Exploring the Application of Digital Media Art in Virtual Exhibition Space

Shouli Zhao and Lei Liu(✉)

Jingdezhen Ceramic University, Jingdezhen, China
75171381@qq.com

Abstract. This paper analyzes the art of digital media, and discusses the characteristics of digital display design and virtual display space. The rapid development of science and technology makes the techniques of digital technology in art more diversified. Using digital technology can create a virtual scene for viewers and let them experience a strong virtual exhibition hall. Therefore, this paper studies the characteristics and innovative application of digital exhibition design, laying a foundation for the application and development of digital media art in virtual exhibition space.

Keywords: digital media · virtual display · space · application exploration

1 Introduction

With the rapid development of big data, Internet of Things, artificial intelligence and other network technologies in today's society, the country has started the information age. The continuous maturity of network technologies and the continuous development of society are all promoting the progress of art, especially the emergence of network technologies, which provide an opportunity for the development of art in today's information age. Digital technology, as the development achievement of information age, plays an important role in the development of media art. The application of digital technology can create a virtual space world for visitors, which can make visitors feel the true feelings that art wants to express. The application of digital media art in virtual exhibition space provides directional guarantee for the development of media art in the future.

2 The Concept of Digital Media Art

Digital media art is a comprehensive subject of social science, cross-natural science and humanities, which embodies the ideas of humanities, science and art. Digital media art involves a wide range of knowledge, including knowledge about art, modeling design, digital image processing technology, interactive design, computer graphics, computer language, information and communication technology. Through the application of various digital, information technology and other network technologies, it produces various

C. F. Peng et al. (Eds.): EIMT 2023, AHSSEH 8, pp. 340–348, 2023.
https://doi.org/10.2991/978-94-6463-192-0_44

forms of artistic works with independent aesthetic values, which are virtual in simulating reality. Imagination, interaction of artistic creation and the basic characteristics of using network media, which skillfully combines data technology with modern media art, show a brand-new cultural and artistic characteristics and aesthetic characteristics for the public in the digital age. The word "art" has a deep meaning, which means that the works are not only modern and technical, but also have their own artistic flavor, and the works should fully express the emotions expressed by the creators. The main core technology of digital media art is computer network. By setting a good programming language for the computer and then restoring the scenes of artistic works to the greatest extent, the emergence of digital technology provides a variety of development possibilities for today's art. When packaging different arts, the same digital media technology may make the works present different artistic styles. Therefore, while applying digital technology, we should pay attention to selecting the artistic packaging that is consistent with the works of art, so as to improve the visual effect of the products [1].

3 Virtual Reality Technology and Its Virtual Display

3.1 The Concept of Virtual Reality Technology and Its Included Technologies

Virtual reality technology, also known as VR, is a technology that uses computers to generate a virtual world that can directly apply auditory, tactile and visual feelings to participants and allow them to observe and operate interactively. Imagination, immersion and interactive virtual reality technology are three basic features, which mainly emphasize the leading role of people in VR system, making the information processing system suitable for people's needs and consistent with people's senses. Figure 1 is an overview of virtual reality technology. Imagination, interactivity, immersion and multi-perception are several characteristics of virtual reality technology, among which interactivity and imagination are widely used in media art. Interactivity refers to the degree to which users can operate objects in the simulated environment and the natural degree to get feedback from the environment. For example, users can grab virtual objects in the simulated environment directly by hand, and then users can feel the weight and movement of objects. The conception of VR is also called autonomy. It is mainly used to emphasize that virtual reality technology contains a wide range of imaginable space, which can not only present a real environment for users, but also build an environment that does not exist or is impossible for users in real life. See-Through technology in virtual reality technology plays an important role in its development. It can collect the real-time view of the surrounding environment through the camera and display it on the screen, giving people a feeling that the human eye can directly see the real world around it through the head display, so it is also called perspective function. The calibration formula of See-Through technology is as follows. Consider the virtual camera defined by eyes and the virtual screen of OST-HMD, assuming that the screen and its coordinate system S are flat and located in tSEo: = [sx, sy, sz]T in camera coordinate system E0. The camera can be considered as an off-axis pinhole camera. Now, without losing generality, assume that the z axis of E0 is perpendicular to the virtual screen. Then, the camera is represented by the inherent camera matrix KE0 as Fig. 2. S(tSEo) converts 3D points in Eo into virtual image screens in actual proportion, and A is a diagonal matrix that converts projected

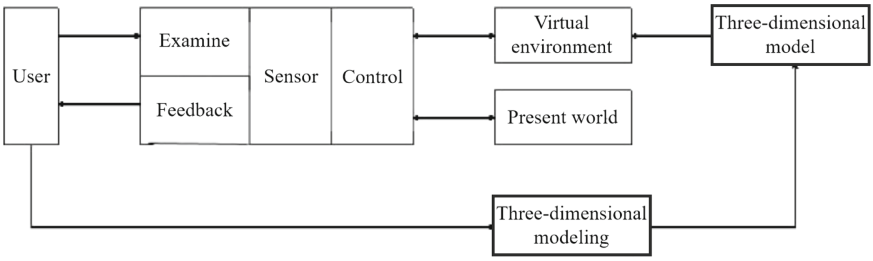

Fig. 1. Overview of virtual reality technology

$$\mathbf{K}_{E_0} := \underbrace{\begin{bmatrix} \alpha_x & & \\ & \alpha_y & \\ & & 1 \end{bmatrix}}_{=:\mathbf{A}} \underbrace{\begin{bmatrix} s_z & & -s_x \\ & s_z & -s_y \\ & & 1 \end{bmatrix}}_{=:\mathbf{S}(\mathbf{t}_{SE_0})=\mathbf{S}(s_x,s_y,s_z)} .$$

Fig. 2. The camera is represented by the inherent camera matrix K_{E0}

screen points into image pixels by scaling factor {αx, αy}. Note that S(tSEo) is selected so that S(tSEo) is projected to the origin of the image pixel plane. In addition, the scaling factor {αx, αy} has nothing to do with the eye position, while S(tSEo) depends on the eye position. Finally, the internal matrix KE of the new virtual camera is: KE = AS(tSE) = KEOS(tx/sz, ty/sz, 1 + tz/sz). Through the above formula, one virtual camera can be converted into another one made of new virtual cameras [2].

3.2 Virtual Display

Virtual display is the use of computer network technology to display products in a virtual space environment. Virtual display can give users an immersive feeling, and can observe every item in the system. Through virtual display mode, the content can be actively and diversified presented to users. As an important part of product display and art display, virtual display is widely used in all fields of people's lives, such as "cross-border e-commerce". In recent years, with the rapid development of network technology, e-commerce has started to rise in a wide range, and online shopping has gradually entered the public's perspective, which is quite different from the traditional shopping mode. [3] E-commerce is mainly applied to virtual display, which can display virtual products on related websites and change people's shopping style. Virtual display has been applied to e-commerce, and also to live commentary, online conference and remote visit (as shown in Fig. 3).

Fig. 3. Virtual display

4 Features of Digital Display Design and Innovative Achievements in Virtual Reality Technology

4.1 Increase the Interactivity of Users in the Exhibition

Interactivity is mainly to enable visitors to interact with the exhibits, to make them feel like they are there, to stimulate visitors' interest in the exhibition to a great extent, and to take the initiative to explore the stories of the exhibits, so that visitors can change from passive identity to active identity, and from visitors to participants. Adopting this interactive exhibition form can attract visitors' attention more. With the continuous maturity and development of information technology in today's society, the traditional information transmission methods in the past will make the audience feel bored and boring. Such information transmission methods will reduce the audience's enthusiasm for visiting exhibits and can't arouse the audience's interest in visiting. The application of digital display in media art has solved this problem well. Digital display design adopts today's virtual reality technology and some computer network technologies to decorate exhibits from multiple directions and angles, changing the traditional way of information transmission, making the way of information transmission more flexible, and making visitors feel different information and feelings from visual and auditory aspects. This brand-new display way breaks the disadvantages of traditional display ways, and it is bound to become the future development prospect of media art [4].

4.2 Embodiment of Virtuality

The traditional display of exhibits generally adopts the central display method, the close-up display method and the unit display method, etc. This traditional display method only provides visitors with the service of visiting, but does not allow visitors to visit the exhibits from various directions and angles. With the rapid development of the times, this traditional display method has been unable to meet the visitors' visiting needs. Virtual

Fig. 4. The application of holographic projection technology in digital exhibition hall

exhibition space is one of the achievements of the development of the information age. It uses network technology to vividly show digital media art to visitors. It mainly uses projection technology and some electronic technologies to display physical products in virtual space, that is, it doesn't display physical products in exhibition halls. This virtual technology can not only meet the visual needs of visitors, but also meet the auditory needs of visitors. Audio equipment can be used to add some sound effects to the exhibits, such as gunfire and walking. Holographic projection technology can be used to achieve visual display, and holographic projection technology uses interference principle to record three-dimensional images that can reproduce real objects. Figure 4 shows the application of holographic projection technology in digital exhibition hall. The virtual nature of this kind of exhibition can not only create a realistic virtual visiting environment for visitors, but also stimulate more space imagination through three-dimensional space, which provides a brand-new exhibition mode for visitors and directional guarantee for the future development of digital media art.

4.3 More User-Friendly Design

"People-oriented" and "people-centered" are the core contents of humanized design of products. With the change of visitors' demand for products, visitors begin to appreciate more humanized exhibits. Therefore, incorporating more humanized components into product design can make products more emotional and humanized, and meet the visiting needs of today's visitors. From the current exhibition design, we can easily see that more and more exhibits are no longer the boring transmission mode adopted by traditional information in the design of information transmission, and more humanized design is adopted in the information transmission. For example, the application of virtual reality technology, holographic projection technology and audio and other equipment, through the application of these new network technologies, visitors can communicate and communicate with exhibits, which is more humanized. Visitors can feel the feelings and contents contained in the exhibits through vision and hearing, and can appreciate the

indomitable vitality of the exhibits. In this way, visitors will be interested in the stories behind the exhibits, and they will urgently carry out active exploration and research on the exhibits. A more humanized exhibition space can make visitors stay in their footsteps and catch their eyeballs, and their feelings can make visitors stay in the exhibition space actively and enjoy the complete exhibits quietly.

4.4 Innovative Achievements of Digital Media Art in Virtual Reality Technology

With the wide application of virtual reality technology in various fields, its appearance and development have also promoted the development of digital media art, and made digital media art get more innovative achievements in virtual reality technology, such as TiltBrush, PSVRDream, OculusQuill and OculusMedium, which have also brought great convenience to designers. TiltBrush is a VR drawing application, a digital media innovative application with virtual reality technology as its core and various innovative styles. [5] It is also called the killer application of VR. In the creation of digital media art, the creator can create any imaginary object in the virtual exhibition space only by controlling the handle. For example, an art creator can draw a unique clothing store. In addition, the creator can "enter" the interior of the clothing store and design and create clothes in the clothing store (as shown in Fig. 5). The whole process is similar to the process of opening a clothing store in reality, which enables the creator to actually experience the fun of things themselves in the virtual exhibition space. In addition, TiltBrush can also render the internal environment in the virtual exhibition space, for example, it can provide the space with star lights, green grass and boundless snow. Art creators can choose the appropriate internal environment according to their own products. The tracking function of helmet is the core technology of TiltBrush, which provides creators with a 360-degree all-round observation system that can rotate freely, which can facilitate creators to design and modify products during creation. TiltBrush, as one of the innovative achievements of digital media art in virtual reality technology, makes up for the mechanism of traditional art creation to a great extent, changes the display mode of art products, and lays a foundation for the development of digital media art [6].

Fig. 5. The creator "enters" the clothing store to design and create clothes

5 Application of Digital Media Art in Virtual Exhibition Design

5.1 Application in Chamber of Commerce Exhibition

High efficiency and low cost are the characteristics of virtual exhibition, so it is a very convenient and useful exhibition mode to apply virtual exhibition in commercial exhibitions. The application of holographic projection technology in virtual exhibition can break the boundary of traditional product exhibition, and it is no longer limited by time, space, region and funds. No matter whether visitors are in the exhibition hall or not, virtual exhibition can let visitors see the exhibition, which can be accomplished by remote viewing or remote live broadcasting. It can convey information to visitors in the simplest and most convenient way. [7] This kind of virtual display has been widely used in today's society. For example, in some luggage exhibitions, the use of virtual display can provide opportunities for visitors who can't get to the scene, and it can be used as a virtual space for visitors to hold. Visitors can learn about some products in detail through these virtual reality technologies, and it can also promote the interaction between visitors and products. [8] Such exhibitions can greatly improve the display effect of products and break the restrictions between regions. In addition, virtual exhibition has a great advantage: visitors can watch several exhibitions at the same time, because virtual exhibition displays physical objects on the network through computer technology for everyone to watch. Therefore, even at home, visitors can watch multiple exhibitions at the same time through the network, and click on their favorite bags through the network to complete the operation of 360-degree viewing of bags, which greatly meets the visitors' visiting needs. This kind of virtual display saves financial and material resources to a great extent, and it is its convenience that makes it the trend of development in the information age [9].

5.2 Application in Museum Exhibitions

As we all know, the establishment of a museum requires not only a large space, but also sufficient funds. All the exhibits displayed in the museum are of historical value from ancient times to the present. Therefore, both the design structure and the display of exhibits in the museum have higher requirements, so this traditional museum exhibition is more suitable for cities with relatively developed economy. With the rapid development of Internet technology, the above-mentioned problems have also been solved. [10] By using digital media technology, visitors can visit the virtual museum on the Internet, which avoids a large amount of funds needed for building the museum, and to a great extent, it also narrows the distance between visitors and exhibits, which can make visitors feel that the exhibits are in front of them. In addition, for people in today's society, the pace of urban life is getting faster and faster, and fewer and fewer people can take free time to really visit the exhibits in museums. Therefore, the application of virtual display breaks the time limit of visitors, and visitors can visit various museum exhibitions around the world without leaving home through the network, and they can experience the fun in the process of visiting. This kind of virtual display is to store all the physical resources in the network hard disk. As long as the visitors have the network resource base, they can visit the exhibits anytime and anywhere. Through the interaction with each product,

they can actually realize the deep meaning behind each exhibit. Finally, the application of virtual display in digital media art can play the role of user interaction. [11] By using computer technology, visitors can feel the exhibits from all aspects, such as hearing and vision, so that visitors can get the best interactive experience and know the story behind the products. As a product of the Internet age, virtual reality technology plays an important role in the development of digital media art.

6 Conclusions

The continuous maturity and development of network technology has promoted the rapid development of media art in today's society. The innovation and development of media art can't be separated from the emergence and application of digital media technology. The application of digital media technology using virtual reality technology in art has not only broken the traditional exhibition mode of art exhibits, but also made visitors no longer limited by time and space, realizing that people can visit any exhibition without leaving home. Generally speaking, the application of digital media art in virtual exhibition space enriches the product display mode, and brings innovation to visitors both in spiritual level and perceptual level. Therefore, relevant workers should increase the exploration and research of digital media art.

References

1. Wang Xueyin. Application of Digital Media Art in Virtual Exhibition Space[J]. Art Science and Technology, 2016(9):1.
2. Fu Liya. Research on the Application of Digital Media Art in Virtual Exhibition Space[J]. Art Education Research, 2015(8):1
3. Zhou Shiming, Liu Xinhe. Research on the Application of Digital Media Art in Virtual Exhibition Space[J]. Intelligent City, 2017(03):48.
4. Yao Feiyang. Research on the Application of Digital Media Art in Furniture Exhibition[D]. Central South University of Forestry and Technology, 2019.
5. Zhang Hui. Research on the Application of Digital Media Art in Exhibition Design[J]. Art Science and Technology, 2017.
6. Guo Jing. Application of Digital Media Art in Film and Television Animation[J]. Panorama of Chinese Nationalities, 2019(4):2.
7. Liu Hao. Analysis on the Innovative Application of Digital Media Art in Exhibition Design[J]. Panorama of China Science and Technology, 2015, 000(028):P.239-239,241
8. Zhi Ting. Analysis on the Immersion and Virtual Characteristics of Digital Media Art[J]. Literary Life, 2018(5):1.
9. Zhang Shangli. Current Development Status of Digital Media Art and Its Application in Virtual Space Design[J]. Digital Technology and Application, 2017(8):2.
10. Wang Yang. Analysis of Digital Media Art Creation under Virtual Reality Technology[J]. RADIO&TV JOURNAL, 2017(11):2.
11. Zong Min. Cross and Fusion Application of Contemporary China Digital Media Art Works and Virtual Reality Technology[J]. Beauty and the Times: Creativity, 2012(7):3.