A Study on the 3D Contents Production Technology of Taepyungmu

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Abstract

Taepyungmu is a performing art that can be called the most skillful dance among Korean dances. It expresses the meaning of honoring the peace and peacefulness of the country in dance. The construction of 3D stereoscopic digital contents for Taepyungmu is in a series of processes such as 3D recording of intangible cultural properties and implementation of hologram contents. The purpose is to try various possibilities through various technologies and methods, to establish a technical basis of the preservation paradigm change of intangible cultural properties and to present a leading direction to realize real digital cultural properties.

Keywords: Taepyungmu, 3D content construction, 3D shooting technology, hologram, 3D editing technology

1. Introduction

Taepyungmu expresses the meaning of honoring the country's peace and peaceful vocalization with dance. It is not certain that when it originated, but it is known as one of the dances that Han Sungjun, a dancer of the 1900s, restructured the game shaman dance. In 1988, it was listed as Important Intangible Cultural Enterprise No. 92, and Kang Sun Young was recognized as an entertainer. Taepyungmu is a performing art that can be called the most skillful dance of our country. It expresses the characteristics of folk dance and has a high artistry comparable to the world. The men and women dress up as kings and queens to show the grandeur and splendor of court style, and the dancing is more complicated than the other dances. With the change of the slow and fast movement, jangdan, the technique of the jiggle shows a glorious but imminent temperance. Also, the operation is delicate and elegant, but there is also moderation[1-3].

The construction of 3D stereoscopic digital contents for Taepyungmu aims at various possibilities through various technologies and methods in a series of processes such as 3D recording of intangible cultural properties and implementation of hologram contents, so that the technical basis of transition of preservation paradigm of intangible cultural properties. And it presents a leading direction to enable realistic digital cultural properties experience. In addition, it is important to improve the awareness of intangible cultural recycling, and to emphasize the value of cultural assets through visits such as actual viewing in the nearest pavilion without having to directly visit intangible cultural properties such as Taepyongmu which is being performed in remote areas[4-6].
2. Status of Taepyungmu

2.1 Overview of Taepyungmu

Taepyungmu shows the grandeur and splendor of the royal court style with the dress of the king and the queen, and the dance is complex and complicated in comparison with other dances such as jinsoe, naggung, teobeollim, dosalpuli etc.

In addition to the change of the jangdan, the double steps, the short steps, the walking in the knee, the heel breaking, the movement is delicate and graceful, and there is a moderation in the one. The dance of the moving is a mixture of the common people's simplicity and the aristocratic emotion, and the harmony of excitement. You can feel the dignity of dance by its gracefulness and splendor, while its rhythm is big and its arms are wide and graceful.

There are two characteristics of Taepyungmu: one is the art of various gestures and arts, and the other is the unique footwork. Taepyungmu's dance performance is composed of the seungmuui jangsam, ppulimg, and gyeonggi folk dance. It is characterized by the technique of baldim, such as gyeobgeoleum, ttala butineun geoleum, jangeoleum, dwiskkumchi jigggi. In addition, Taepyungmu is distinguished from other folk dances by its skillful footsteps and strong hand movements. When you go out to Taepyungmu, your feet should not be on the floor. It is so gorgeous that Taepyungmu's footwork is enough to tell how much it is floating. The footwork consists of a unique sawi called as jangdansawi. In this way, Taepyungmu has characteristics that there are movements in jangdansawi.

2.2 Distinction factors through the exaggeration of Taepyungmu

Taepyungmu is different from other folk dance in its composition. These components can be divided into five major categories: naggung gwajang, teobeollim gwajang, ollim gwajang, dosalpuli gwajang, and ending teobeollim gwajang.

A. Naggung gwajang: As the introduction of Taepyungmu, the dancer from the heel of the right foot goes forward. The silent dance is delicate, graceful, and temperance.

B. Teobeollim gwajang: At the beginning, there is a developmental phase where slowly puking goes backward and gradually gets faster. It can be shared with the dancer who sees it only if it reaches the high spiritual world.

C. Ollim gwajang: The winding and unwinding sawi and gyeobgeoleum sawi are main ones. Dancer has to be skillful in pulling, so the beauty of dance comes out.

D. Dosalpuli gwajang: The dosalpuli gwajang is also a field of artistry combined with drag and pull, overturning. Therefore, Taepyungmu is the most skillful and unique dance among the Korean dances.

E. Ending teobeollim gwajang: It is teobeollim gwajang for finishing. It gives an extremely short feeling, but you can taste the extreme of joy in a short time.

3. 3D Visualization of Taepyungmu

3.1 High-resolution digital photography and E-book production

Using a digital camera, take a detailed picture of the landscape of Taepyeongmu, the photograph of each location and the work process. The photo shoot is a high-resolution digital camera with 30 million pixels or more and shoots with orthography.

Be careful not to cause shadows in the daylight condition based on the color of the object, and take an ortho picture taking into account the shooting distance and redundancy. If the sharpness, color, etc. of the
photograph are distorted due to photographing conditions, the photograph should be re-photographed or, if necessary, corrected. Next, based on the photo materials, an e-book that can be used in the movie theater, the homepage, and the kiosk is produced.

3.2 Key Factor of UHD 3D imaging operation
The digital record of intangible cultural heritage such as Taepyungmu is life as it is. It is important to ensure the suitability of 3D shooting for large or fixed object and motion-rich performances. Also, the source determines the quality of the work. It is necessary to minimize the error in shooting by applying the special shooting technique for each theme. Finally, the efficiency and maneuverability of equipment operation must be ensured in order to cover the contents of a very large movement.

3.3 Implementation Direction of 3D Technology
The direction of implementation of 3D technology for Taepyungmu controls real time stereoscopic depth value in cooperation with 3D rig system. The camera uses the 4K camera suitable for cultural properties such as Sony F55 / Panasonic GH4 as the main camera, and realizes the best image quality. Next, 3D human factor elements such as visual fatigue, dizziness, and discomfort are met. Metrics studio photographs and CG data are produced with minimal 3D inconvenience when synthesized. Finally, 3D stereoscopic images with excellent stereoscopic and realistic feel are realized so that various layers from children to adults can be viewed. In particular, clarify contents of 4K UHD shooting, editing and post-production input technology.

3.4 Implementation Direction of 3D Technology
We pre-simulate the image to be produced by planning 3D effect that is specialized in 3D stereoscopic image production. As a result, it is possible to save the efficiency of shooting equipment planning, the convenience of shooting operation and the production time, and it is necessary to appropriately measure the degree of stereoscopic effect on the whole contents. It dramatically enhances storytelling applicability by pre-simulating which scenes in the video will pop up and which scenes will look deep.

4. Hologram Production of Taepyungmu
The content of the hologram exhibition video for Taepyungmu should be photographed and configured by using movements and special effects that can maximize the performance factor of intangible heritage. Therefore, the shooting and production team with experience of the performance will shoot, edit and direct. We will make intangible cultural assets worthy of stereoscopic images by expressing the features of each director and his / her duties and masks, and the exhibition content data will be processed and manufactured in accordance with the digital arts environment of digital cultural heritage. In addition, it is necessary that we make it possible to observe various layers through 3D real image, CG, sound effect insertion, etc. It is possible to shoot the original source so that it can be used in various aspects such as website advertisement, Is produced by a combination of computer graphic images. The content prototype data resolution is made by UHD (3840 × 2160).

4.1 Production process of Taepyungmu hologram
A. Analysis of photography environment of Taepyungmu hologram
Since Taepyungmu is a performance with a lot of movement but also a combination of poetry and dance, Chroma shooting is essential to acquire the utilization source of the hologram. It has a varied character because it performs as if it expresses the dance of the person by the hand movement and the foot motion for the audience that surrounds it in the wide space and the narrow space.

For foreigners and children who are not familiar with different languages and less understandings, it can be a somewhat unfamiliar and funny content, emphasizing the importance of image shooting. In order to overcome this, it is possible to enhance the fun and completeness of the work by overcoming the movement and gesture of the protagonist through the visual effect by 3D.

B. Characteristic of shooting process of Taepyungmu hologram

The elements of the Taepyungmu are composed of nakung gwajang, teobeollim gwajang, ollim gwajang, dosalpuli gwajang, ending teobeollim gwajang. The situation and performance are relatively decent and fast compared to other dances and performances.

In addition, various costumes and hair colors are to be represented in realistic holograms. In order to do this, it is required to capture the moment and capture proper angles rather than the maneuverability of the camera. In order to do this, it is necessary to have a complete shooting configuration in advance, a technique to produce the atmosphere of the scene as it is without losing the shooting point of each in the practice, simulation and position of each camera, Therefore, each camera should be engaged in shooting with the following purpose.

① Fixed main camera: Record the whole image in full shot with the same setting.
② Movable main camera: Keep track of the main characters.
③ Subcamera: Record the characteristic act of the hero and the actors of the surrounding actors.

In such shooting work, communication between the director and the shooting step and teamwork are very important, and it is necessary to apply the exact shooting composition technique according to the contents. Especially, it can be said that the role of simulation of 3D stereographer is important.

4.2 Capture technology of Taepyungmu hologram

A. Operation of photography technology of Taepyungmu hologram

First of all, in Taepyeongmu's dance performance, it captures exquisite movements while being small as a stream of poetry and dance.

Next, the actors and the photographer who are going to talk about the behavior of the character and the photographer are willing to take the photograph after perfect learning, so that the fun of the scene is displayed on the screen, and the characteristic appearance, gesture, dancing sawi.

Finally, as the content of Taepyungmu is conveyed by the actor's dance, the attention is focused on the main character while being totally calm, so that the action of the camera is minimized and recorded.

B. Taepyungmu hologram shooting technology input contents

Because all the actors' expressions and movements are alive, they are closely photographed through intercommunication like multiple cameras relaying according to movements such as flexible but big movements such as hand gestures, foot gestures, and body gestures.

Especially, since the surrounding people, the props, and the audience are located around the main character, it is necessary to express each specific element with several cameras. In addition, by maximizing the
characteristics of folklore, it is necessary to maximize the protruding effect of the positive region of the actor on the ground, and to enjoy the beauty of the hologram stereoscopic effect. The scene and composition of Taepyungmu and the shooting technique are as follows.

1. Combine poetry and solo dance and group dance to make a variety of realistic yet varied anchors.
2. Studio photographs concentrate on the gestures and movements of each performer focusing on the light and the background which are set in detail for the decisive moment.
3. At this time, the performances are divided into viewpoints rather than the viewers' viewpoints, and the images of each part are captured in delicate video recordings, costumes and gestures.
4. Obtain the source of hologram for Chroma-key shooting.
5. Image processing technique using depth map - Obtain simultaneous shooting source of many performances.
6. When depth map information is used, depth map images taken by an infrared camera are useful for compositing because it includes accurate depth information for all objects when synthesizing delicate motion images such as a thumbwheel.

4.3 Use of Horizontal and Orthogonal Rig shooting techniques

A. Input contents of Horizontal Rig shooting technique

1. Features: The camera is arranged side by side, similar to the human eye, and is mainly used for taking pictures of distant objects.
2. Advantages: It is convenient to match with rig fitting, and there is no reduction in exposure color when shooting. Also, it is very adaptable because it is similar to general camera.
3. Characteristics of Horizontal Rig Operation
   - Distance can be adjusted according to camera lens (13 ~ 50cm Interaxial Distance).
   - The horizontal rig may be different from the minimum IAD depending on each camera model. It can start at about 13cm and open between 20cm ~ 50cm depending on the length of the rig.
4. Contents of horizontal rig setting
   - Set the stereoscopic value: Rigging (Fix the camera in the rig) → Alignment (align the horizontal) → Framing the scene → Specifying the screen point → Set the zero point → Measure the distance between the subject and the camera → Axis spacing Control → Daylight Control
   - There are two ways of monitoring. One is an LCD monitor mounted on the left and right cameras or two external monitors, and the other is a method for viewing video signals on a small / medium 3D monitor by outputting video signals from the left and right cameras.
B. Input of orthogonal rig shooting technology

① Feature: The camera is placed vertically and the Half Mirror is inserted between the two lenses, and the light is projected by dividing the incoming light by the upper and lower cameras by 50%. It shoots the near vision and the distant view.

② Advantages: It is possible to shoot close subject with flexible distance between axes, and can achieve high stereoscopic quality.

③ Operation of orthogonal rig

The distance can be adjusted according to the camera lens.

✓ If horizontal or vertical is turned off, it can be corrected by Sip2000.

✓ Adjustment of interaxial distance (0 ~ 10cm) is possible.

✓ Convergence operation is possible from 0 degree to 20 degree.

✓ Vertical method (bottom-up design)

✓ Half miller for advanced optics (2mm)

④ Setting contents of orthogonal rig

✓ Lens Matching: The two cameras installed for stereoscopic photography should have exactly the same angle of view and lens arrangement. If the image size differs according to the angle of view or the chromatic aberration differs, the stereoscopic quality will deteriorate. Also, the zoom speed between the two lenses must be exactly the same when using the zoom.

✓ Matching of focus: Use follow focus equipment with wired / wireless focus adjustment to match the focus ring of two lenses precisely.

✓ White Balance: Adjust the white balance using a gray card or white card to match the colors correctly between the two cameras.

✓ Exposure control: Set the same exposure value for both cameras, but if the focus is not correct, adjust exposure value with different depth of focus with sufficient depth.

✓ Shutter angle: Set the same shutter angle between two cameras.

✓ Frame Synchronization: The left and right camera frames match exactly.

⑤ Type of orthogonal rig entered into this production

There are two types of orthogonal rigs: the left camera on top and the bottom camera. The 3Ality Rig / FreeStyle rig that is put into production of Taepyungmu's 3D stereoscopic image is the way of putting the left camera on the rig.
5. **3D editing operation of Taepyungmu**

5.1 **Key Factor of Editing Operations**

A. Increase 3D visual effects while sticking to storytelling in scenario. Based on various 3D editing technology + experience + excellent manpower, visual effect is given to feel fun, touching, realistic experience from source source.

B. Operate advanced 3D editing technology and manpower.

It manages color correction, special effect editing technology and high-end editing equipment to match scenario and production intention.

C. Proceed with the design of the content considering editing from the source source creation step.

Storytelling + DEPTH MAP script chart that can take advantage of the characteristics of 3D contents + Ensure quality improvement through special effect and post-production technology simulation.

5.2 **Analysis of environment of editing operation**

A. 2-layer hologram and a 1-layer hologram are appropriately arranged to suit the characteristics of each scene, and a normal image is displayed on the background, and a hologram is projected on the second ray on the front to express a realistic and detailed image.

When using a 2-layer hologram, the viewer creates a more realistic and immersive image by using various editing techniques such as increasing the brightness of the hologram of the second layer and the general image of the first layer, or focusing out.

5.3 **Detailed operation of 3D editing according to production process**

A. Raw data extraction and management

1. Source Source Data: The movie raw data obtained by shooting is extracted, stored and stored in memory card or external hard disk.

2. LAW file and metafile: It is an image sequence file that assembles high-quality image files. It keeps the LAW file and the editing metafile at the same time so that the size change, color correction and composition change easily.

3. Because high-quality digital files can be produced directly from the camera, it minimizes deterioration in image quality, simplifies management, and simplifies the editing process.
④ Operate a unified operating system from content design stage to shooting, calibration, convergence, editing, post-production, implementation, and demonstration so that the production image source classification and systematic management of content data are all in ONLINE.

⑤ Through this, the maker plans the preliminary process and the simulation to precisely plan the scenes to be used in advance in order to facilitate editing. It also scripts the overall content flow and the 3D stereographer creates the optimal DEPTH MAP SCRIPT.

B. Select scene data to be used according to production situation

① In this work, various types of image data are processed and corrected for scene composition and contents interest based on contince scenarios, and images are selected easily in the editing process.

② Select scenes on the scene that cause interference with the viewing environment caused by 3D human factors.

③ The original data is saved separately according to the classification system in order to minimize the errors that occur during the erroneous photographing and convergence process, so as to prepare for errors that may occur in the process of correction and editing.

C. First convergence adjustment through raw data convergence

① Depth graph is designed in advance to induce 3D stereoscopic change of viewers in scene development for comfortable 3D stereoscopic creation.

② However, since this work is a documentary form faithful to the factual record, it re-adjusts depth of scene scene according to human's sight and atmosphere, and then it considers convergence to L and R content data through rendering. At this time, the correction mainly focuses on the L and R scene discrepancy correction which does not affect the image quality of the original image.

D. Second Convergence - Acquisition of L, R content data

① The original data used in the final editing production has various visual anxiety factors, which are corrected and converted into the L and R image data formats for contents to be used for final editing. At this time, we focused on scene depth control, speed control, color correction, special effects processing, synthesis, and produce final L and R image sources for general films.

② All work is done by DEPTH MAP script designed by 3D stereo grapher.

E. 3D total editing

① The final video, CG, and recorded L and R field sound sources, which have been corrected by the first and second convergence and editing, are arranged in the timeline in accordance with the scenario and conti, and various special effects processing, final L, R image sources are produced.

② Image editing is done by editing and collecting the L and R images using the same layer using the script data set by the director and the 3D stereographer.

F. Dubbing audio with master L, R video COMBINE

3D stereoscopic is one step further than COMBINE process and audio dubbing process to stereoscopic L and R final master images produced by general editing unlike general video production.
G. 3D stereoscopic mastering

In 3D stereoscopic images, source shapes are different according to the demonstration method, and image source types are L, R independent method, SIDE-BY-SIDE method and so on, but they are processed according to the digital image heritage system.

H. Progress of color correction

① Continuity: Reduces the color difference of each camera image when multiple cameras are used, creates narrative enhancement and color effect.
⇒ Realizing the material of the building or putting a strain on the appearance of the subject
⇒ Eliminate the absence of continuity caused by resolution difference, exposure difference, contrast difference, or white balance problem.
⇒ Properly color-corrected images for various platforms and different display viewing environments are essential for optimized demonstration.

② Contrast
Contrast is one of the important factors that determine the look of an image because of difference between lightness and darkness. Due to the nature of both cameras, it is saved as a RAW file, converted into post-production again, and the color variation is widened by the controller which is divided into the brightness area and color area of the detailed photographed source.
⇒ At this time, adjusting the high contrast is more obvious than the low contrast, and it gives the effect during the visual browsing.

③ Color Balance
⇒ In using the rig, the color balance of the two cameras may be different, so it is necessary to calibrate it in the latter DI work. This color balance is a task that balances the color and makes the image equal to the shooting condition.

④ Saturation
⇒ If you shoot two cameras in an orthogonal rig, you will get a difference in color saturation / color balance due to the half mirror, so you get a clear stereoscopic image that matches the colors of the two cameras during the DI work.

![Figure 3. Scene of Color Correction](image)

5.4 3D CG production of Taepyungmu

A. Characteristics of Taepyungmu 3D CG Process
- Produce a 3D CG to give hologram effect to the image introduction part and the middle part.
- Creates objects for background and scene switching necessary for various scenes of each director.
- Select scenes and visual effects that cannot be photographed and what is necessary for storytelling.

![Figure 4. Example of Taepyungmu hologram 3D CG production](image)

B. Work environment related to 3D CG production

- The completion of the CG work of Taepyungmu is the synthesis of the finished object and the effect with the background of the object.
- Finish what you cannot work in 3D in 2D and trim the screen as a whole to produce a stereoscopic image.

6. Conclusion

The Taepyungmu contains a message that the king or queen dances to pray for peaceful prosperity of the kingdom and peaceful vocal cords of the country. It is a creative dance that shows the fast pace and skillful footwork that lightly cross the complex tense. It was listed as Important Intangible Cultural Enterprise No. 92 and Kang Sun-young was recognized as an entertainer. Taepyungmu is one of the most skillful performing arts in Korea, and it expresses the characteristics of folk dance and has a high artistry comparable to the world. The men and women dress up as kings and queens to show the grandeur and splendor of court style, and the dancing dance is more complicated and complicated than the other dances. Thus, it seems that literary therapy can be driven by the phenomenon of reversal of the coding of biotic currents in the current trauma situation in the resolution of various Gestalt by coding and contact.

The construction of 3D stereoscopic digital contents for Taepyungmu has various possibilities through a variety of techniques and methods in a series of processes such as 3D recording of intangible cultural properties and implementation of hologram contents, so that technical paradigm transformation of intangible cultural properties and to present a leading direction for the realization of realistic digital cultural properties. In addition, it is important to improve the awareness of the use of intangible cultural heritage by allowing visitors to experience the intangible cultural properties such as Taepyongmu.

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