

Research on the application of digital image in stage space in the context of digital media

Yuwei Qin^{1,a,*}, Xiao Xu^{1,b}

¹*Xianda College of Economics and Humanities, Shanghai International Studies University, Shanghai, China*

^a305973080@qq.com, ^b550489570@qq.com

Abstract: *The progress of science and technology is promoting the revolution in the field of art and constantly changing the form of artistic creation. The development of digital media technology has enabled digital image to be applied to more fields. In the early 20th century, image technology began to be applied to stage performance activities, promoting the innovation of creative methods and concepts of stage art. Based on the digital context, this thesis takes the image design of stage space as the research object, and discusses the stage space and image design by collecting and analyzing relevant stage art works and literature.*

Keywords: *Digital image, Stage space, Virtual space, Digital media, Image technology*

1. Introduction

In the early stage of the application of image in stage space, the overall development level of image technology and media is low, and the cost of image design and production is high, which not only limits the artistic creation of stage designers, but also hinders the application and popularization of image on stage to a certain extent. With the progress of the times, the audience's appreciation level and viewing demand are also gradually improved, and it is necessary to constantly innovate stage performance ways to meet the needs of the audience. The emergence and development of digital multimedia technology has brought new creation tools and ideas to stage designers. Digital image technology enriches the content of images, enhances the visual expression of the stage, and innovates the creation method of stage art. This paper mainly discusses the application and presentation of digital image in stage space under the context of digital media technology.

2. Overview of digital image and stage space

2.1. Digital image

Image is a visual symbol created by human beings, a reproduction of the objective world, and one of the visual languages for people to transmit or communicate information. The content and presentation of images are constantly enriched with the emergence and development of digital imaging technology. Nowadays, various digital image acquisition equipment, high-performance computers, image processing technology and virtual simulation technology are applied to image production, which can not only realistically reproduce the objective existence of things, but also create virtual visual effects to present various real or imaginary scenes and contents in various forms and realize various ideas of the creators.

2.2. Stage space

The stage is the venue where actors perform in the theater. Stage came into being with performance activities. The earliest stage originated from the ancient Greek wine ceremony, and then gradually formed the ring theater. With the development of performance activities, the demand for the stage is constantly improving, the form of the stage has also changed, there are many forms of the stage, such as outstretched, center, frame, variable and so on.

The stage space has both material and performance properties. From the point of view of material properties, stage space is the material component of the theater building and the material support of performance activities. From the perspective of performance properties, the stage space is accompanied

by performing activities and then to change, can breakthrough the limitation of the material properties of the stage and go beyond the fixed scope of the theater. Whether it is a classroom, a street, a station or a square, the space where performance exists can be temporarily separated from or partially retain its original function and transformed into stage space.

2.3. Digital image applied to the stage space

After the emergence of image technology, it was also used by stage artists with a spirit of exploration to enhance stage expression and innovate stage forms. In the 1920s, image began to be used in the stage space. German theater director Erwin Piscator used historical documentaries and self-taken films to create stage performances. From the beginning, he placed images and actors together on stage, and developed to match images with actors' performance movements, gradually forming his unique and modern style of stage design, performance forms and theater concepts.

Nowadays, more and more stage creations try to use images to enhance the visual expression of the stage, or use images as an important support structure, and images have already become an important role on the stage. The use of image in the stage is the need of the development of the times, but also an inevitable trend of the development of the field of stage performance.

3. Image content of the stage space

3.1. Documentary video

The earliest images that appeared on the stage were documentary images. Documentary videos record the real life, history and living environment of human beings, and show the truth as the essence. Videos from human life can guide and hint the audience, arouse their memories, trigger their thinking or bring their thoughts to a certain scene or era.

Muqam Impression, a work of music, dance, poetry and painting, is based on the Traditional Uyghur art "Twelve Muqam". It integrates elements with local characteristics and integrates muqam's music, dance, poetry and painting through modern stage design and image design. The music handed down from ancient times and the original folk music scene together lead to the theme of the play, arouse the audience's yearning for Muqam, and bring the audience's thoughts from the real life to the ancient time to be presented on the stage (Figure 1)^[1].



Figure 1. Impression of Mukam

3.2. Spatial scene

The most basic function of stage image is to show various specific spatial scenes of roles on the stage, which can be divided into realistic scenes and surreal scenes. Realistic scene mainly refers to the real space in the real world, or in line with the world view of the plot of the scene. Surreal scenes are non-existent Spaces in the real world or the distortion and deformation of the real space, which can show the characters' deep psychological space, subconscious, dream and other strange scenes to create a special atmosphere.

The musical *The Legend of Amani Shahan* tells the story of Amanishakhan in Yarkham Khanate in

the process of collecting, sorting and creating twelve muqams. The creator uses images to participate in the shaping of stage space and rendering of atmosphere. In the third act (Figure 2), the creator tilted the palace in the background and lowered the saturation of the image, so as to reflect the change of atmosphere in the plot and intensify the tension and dangerous situation between the characters.



Figure 2. The Legend of Amani Shahan Act III

3.3. Stage role

The image in the stage space can not only be the scene or space, but also reproduce or virtualize the actor's image or action state in the stage, which can be used as the actor's fantasy or inner projection with the real actor's performance, presenting the content that cannot be expressed or performed by the real physical performance, making virtual or surreal expression, and creating the stage illusion of combining reality and fiction.

Holographic projection technology was used to present virtual actor images in the digital theater production *Mirror- Boundary*(Figure 3).The creators used a high-speed camera to record the actors' dance movements and artistically processed the actors' movement images to create four virtual images of the actors corresponding to the four voices of the strings, as well as a visualization of the dancers' inner workings. The virtual actors and the real actors cared for each other and together they built a combination of real and virtual performances on stage^[2].



Figure 3. Mirror-Boundary

3.4. Abstract image

Abstract image is composed of points, lines, surfaces, smoke, ink, texture and other elements, is hazy, chaotic, no concrete entity image, with ethereal, ethereal, romantic or mysterious sense. Abstract image does not have intuitive practical significance, but is a feeling or image expression, can create a variety of stage atmosphere and artistic conception, for the audience to bring broad fantasy space.

The multimedia folk instrumental drama *Flute Heavenly Music* uses abstract images to show the transformation of plot and atmosphere in the stage space. In the second act of the first chapter, dark red surging clouds are used in the stage canopy to show the hunting scene of the primitive society and the chaotic, barbaric and uncivilized state of the ancestors(Figure.4).In the third act, the restless red clouds

turn into quiet and elegant clouds, creating a mysterious and peaceful fairyland brought by the arrival of the god of Music, and revealing the civilization's lighting of obscurities(Figure.5).



Figure 4. Flute Heavenly Music Chapter 1 Act 2



Figure 5. The third act of the first chapter of Flute Heavenly Music

3.5. Decorative pattern

Decorative patterns or shapes, such as primitive totems, folk patterns and traditional ethnic patterns, have obvious and unique artistic styles, full of historical culture, ethnic traditions and aesthetic interests, and are often used in historical scenes or stage performances with ethnic characteristics.



Figure 6: Mukam Impressions Chapter 4 Act 1

The first act of the fourth chapter of Muqam Impression is an excerpt from the Hami Mukam, in which the wife's attachment to her lover is expressed mainly through singing and dancing. Since there is no obvious storyline, the creators have taken typical embroidery patterns from the Hami region as the subject of their images (Figure 6). On top of the veil, gorgeous golden lines flow and rich colors are

spread out in layers, as the creators use images to reinterpret the national aesthetics and ideals embedded in the traditional patterns. Freehand brushwork vision expresses the essence of traditional art, organically integrates images with the connotation of traditional national art, and realizes the complementary and localized presentation of music, dance, poetry and painting.

4. Image content of the stage space

As mentioned above, digital image is binary information in essence, which cannot exist independently in physical form and should be presented through digital media and equipment. Commonly used media for stage image include LED screen, projection equipment, augmented reality equipment, motion sensing equipment, etc. As an entity in stage space, image media is an important part of stage space modeling, and the design of its form should obey the overall design of stage.

4.1. Digital Projection

Projection is an imaging method that uses projection equipment to project the image onto the projection medium. Projection requires imaging with projection media, and the image presented is a reflective light source, so the color saturation and brightness are low, and the light resistance is weak. Due to the soft contrast and fine quality of the projection, it has a good effect on the virtual and real relationship of the image, which is very suitable for the drama stage. In the early development of projection technology, the most common projection medium is white or gray curtain and screen. With the development of science and technology, the brightness and resolution of the projector has been greatly improved compared to the early stage, the impact of the material of the projected object on the projection effect is gradually reduced, walls, ground, buildings, water, water mist and so on can become the medium of projection. At the same time, more media suitable for projection have emerged, such as highly transparent holographic screen, holographic film, etc. Since projection can be imaged with the help of a variety of media, the projected image has strong adaptability to space and can be combined with various media forms to form different visual shapes. At present, the projection technology commonly used in the stage are 3D projection mapping, holographic projection, stereoscopic projection, etc.

4.2. LED screen

LED screen is one of the image media commonly used in stage space. LED screen consists of small independent LED panels spliced together, so it can be flexibly combined according to the needs of the performance. LED screen with high brightness, high contrast, vivid colors and strong light resistance is suitable for various indoor and outdoor performance activities. The entity of LED screen occupies the stage space, and its shape has an important influence on the stage. It should be designed according to the performance needs and image needs.

4.3. Mixed Reality

The use of mixed reality technology in stage performances can integrate virtual elements with the real stage and make the two interactive, thus enhancing the audience's viewing experience. Augmented reality is commonly used in stage performances in two ways. One is used in television shows, where a virtual image is superimposed on top of a stage performance captured by a camera, which viewers can view directly on their TV, computer or mobile phone screens^[3]. The other is a real-time fusion of virtuality and reality for a live stage performance, which requires viewers to wear augmented reality displays.

4.4. Real-time interaction

Real-time interactive system uses motion sensing equipment to capture the target's movement in real time, using data processing system to analyze the movement, generating the movement data of the captured target, and then input the movement data into the image interactive system for processing, using the data to trigger the effect of the image or change the form of the image, so that the image produces the effect of real-time interaction with the captured target, the stage generally uses LED screen or projection to present the image. The stage generally uses LED screen or projection to present the image.

5. The artistic function of image in the stage space

5.1. Create virtual environment to expand stage space

The expansion of stage space by video is mainly reflected in two aspects: visual space and performance space. From the perspective of vision, images can create virtual space and change the size of the stage visual space^[4]. The virtual space created by images in the stage space makes the stage present a larger visual range beyond the original physical space. By adjusting the perspective relationship, the contents of the close and distant views are switched to realize the transformation of different spatial sensations. From the perspective of stage performance, various image media present virtual actors, so that the actors' performance is no longer limited to the physical space of the stage, and virtual images have become an important role in the stage. Actors echo, communicate and dialogue with images on the stage, extending the stage performance space between the combination of virtual and real^[5].

5.2. Reshape the stage form and build a written expression

When the video is projected on the stage, it changes the visual effect of the stage, making the stage space detach from its original form or function, subordinate to the space generated by the image, and become part of the new space. The video dissolves the original physical form of the stage, creating another space with virtual properties, and the creator can use a variety of video content in the stage space for flexible, written expression. For example, dynamic images can endue stage space with timeliness, juxtize and connect images of different Spaces together, so that actors can freely and smoothly shuttle through different time and space, and achieve the effect that is difficult to present in traditional stage space.

5.3. Virtual and real interactive integration to create an immersive experience

Immersion experience is an experience and feeling of total immersion in a certain activity. In the process of immersion, the experiencer will rise from sensory experience to cognitive and emotional experience and communication, thus achieving a state of immersion. The various image technologies and media applied in the stage make the stage space break through the traditional performance form, blur the boundary between real space and virtual space in the stage, create a scene of fusion between reality and reality in the stage, realize the interaction between real actors and virtual images, introduce the audience's vision and feeling into the time and space with the stage, this form of watching between reality and reality, to a certain extent, dissolves the traditional This form of viewing between reality and reality, to a certain extent, eliminates the interval between the performance and the audience in the traditional performance mode, thus creating a sense of immersion in the audience.

6. Conclusions

Nowadays, image has been commonly used in stage productions and has received widespread attention as a newer form of visual expression for the stage. The development of digital image in the stage space requires the infiltration of technology. From the initial experimental attempts in the stage, image is now widely used, providing a wide creative space for stage designers, and constantly bringing new viewing experiences for the audience, so that we see the broad development prospects of image.

The application of digital image in the stage is still in the exploration stage, the progress of technology will promote the innovation of the concept of stage digital image design, create more stage image expression forms with the characteristics of the times, the future digital image and stage space will achieve a more appropriate combination, so that the image can better serve the stage performance activities, so that the stage performance to better meet the needs of the audience.

Acknowledgements

This research was completed under the financial support of "Shanghai Young Teachers Training Funding Plan for Colleges and Universities in China" in 2020, the project number is Z20001.20.904. I would like to thank my colleagues and my students who have worked with me on this research for your continued support.

References

- [1] Dai XiaoRong. *On the creative orientation of western theme theater music from the perspective of Music, dance, poetry and painting muqam Impression*. *People's Music*[J]. 2018(05):18-20.
- [2] Shen Chen. *Path analysis of improving performance connotation in virtual performance space design* [J]. *Art Education*, 2020(12):178-181.
- [3] Shen Yubin, Cai Yong, Li Qingchao. *Application research of Virtual Object Projection based on Augmented Reality Technology* [J]. *Microcomputer Application*, 2008(05):73-77.
- [4] Qin Lei. *Research on visual application of digital media art in stage design* [D]. Guangxi Normal University, 2015.
- [5] Luo Chenxi. *The artistic value of digital image expanding stage space* [J]. *Audio-visual*, 2015(05):178-180.