

The format experiments and developments of history documentaries have been a process of trying to find a way to reproduce the insufficient videos and combine the historical facts of the past with today in space and time. Various production techniques for history documentaries have been developed including the drama techniques for a dramatic interest, special video techniques to reproduce the vanished historical objects, and virtual studio techniques through which interviews with historical figures in a virtual field are possible. This kind of documentary production techniques greatly helps the viewers to understand and share the historical events with interest by maximizing the factuality, vividness, and informativeness[1]. The evaluation about the formative experiments and “experience and immersion” production techniques of the history documentary is positive. This paper aims to analyze the “immersion and experience” techniques of the programs, which have been the main turning points in the development of history documentaries, and investigates the possibility of applying the virtual reality (VR) as a new future technique.

### 2. The development of the production techniques of history documentaries in Korea

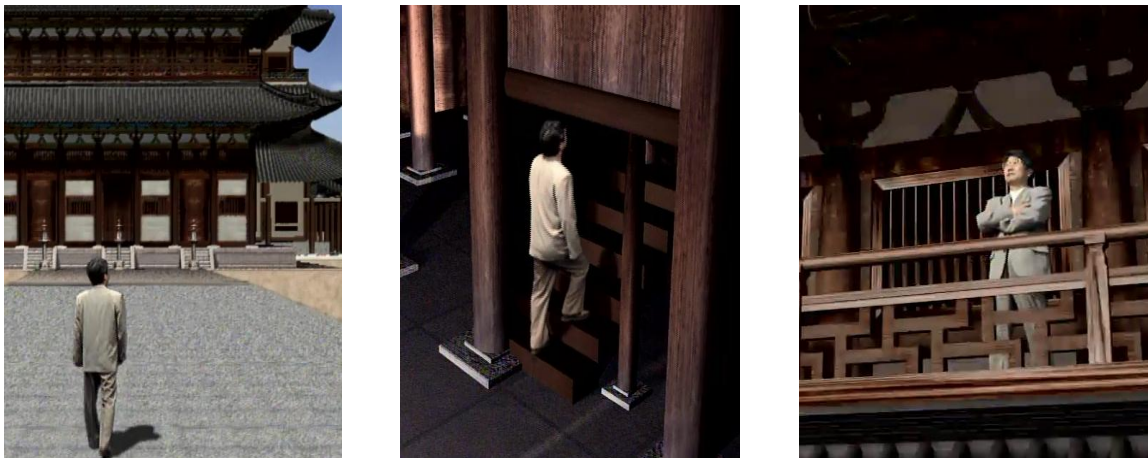
#### 2.1 Drama documentary techniques

“Documentary Theatre” is a history documentary broadcasted in 1993, which is the first “drama

documentary” that tried a chemical combination of documentary and drama half and half[2]. After checking the basic documents such as photos, records, diaries, articles, and memoirs and checking the situation through the testimonies of the related people, it reenacts the drama based on it. This is a device to eliminate to a maximum degree the problems of distortion, exaggeration and fabrication that can happen in the drama reenactment in history documentaries.

## 2.2 Special video reproduction technique

“Sunday Special” - KBS 10 Cultural Heritage Video Restoration Hwangryong” is the first program that reproduced the historical remains in earnest through a cutting-edge special video technique. The special video technique that has been introduced to the program realizes the vanished historical remains in front of the viewers by perfectly reproducing the related objects.



**Figure 1. Virtual studio technology**

Figure 1 is the scene that used the virtual studio technique. The scene in which MC goes into the restored Hwangryong-Sa Tower gives the virtually reproduced remains factuality and vividness.

## 2.3 Virtual studio technique

“History Special” is a history documentary that introduced the virtual studio technique in earnest in the regular program. The virtual studio, which was used in “Shilla people also did bottoms up (three shots at a stroke)”, shows a more advanced technique than the ones used in the previous programs.



**Figure 2. Virtual studio interaction**

Figure 2 is a scene which interacts with the virtual studio. [3]. The MC grabs the dice which has been reproduced or lights up the dark interior by turning up the lamp with a lighter, highlighting the factuality of the remains, which was reproduced through interaction with the virtual studio.

#### 2.4 4K 3D stereoscopic production technique

“Uigwe, the 8-day festival”, is a 3D stereoscopic realistic video documentary that reproduced the 8-day festival, in which Jeongjo went with his mother Hegyeong-gung Hong to Suwon Hwasung , where his father’s tomb was located. This program integrated the whole formal and technical technologies which the historical documentaries have experimented so far. The reenactment of the drama vividly featured the event with 3D video and 4K high-definition video based on the performance of the actors and the costumes of the entourage, which have been perfectly ascertained.

Figure 3 reproduced “Memory of the World Wonhaeng eulmyojeongri Uigwe”, which recorded Jeongjo’s visit to Hwasung.



Figure 3. Reproduction of 3D stereoscopic images

After giving the color to the entourage that appears in the picture through historical research, it reproduced Banchado as a 5-minute graphic image through computer graphics. It also reproduced Baedari, which was built when Yeongjo crossed the Han River, and the construction scene of Hawsung, using actual images and graphics at the same time. Figure 4 is a video image of the parade crossing Baedari.



Figure 4. Synthesis of actual images and graphics

The restoration of Baedari in Han River was done by synthesizing actual images and graphics after building the real set and filming from different angles with 5 cameras using around 100 people for the parade. By making “Uigwe”, history documentaries have gone beyond the limits of the insufficient historical records, images, and hard and logical materials to show videos with dramatic stories and abundant images, allowing

the viewers to be immersed in and experience the historical moments.

### **3. Broadcasting contents and virtual reality**

#### **3.1 Virtual reality**

Virtual reality (VR) is an environment which was made artificially, but which people believe as true[4]. The concept of virtual reality started as Morton Heilig devised a machine called sensorama in 1962[5-6].

The global VR market is expected to make a rapid growth in a short period of time. HMD market is expected to grow from 70 million dollars in 2014 to 3.8 billion dollars in 2018, and the related software market is expected to grow from 96 thousand dollars in 2014 to 4.6 billion dollars in 2018. Various fields are making an effort to develop new contents to utilize VR[7-8].

#### **3.2 The importance of VR in broadcasting contents**

The pre-researches to produce the broadcasting contents through VR at this point are very important and the reasons are as follows. Firstly, VR can be an important medium to secure the young viewers. Currently, most of the young viewers moved to the new media platforms and do not watch TV. The biggest task of the terrestrial broadcasting is to secure the public character of the terrestrial broadcasting and advertisement revenue by attracting the youth. VR market is becoming a new opportunity and a main strategy to attract the younger generation to broadcasting again. Secondly, it can be an opportunity for developing the contents format and the new platform that the digital revolution has entailed. Broadcasters are making their best effort for their existence into developing new platforms or into developing, producing, and distributing the contents that fit the newly appearing platforms. In the course of doing this, VR bears a significant meaning. Thirdly, it has an importance of being Test Bed to complete the two tasks mentioned earlier. It is necessary to conduct an analysis of the difference between the existing image grammar and aesthetics and the VR production method. Doing previous researches and inspections for VR production is also needed.

### **4. Production of VR images**

Problems occur when converting from 3D stereoscopic images to VR images. We need to check the direction of the camera's movement and the degree of dizziness that occur in the acceleration and to investigate the differences in the image techniques utilizing a camera through the difference between the existing images and VR images. The contents of the researches are as follows.

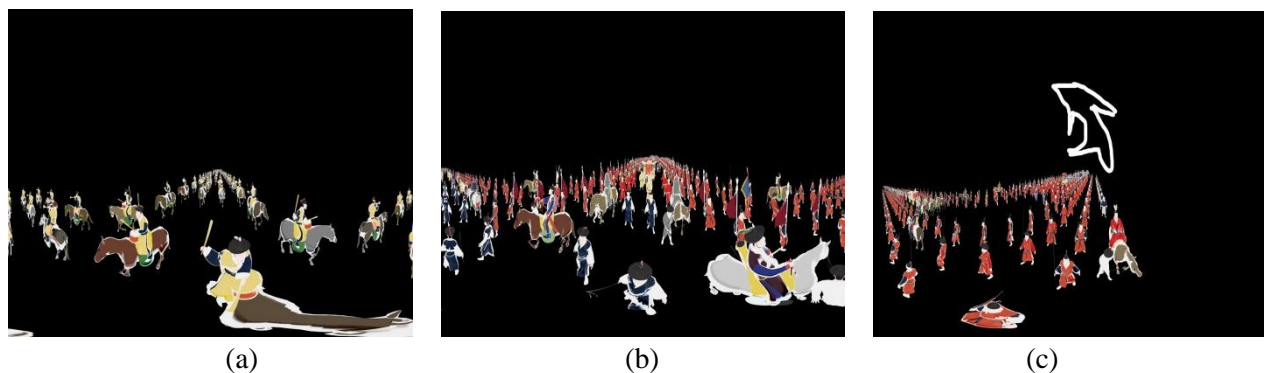
- ① When moving forward with the camera staying still
- ② When a camera moves forward at a constant speed
- ③ When a camera changes its direction
- ④ The difference that occurred in the general 3D images and VR images

VR image production starts with 3D image production, followed by VR image production. The 3D image material for VR production utilizes "Banchado", which is 5 minutes long and was reproduced in the "Uigwe, 8-day festival".

#### **4.1 Production methods**

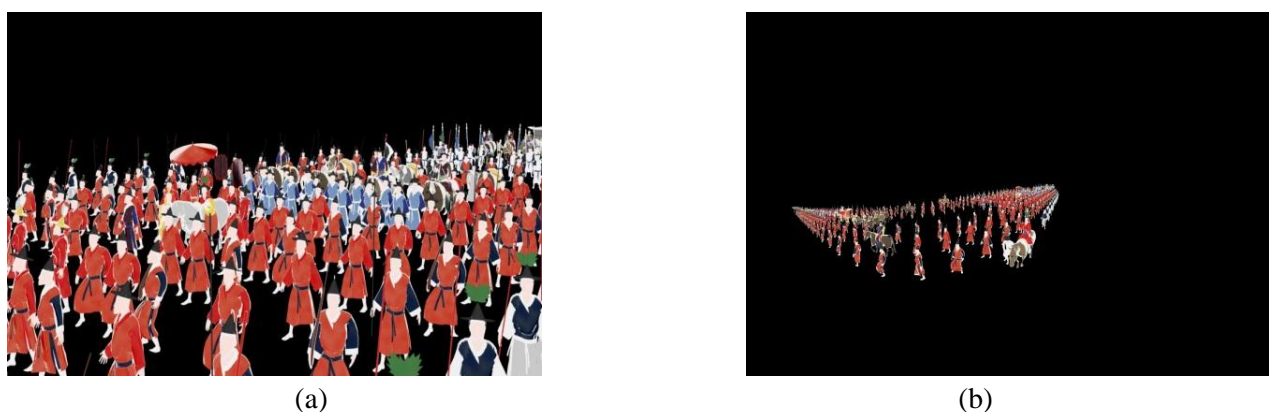
VR images basically require 360 degree images. With "Banchado", a 3D stereoscopic image which was made based on Hangryeoldo (picture of a parade), cannot realize the feelings of the background, the floor, and the sky other than the movement of the members in the parade. When making VR images, the existing 3D images are utilized, which makes it hard to edit other cuts, and the scene transition needs to be smooth to

reduce dizziness. As moving horses in the center of Hangryeoldo are highly likely to cause dizziness, it gave acceleration to 3D images through the gaze of the camera to adjust the movement. Basically, the camera needs to move slowly and be cautious with the adjustment of speed not to cause dizziness. The difference in the image techniques by utilizing the camera through the difference between VR images and the existing images are as follows.



**Figure 5. The result of making VR contents;**  
**(a) The progression of accelerated VR contents, (b) The progression of VR contents at a constant speed, (c) Direction change of VR contents**

As shown in Figure 5, the contents at the moment of acceleration feel dizzy when the camera moves forward at a standstill. As the moment that acceleration occurs is the time that gives feeling of dizziness, proper adjustment of acceleration is needed. When the camera moves forward at a constant speed, dizziness rarely occurs. Also, as shown in Figure 5(b), adding the frame effect to the surrounding of the camera just like the inside of a car is effective in mitigating dizziness. As shown in Figure 5(c), when the camera changes its direction, it is likely to cause dizziness as acceleration occurs as much as the speed of each changed direction.



**Figure 6. The changes in the screen size of the general images and VR contents;**  
**(a) General Images, (b) VR Contents**

Figure 6 is the changes in the screen size of the general images and the converted VR contents images. As shown in Figure 6(b), the VR images look very distant unlike the images taken by an average camera.

#### **4.2 The result of production**

When making the VR images, the camera management techniques and the grammar of images need to be changed. It is hard to realize the effects such as close-up, zoom-in, zoom-out, and defocus in VR images. As it takes longer to recognize the field than the general images, realistic camera managements such as long-take cinematography and editing techniques seem to be more adequate for VR. The general images create “open space” through dynamics that goes beyond the frame as well as within the frame, but it is not the case for VR. We can confirm that “open space”, the grammar of images, is not applied to VR images. To produce VR, the grammar of VR image production needs to be studied, not the existing grammar of images and camera management. There are many restrictions in applying the existing editing aesthetics to VR production and the role of a camera director is expected to be reduced as a whole.

The view of VR does not have to be always 360 degrees. When users first see the VR image, they examine the whole view to understand the situation and information. After that, they focus on the front view and the side view to be more immersed in the field. In this regard, viewing angle of 180~230° is adequate for the contents after the beginning. It is important for the camera to adjust the speed and movement together with the movement of the real objects to prevent the immersion effect and dizziness.

It takes long to recognize the VR images as they have wide screen and provide a lot of information. The recognition time of scene transition cuts of VR images is at least 2~3 seconds. Therefore, it takes at least 4~5 seconds to see one scene and then recognize the next scene, which makes the length of a cut in editing longer than that of the general images. The length of one cut needs to be longer than 10 seconds, and the minimum 20~30 seconds is adequate. As the screen gets wider and the amount of information is bigger, the importance of sound of the field needs to be much more emphasized to reproduce the reality of the field and deliver the specific information about the objects.

#### **5. Conclusion**

This paper conducted a research on the VR contents production of the history documentary contents in the following process. First, it investigated the development of the production techniques for “experience and immersion” of the history documentaries in Korea. Second, it produced VR image contents utilizing the 3D stereoscopic realistic image documentary “Uigwe, the 8-day festival”. Third, it examined and analyzed the problems of process of making VR image contents and applicable image production techniques.

The result that we got from VR production is that through VR images, we can get “experience and immersion”, but instead we can lose the strengths of aesthetics of the existing images. To produce the broadcasting contents through VR contents, it is effective to utilize the scenes with virtual reality effects in the historical reproduction rather than in the whole programs. More experiments and researches are needed to make an effective conversion to VR contents.

This research is expected to be utilized in the VR image contents production as a new media of the broadcasting contents.

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