Application of Virtual Design of Exhibition Hall Based on Multimedia Technology

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Abstract—With the advancement of today's social science and technology, people have a different view of beauty, creating more possibilities for the development of the art field. Under the conditions of the development of multimedia technology, the display design should pay more attention to the experience of the audience while reflecting the information expressed in the exhibition hall. The emergence of multimedia technology has broken the way of static display in the past. From static rotation, virtual display can replace physical objects. The medium of display is also constantly changing with the progress of science and technology. This paper mainly focuses on virtual reality design in multimedia technology display design. The specific application of the research is carried out, and the theoretical research is used to promote the progress of science and technology and the development of the industry.

Keywords-multimedia technology; virtual design; display design

1 INTRODUCTION

In recent years, due to the improvement of people's living standards and technological updates, the effect of display design is no longer limited to the display of space and products, it also pays more attention to the audience's sense of experience in the context of the new era, the audience also has new requirements for the future of experiential exhibition halls. Audiences are no longer limited to viewing products, but bring new feelings to them with the help of display products. With the continuous development of new media technology and the continuous emergence of virtual technology, the exhibition hall design is liberated from the dull flat effect. While satisfying the audience's combination of technology and real life, it also creates another space for designers.

2 FEATURES OF MULTIMEDIA TECHNOLOGY IN DEMONSTRATION DESIGN

2.1 Multimedia technology is "interactive" in display design

The physical display in most exhibition halls has been difficult to arouse the audience's resonance and interest, so it can meet the pursuit of technology and integrate it into the multimedia display to design to meet the audience's requirements for display interactivity and bring more benefits to the audience. Premium feel. The emergence of virtual design under

ICICA 2022, December 02-04, Chongqing, People's Republic of China

DOI 10.4108/eai.2-12-2022.2327959

multimedia technology has brought more opportunities and possibilities for the interaction between exhibits and audiences. The interaction and communication between humans and machines makes the images of exhibits more three-dimensional, and also allows the audience to have a better understanding of the nature and connotation of the objects displayed. After a deeper understanding, the two-way communication and interaction between the audience and the exhibits was completed. The increase in the interactivity of the display design makes the display objects more interesting, so the audience can get a better visiting experience, have a new understanding and feeling for the exhibits, and have a more comprehensive and convenient look and feel. This is the difference between traditional display design and multimedia virtual technology. An innovative combination.

2.2 Multimedia technology has "virtual immersion" in display design

Immersion is a distinctive feature of multimedia display design. It is precisely because of the comprehensive display of the sceneby virtual reality technology that the audience can feel the attributes of the displayed objects and gain a deep sense of immersion and storytelling. Or the addition of interesting scenery gives the display a charming color. For example, virtual reality technology can restore the full details of historical sites and so on. Even the extinct historical relics can be presented by technical restoration, so that the audience can break the time limit and make the real media feel the most primitive style of the historical relics.

Under special conditions, how to view the exhibition during the retreat? The application of virtual technology in the exhibition hall has become popular. As long as there is a mobile phone, you can break the boundaries of time and space and achieve anytime, anywhere. Shenzhen Museum VR virtual exhibition hall - "Sanxingdui" (Figure 1) In this exhibition, Professor Tang Jigen passed the "physical object" The exhibition method of "plus "technology" uses physical cultural relics and 3D printed cultural relics to restore the sacrificial scenes of the ancient Shu Kingdom more than 3,000 years ago, so that the Shenzhen audience can intuitively and comprehensively understand the sacrificial culture of the ancient Shu Kingdom and understand every cultural relic in Sanxingdui Behind the sacrificial meaning represented, the virtual cloud exhibition brings a different sense of immersion. It supports 360° panoramic viewing of the exhibition, and supports any switching of 6 different perspectives such as fish eye and asteroids. All sections of the exhibition are presented, and the corners of the exhibition hall are not missed, and the on-site viewing experience is fully restored. The interior of the exhibition hall is designed to restore the historical environment of cultural relics with virtual design, so that the exhibition hall can have an immersive experience with the audience and at the same time, it is presented in the exhibition hall with multimedia technology.

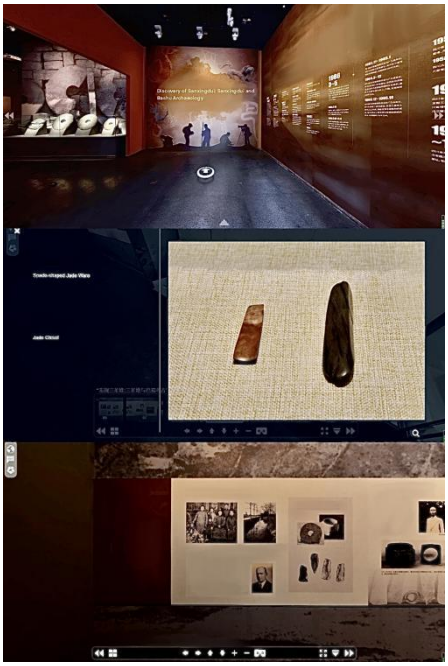


Figure 1 i Tour Shenzhen, Shenzhen Yiwenhui (Image credit: "Capital Education")

3 APPLICATION OF VIRTUAL TECHNOLOGY

3.1 Development of Virtual Technology

Virtual reality technology, also known as "vr technology", refers to the use of electronic graphics, electronic simulation, new media technology, [1] sensing technology, etc. to form a comprehensive display. Through computer simulation, the designer uses three-dimensional technology to simulate the dynamic three-dimensional environment of the real environment, and multi-perceive the three-dimensional environment, so that the sensing facilities and virtual objects can interact with each other. In addition to vr glasses, it also includes full-body virtual equipment such as helmets and gloves, which cooperate with each other to allow the audience to experience a full-scale virtual experience. In the future VR game market, the most promising consumer VR content includes game, film and television, live broadcast, and other four types. 2019 is a turning point for the consumer content market, where the major content producers in the industry begin to turn a profit. In 2021, the size of the consumer content market reached 27.89 billion yuan, of which VR games accounted for the most recent 35%, with a market size of 9.62 billion yuan (Figure 2).

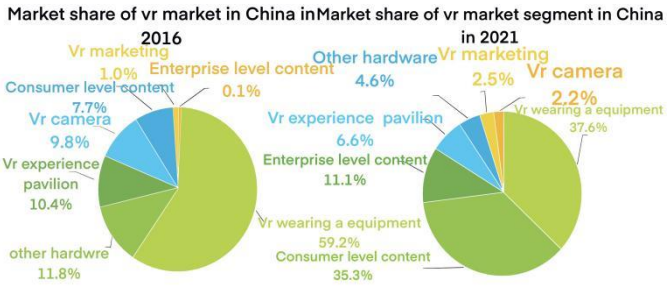


Figure 2 China vr market segment in 2016 and 2021 (Image credit: "Corporate Open Data Industry Interview")

The emergence of virtual technology makes the difference between traditional media display design and multimedia display design continue to increase, and the market demand is also increasing.[3] The application prospect of real technology is broad. According to the data survey, it is found that the global demand for virtual technology will gradually increase with the passage of time, the improvement of scientific and technological level, and the popularization of this market scale will gradually increase, and the overall market will gradually increase. The economic development prospects of scale and forecast are on the rise. This trend provides another world for exhibition design. People's pursuit of technology has accelerated the communication and progress of virtual design in the design industry. Because of these, virtual design is in the display design. In recent years, the application results have become more and more popular and resonated.

Table 1 2019-2023 virtual reality market size and forecast

2019-2023 Global Consumer Virtual Reality Market Size and Forecast	Projected Amount ($ Billion)
2019	3.3
2020	2.6
2021	3.7
2022	4.6
2023	5.1

(Data source:i iMedia Research Data Center)

3.2 The frame of the exhibition hall of virtual design

The virtual exhibition hall takes the Internet as the carrier and is constructed using the virtual technology VR. The virtual exhibition hall is a kind of digital exhibition hall. It integrates Internet technology and traditional offline exhibition halls to provide the audience with a good browsing experience, breaking through the limitation of time and space, with a friendly interface, allowing the audience to be immersed in the scene. The virtual exhibition hall process, the preliminary design of the exhibition hall, and the final draft production after planning. According to the design, the model is reconstructed in 3D software such as 3dmax,

blender, etc., and the scene construction software model is imported into a 3D game engine such as UE4, unity3d, and lighting materials are set, etc. For visual effects, the 3D engine cooperates with the vr device to develop related functions, and the output can be experienced through the vr device.

3.2.1 Display layer

The exhibition layer includes the portal website of the exhibition hall and several exhibition halls. The display resources are reflected in the exhibition layer, and the access users enter the unified entrance on the exhibition layer.

3.2.2 Application layer

The application layer is mainly composed of user UI experience, multimedia interaction, virtual reality, multi-dimensional images, virtual character explanation, 3D model experience, and 360-degree virtual roaming functional components.

3.2.3 Data layer

[4] The data layer defines the data model of the exhibition resources, realizes the organization, storage and management of the data, and provides data services to the support layer and the application layer. It is mainly based on text, pictures, audio and video, application system and other materials.

3.2.4 Specification of technical interface

The construction of technical interface specifications is the basic work of online exhibition construction and the prerequisite for the safe and reliable operation of online exhibitions. The two interface specifications include human-machine interface and hardware interface of software. Human-machine interface refers to the functional interface provided by a computer system so that information can be transmitted between humans and machines. The hardware interface is the interface between the software and the device.

3.2.5 Safe operation

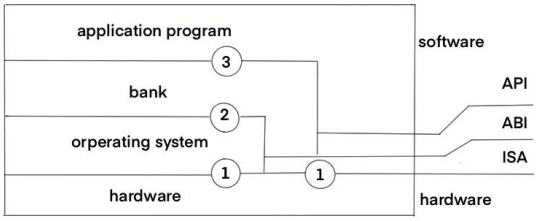
The online exhibition built is deployed in the Internet access environment of all the contractors, and it needs to meet the requirements of the national information security level protection (level II) specification, which is the safe operation of the network information content during the display process.

3.3 The realization and difficulty of virtual technology design

From the perspective of engineering, virtual technology can be expressed as follows: "Virtual technology is a system framework and methodology mountain that divides computer resources into multiple execution environments by using one or more of the following concepts or methods: hardware and software partitioning, time-sharing, partial or full hardware simulation, simulation, providing quality of service (2oS), etc." The goal of virtual technologies is generally functionality or portability. From an implementation point of view, it does the mapping from one instruction set to another. The realization of virtual technology needs the cooperation of various "paradigms" in the development of computer science and technology.

Virtual technologies can be classified into hardware virtual, logical virtual, software virtual, and application virtual according to different virtual levels. Hardware virtualization (physical partitioning) technology emerged with the development of Unix servers. It is based on a special hardware architecture, such as the modular building block (MBB) architecture used by HP and Sun for Unix servers. Each building block (BB) has its own CPU, memory, and I/O card. Cpus in different BB's have different clock frequencies and support hardware hot swap. The advantages of hardware virtual mode are 100% isolation and security, and the virtual control program occupies less system resources. In logical partitioning, the virtual controller also runs directly on the system hardware, where multiple operating systems can run simultaneously. What it has in common with hardware virtual mode is that it has nothing to do with the operating system where the application is located, and only depends on the system hardware. However, it is time division multiplexed to the underlying hardware, losing part of the isolation of the hardware partitions. These two modes require some degree of hardware support. Both the software virtual mode and the application virtual mode need to run on the same main operating system. The virtual layer software has nothing to do with the hardware. The difference between the two is that the former runs a guest operating system on top of virtual-layer software.

Table 2 Virtual technology computer system interface composition



4 SIGNIFICANCE OF VIRTUAL DESIGN IN DISPLAY DESIGN

4.1 Maintenance and protection of cultural relics

The virtual environment is created by virtual reality technology, the details of the physical form of cultural relics are displayed in the virtual scene, the cultural relics and historic sites are restored, and then the audience can browse the virtual environment in depth. The cultural relics are displayed in front of the audience in a safe state so as to fully experience its long history. For example (Figure 3), the digital treasure pavilion built by the Palace Museum uses high-precision three-dimensional data to display the detailed information and overall appearance of cultural relics, allowing the audience to "touch" and interact with cultural relics at zero distance and 360 degrees. After clicking on the web page, you can rotate the artifact as you like and observe the details anywhere.

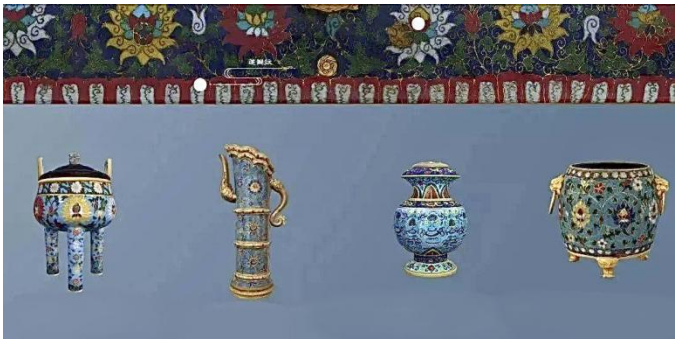


Figure 3 The museum in i ears, the news of Sichuan View, the official website of the museum (Image credit: "Capital Education")

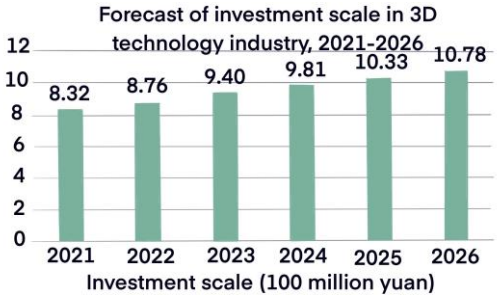
4.2 Expand the exhibition space

The application of virtual reality technology to the exhibition space can enhance the audience's experience of virtual goods. In the simulated interactive commodity environment, the display effect of the exhibits can be observed only by using three-dimensional, so as to meet the needs of the audience for the overall look and feel. Compared with flat pictures, the three-dimensional exhibits bring more realism to the audience. The simulation takes people as the main body and can meet the sensory needs of the audience. Save real space and further expand the exhibition space pattern.

4.3 Rich exhibits display

The use of virtual technology can make the exhibits truly displayed in front of the audience to achieve the best interactive effect. Virtual technology can make the exhibits realistically presented to the audience to achieve the best interactive effect. Virtual reality technology can better solve the problem of lack of authenticity of exhibits, and three-dimensional space technology can show realistic exhibits.

Table 3 Forecast of investment scale in 3D technology industry, 2021-2026



Virtual design can also use its interesting interactive features in the display design, such as the "Virtual Exhibition of Hanxiu TombMurals" (Figure 4). In addition to the vivid animation explanation, there is also an interactive game of "repairing cultural relics", the theme of "Recovery and Creation" was advocated. The designer imagined the future under today's conditions and stimulated new cultural creations. He decided to display the restoration process

of murals in the form of a virtual exhibition, and also added an interactive game with the theme of mural restoration. The content is delivered to the audience with a more craftsmanship and a sense of experience of the exhibition, and a more real sense of historical charm and technological progress, making virtual design entertaining.

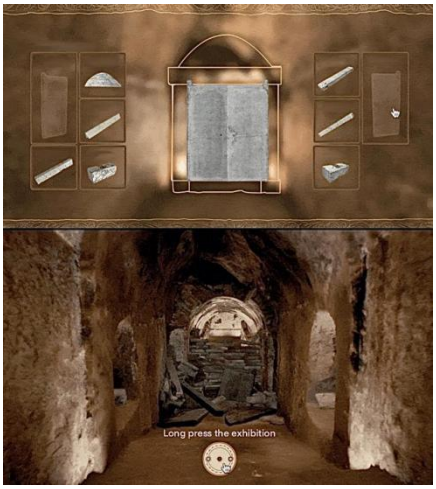


Figure 4 Chuanguan News, the museum's official website (Image credit: "Capital Education")

5 VIRTUAL DESIGN OF EXHIBITION HALL BASED ON MULTIMEDIA TECHNOLOGY

5.1 The virtual effect of multimedia technology in the display

In the design process of each exhibition hall, digital media, electronic media and optoelectronic integrated media participate, and the technical resources are extremely rich, realizing the harmonious unity of technology and art. Even the ultimate virtual payment technology can enable audiences to achieve a true representation of the virtual display in the virtual display. A language of interaction can make virtual debates both very engaging and well-done. In today's market, people's favorite virtual multimedia technology has multi-touch screen technology, three-dimensional technology and dome screen.

The three-dimensional display technology uses the specific symbols and graphic information in the promotional materials, and the audience can inquire through the corresponding query screen in the pavilion design, so that the audience is immersed and impressed. Such as (Figure 5) panoramic view of the Forbidden City through the virtual panoramic technology, the original appearance of the Palace Museum and the palace is displayed. Without walking, the user uses multimedia technology to select the desired scenery and uses 3D technology to completely display the whole picture of the Palace Museum. When viewing the details of each place, there is also a personal "tour guide". "To explain to you, each text commentary can be seen clearly. The designer brings a different experience through the new virtual technology. In summer, you can feel the scenery of the Forbidden City in winter, and use virtual technology to make the Forbidden City different throughout the year. The view brings the audience.

Dome screen: Use spherical projection technology to image the outside of the spherical projection screen. In the design of the pavilion on the surface of the sphere, the display of static, dynamic and image can be played in a single window or multiple windows, which is very shocking. Applying these virtual display technologies to the design of the exhibition hall can better enhance the visiting experience of the exhibition hall and impress the audience, thereby enhancing the effect of the exhibition. effect of the exhibition.

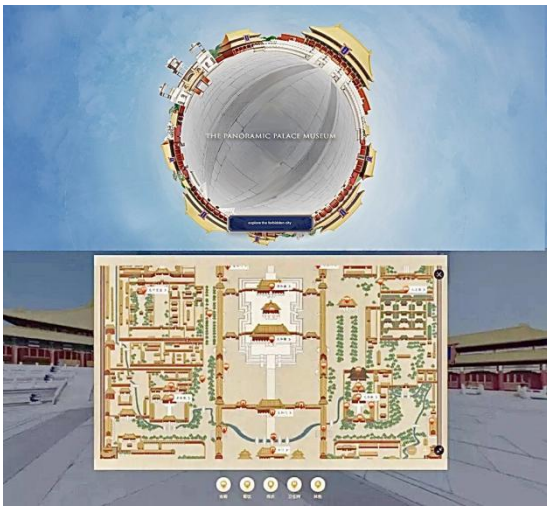


Figure 5 Chuanguan News, the museum's official website

5.2 Case study of multimedia technology in virtual design of exhibition hall

Hangzhou Water Conservancy Science Museum focuses on the theme of "Water and Hangzhou", and uses various modern display methods such as immersive cinema, VR interaction and multi-touch to display water conservancy knowledge. The original large-scale wave wall "Spirit of Water" tells about the connection between water and the three major cultural heritages of Hangzhou, and realizes the soul of water and Hangzhou. The use of virtual design in multimedia exhibition halls is also increasing, and technology has gradually become a new standard for artistic creativity. Among them, the application of technology in exhibition design involves multimedia exhibitions such as 3D animation, digital exhibition hall, electronic sand table, holographic projection, virtual reality, and promotional films. The emergence of these multimedia technologies has created more conditions for designers to design ideas.

5.3 Realization of virtual design application of exhibition hall with multimedia technology

The application of virtual design in venues should be planned first. The principle of virtual reality augmented reality technology is to simulate virtual information such as text, images, 3D models, music, and videos to enhance the real world. After the planning is completed, it has a real-time interaction function, which can generate images according to the position and angle, and the interaction is good. By superimposing virtual text, pictures, videos and other

information on the exhibits, provide the audience with an introduction to the exhibits. Through the investigation of people's physiological and psychological expected effects. Virtual reality technology comprehensively applies graphics technology, simulation technology, sensor technology, reality technology and other computer hardware and software technology (Figure 6), which is the foothold of the application of computer technology in display design.

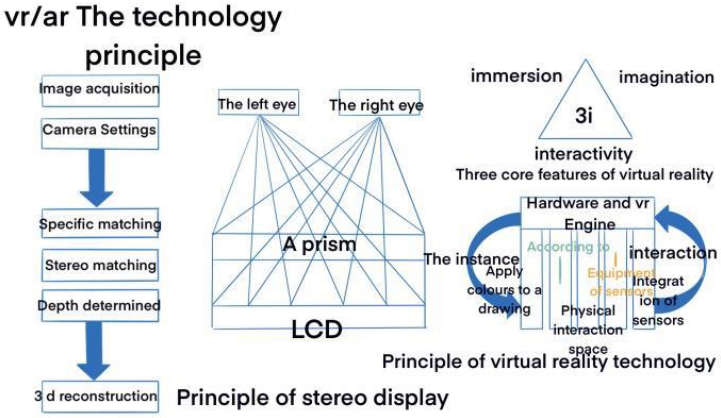


Figure 6 Principle of Vr/Ar technology (Image credit: "Special Research Report")

For the driver layer of VR, a very important work is to fuse the data of accelerometer, gyroscope and magnetometer. The common algorithm we use to fuse magnetometers is AHRSupdate algorithm written by Madgwick. IMUupdate is a castrated version of AHRSupdate. The AHRSupdate algorithm is as follows:

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ex = (ay*vz - az*vy)  + (my*wz - mz*wy);
ey = (az*vx - ax*vz)  + (mz*wx - mx*wz);
ez = (ax*vy - ay*vx) +  (mx*wy - my*wx);
```

5.4 Application suggestions for the application of virtual design of exhibition halls of multimedia technology

Applying diverse media techniques to showroom design can attract large audiences and generate corporate profits. Appropriate multimedia technology should be used for demonstration during design. Although this technology is widely used in exhibition hall design, there are still some designers who ignore the actual meaning and purpose of exhibition hall design in order to achieve high-quality results. It is a unique and attractive thematic scheme that can effectively locate the information of the exhibits, and finally achieve the excellent application of multimedia technology in virtual design, and then realize the application of virtual design in the exhibition hall.

6 CONCLUSION

Technology is the basis for the innovation of artistic creation methods, and artistic development is the source of new technologies. Throughout the development history of display design, due to the increasing progress of information technology, the forms of display design have become more and more colorful. Although the virtual design of multimedia technology in exhibition halls has not been around for a long time in my country, compared with foreign countries, it is still not perfect. The aesthetics of the audience is progressing with the development of the economy, and the forward-looking requirements for designers are higher. Frequent postings create a good communication environment for designers to combine art and technology, and at the same time provide more possibilities for art creation. The virtual design of new multimedia technology makes the display design more convenient, close to people's life, develops in the direction of humanization, saves time and space, is more convenient and interesting, and has a wider range of information transmission.

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