Research on Immersion in Virtual Reality Technology

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Abstract
The birth of virtual reality technology has made great contributions to the field of art design and games, and has gradually become one of the indispensable technologies in contemporary society. Its technological, efficient and interactive features are unmatched by other artistic methods. The highest demand of art and design creation is to transmit information effectively. Immersion in virtual reality technology can make the transmission of information more idealized and faster.

Keywords-*component; formatting; style; styling; insert*

1. Introduction

With the development of science and technology, virtual reality technology has been continuously developed, involving new products in various fields, and it has been widely used in many different fields such as industry, education, hospitals, military affairs. Virtual reality technology is widely used in life, which can effectively help people solve various diversified problems such as environmental problems, resource problems. Things in life are influenced by the factors of the virtual world, which can enhance the viewer's immersion. Therefore, how to improve the immersion and realism in virtual reality technology has become one of the most critical parts in the development of virtual reality design.

With the development of multimedia technology, computer image art design and virtual reality technology (VR) can be integrated into one, which provides a very broad platform for people to experience the art forms they need, and therefore virtual reality art has been widely used. With the appearance of virtual reality art, both new books and viewers can devote themselves to the virtual world created for artistic works, and interact effectively with viewers in a delicate and simple way. Therefore, this has also laid the goal of the future development of virtual reality technology, that is, to use all methods to improve the connection between the viewer and the design, and to improve the immersive feeling of the viewer when watching the work, so that the user can get deeper information of the work while enjoying the work at close range, and more intuitively understand the author's central idea of designing the work.

2. The Concept of Immersion

Immersion mainly refers to the development and change of mental state from one spiritual world to another. Its greatest feature is that it can eliminate the distance between the displayed object and itself, so as to improve one's interest in the object in front of one's eyes and its emotional fluctuation. The relationship between distance and immersion is not a simple one-choice relationship, but a multi-layered, inextricable and partially contradictory relationship. In the exploration of virtual reality technology, two words of immersion are used, namely "immersive" and "immersion". Two words represent two different fields in virtual reality technology. "Immersive" refers to physical immersion in virtual reality technology, while "immersion" refers to psychological immersion.

2.1. Physical immersive

Immersion, referred to by physiological immersive, is the most widely used in the field of virtual reality technology. Its meaning is described as "let users complete their entry into the environment presented on the screen", which makes users feel that they are not a person who stays out of the way, but a part of the virtual world. Viewers can feel themselves surrounded by things presented on the screen, watch and walk freely in this environment, and interact with objects, just like in real life. Among the research parts of virtual reality technology at present, physiological immersive usually means to improve the sensory impact of viewers with the help of virtual reality technology, giving them a variety

A. El-Hashash et al. (Eds.): IEIT 2022, ACSR 100, pp. 88–93, 2023.
https://doi.org/10.2991/978-94-6463-058-9_16

of differences, namely, the collision of touch and perception, which makes users personally think that they are already in the virtual world created by virtual reality technology, and it is an experience with great sense of existence [1].

2.2. Psychological immersion

Psychological immersion means that the viewer can get psychological satisfaction in the interaction with virtual characters, that is to say, set some challenges for the viewer, so that he can truly immerse himself in the plot, even break away from the shackles of time and forget his own feelings of existence in real life. Since then, the analysis and research of immersion theory has entered a relatively complete field. At the same time, psychological immersion can also be expressed as devoting oneself to a project, thus forgetting the time and ignoring the influence of perception, and living psychologically on this basis, forming a state of almost selflessness, which is psychological immersion [2]. From the above, it is not difficult to see that the transition from physical immersion to psychological immersion is a progressive process. When physical immersion reaches a certain position, it will enter psychological immersion, and the whole virtual reality technology will be sublimated. In addition, psychological immersion is also related to the user's own cognition of virtual reality and the content presented to the user. Some of the contents of physiological immersion are poorly interactive, such as some table games, but the contents of the games can attract all the attention of users, and allow users to directly skip the transition of physical immersion and directly enter the intense psychological immersion [3].

3. Overview of Virtual Reality Technology

The meaning of "reality" in virtual reality technology is very broad, which mainly refers to all kinds of objects and their environments that exist in the world in physical or functional aspects. It can exist in real life, and it can also be an environment or object that can't be realized or even incredible in real life. The meaning of "virtual" in virtual reality technology refers to a technology generated by computer as the carrier. Therefore, virtual reality refers to a special world with computers as the carrier. People can integrate themselves into this environment by using various VR devices, control and create the environment according to their own ideas, and achieve the goal that cannot be accomplished in real life. That is, people are the masters of this world.

Virtual reality technology is a platform for people to enter the virtual world, eliminate the senses of the real world and feel the shock brought by the virtual world through their own cognition. Virtual reality technology is a high-tech field integrating integration technology, design computer graphics, man-machine interaction technology, transmission technology and artificial intelligence technology. Virtual reality equipment is mainly divided into two categories, namely input and output. Input external configurations mainly include handles, gestures, motion capture, etc. (Figure 1, coming from Microsoft: https://pic1.zhimg.com/80/v2-a2f30d0171fbba39409970718e6b4c34_1440w.webp Non-original). The output devices are external helmets (Figure 2, coming from iQiyi: https://openfile.meizu.com/group1/M00/06/3D/Cgbj0FuHT3aAVHSTAAKQyMjhJRA611.png680x680.jpg Non-original), integrated helmets (Figure 3, coming from Baidu: https://img1.baidu.com/it/u=1091029496,428837425&fm=253&fmt=auto&app=138&f=JPEG?w=630&h=330 Non-original), VR glasses for smart phones (Figure 4, coming from Baidu: https://img11.360buyimg.com/n1/jfs/t1/106420/36/6875/29641/5df74127Ec4e5c2ad/204a307796d4a3b1.jpg Non-original), and so on. The progress of multimedia technology and its external equipment is based on the high standard requirements centered on information technology in the 21st century. Virtual reality technology is a key theoretical technology supported by multi-scientific theory which is gradually sublimated with the deepening of science and technology [4].

Figure.1 Virtual reality equipment

Figure.2 External helmets

Figure.3 Integrated helmets

Figure.4 VR glasses for smart phones

4. Strategies to Improve Immersion in Virtual Reality Technology

How to improve the immersion in virtual reality technology, experts in various fields have also studied from different angles and achieved excellent research results, which are mainly divided into the following aspects:

4.1. Explore the causes of immersion

The main reason for immersion is the illusion of the objective existence of the picture produced by the viewer in the virtual reality technology. The illusion of the objective existence of the picture comes from several directions in which people capture information. According to these different directions, we can make a further exploration. If you want the viewer to get the illusion of the real existence of the picture through virtual reality technology, then you need to have the following basic technical requirements:

1) Image: Visual senses are the main breakthrough for people to obtain information. Scientists have found that most of the information people get in real life comes from visual senses. Therefore, the in-depth study of images has become a key part of improving the immersion of virtual reality technology. Image transmission can be presented by people's visual senses and organization's constructive cognition, so virtual immersion space needs to be classified separately in the field of image media. The main meanings of images are divided into two points: display function and constructive existence (Figure 5, coming from Baidu: https://gimg2.baidu.com/image_search/src=http%3A%2F%2Fseopic.699pic.com%2Fphoto%2F50034%2F8705.jpg_wh1200.jpg&refer=http%3A%2F%2Fseopic.699pic.com&app=2002&size=f9999,10000&q=a80&n=0&g=0n&fmt=auto?sec=1670061604&t=754a44dcc011508dc85711c4fd02a42a Non-original). From the rapid development of virtual reality technology, it can be seen that the public's demand for images has not only stayed on the surface. Instead, it has more and higher requirements for images, similar to making pictures more realistic; the details are more detailed; the presented picture needs to match the viewpoint of the viewer, and can change differently according to the shift of the viewer's line of sight; the level of the object image can be processed in different details and so on [5].

Figure.5 Image transmission of the visual senses

2) Interaction: Interaction is one of the indispensable links in people's daily life. The usability, guidance and practicality of interaction directly determine the user's experience in many aspects, and at the same time, this experience will directly lead to whether immersion can really play its role. Only by raising the interactive experience can the viewers have their own subjective sense of the whole virtual world in the virtual world, and think that they can control the objects to a certain extent in the virtual world. Only in this way can the viewers feel similar feelings to those in the real world when they enter the virtual world, laying a foundation for the transition to psychological immersion at any time[7]. (Figure 6, coming from Baidu: https://gimg2.baidu.com/image_search/src=http%3A%2F%2Ff.expoon.com%2Fnews%2F2017%2F06%2F02%2F431822.jpg&refer=http%3A%2F%2Ff.expoon.com&app=2002&size=f9999,10000&q=a80&n=0&g=0n&fmt=auto?sec=1670061376&t=b865b92ec3134a00718e6b4e7eee84cb Non-original)

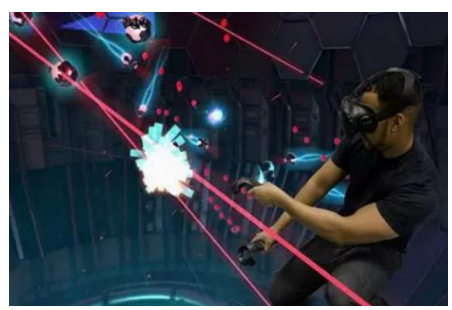

Figure.6 Interactive experience

3) Behavior: The behavior referred to here is not the behavior of the viewer, but the behavior of the virtual characters in the virtual world, which is the feedback made by the viewer after giving instructions to him. The virtual characters or objects must give dynamic feedback. Only in this way can the user pay attention to the current environment completely in the virtual world built by virtual reality technology, and will not be separated from it because of feedback interaction. Psychological activities like this are also very easy to get corresponding feelings in daily life. For example, when watching an excellent and attractive movie, if the pause button is

suddenly pressed on the movie, the viewer (that is, the user in the virtual world) will immediately escape from the atmosphere created by the movie (a larger part is the psychological world created by the viewer himself). Therefore, when designing virtual reality technology, it is necessary to focus on the dynamics of virtual characters and objects [6]. Its dynamic performance needs corresponding feedback after the viewer gives instructions, and it can also be expressed as a performance conforming to the laws of nature, or conforming to the laws imagined by the designers of the virtual world. The feedback of virtual characters or objects to viewers can make viewers have more trust in the virtual world and effectively shorten the distance between viewers and the virtual world. (Figure 7, coming from Baidu: https://gimg2.baidu.com/image_search/src=http%3A%2F%2F6955431.s21i.faiusr.com%2F2%2FABUIABACGAAgx4ay3QUojfWl4wUwgA84wwg.jpg&refer=http%3A%2F%2F6955431.s21i.faiusr.com&app=2002&size=f9999,10000&q=a80&n=0&g=0n&fmt=auto?sec=1670061860&t=e59c18fc3097af3ccb101ad03da91250 Non-original)

Figure.7 Virtual characters behavior

4.2. Virtual world works realize "immersion aesthetic feeling"

Virtual reality works designed in virtual reality technology need to achieve a kind of "immersion aesthetic feeling", so as to fill up the content lacking in immersion. This so-called "immersion beauty" in virtual reality is not a simple sublimation of physiological immersion, but an aesthetic process that makes viewers extend from themselves while watching, and has guiding psychological immersion. To explain it in easy-to-understand terms is to convey the information that users need or like to users. Taking the popular aesthetic requirements of viewers as the basic criterion in the design of virtual works, taking the aesthetic characteristics and obstacles of the virtual world and the real world as an extension, the aesthetic feeling of immersion can be adjusted in time[8].

1) Find the characteristics of the real world: The word virtual reality perfectly interprets the ultimate goal of virtual technology, that is, to express reality incisively and vividly in the virtual world. Therefore, the most basic preparation for immersion aesthetic feeling is to be close to reality, and even need to have more details than the objects seen in real life. When the viewer is in the virtual world, the object environment is no different from real life at all, even more delicate than the environment displayed in real life, it will be very easy to transition to psychological immersion.

2) Conforming to the aesthetic characteristics of virtual reality: This problem is easily overlooked by the designers of most virtual reality works. When the designers create the virtual world, it is a man-made world and a work with great sense of design, which inevitably needs to actively explore the aesthetic needs of the public. The aesthetic needs of users also directly feel the aesthetic basis of works in the virtual world, and its root is to deeply analyze the aesthetics of the masses from their psychological needs, which is the aesthetic standard in virtual world design[9].

3) In line with the stimulus information in visual psychology: In the design of virtual world, it is necessary to create a product that can meet the user's psychological pursuit of stimulus, and create visual information around the stimulus as the main body. In the process of using or interacting with the environment, the attraction of the user will be effectively transferred, and the central idea and meaning of the designer's design of the stimulus will be completely transmitted to the viewer through the viewer's interaction and visual communication.

4) Increase the dissemination of information and dissemination methods of other feelings: The main organ of information people receive is vision, but hearing and touch are becoming more and more important in the research of today's society. Through research, it is found that the perfect combination of auditory and tactile feelings and vision to experience the virtual world can greatly enhance users' immersion, especially their psychological immersion. For example, Rain Room is a way to enhance the immersion of virtual reality by hearing[10].

4.3. Understanding the performance scale of immersion

Immersion is a particularly important performance control scale in virtual reality technology. To realize this, the following necessary conditions are needed: First, it is Multi-sensory, which means sensory stimulation except visual senses, including auditory perception, tactile perception and so on. Secondly, it is Autonomy, which is mainly the degree to which virtual characters or objects in the virtual world are dynamically displayed according to the laws in real life. Finally, it also includes whether the visual field of the virtual world is wide enough, whether the time response of the virtual characters and their objects when the viewer gives instructions is delayed or the feedback is inaccurate, besides, the most

important point is that the restriction degree of interaction is acceptable to the viewer, etc[11].

5. Conclusion

After the above several effective descriptions of improving immersion, it is not difficult to see that although the angle of the station deviates from the starting point, the final solution is reminded in several intersecting aspects. That is to improve the reality of objects in the virtual world environment, so as to create an immersive visual sensory stimulation for viewers; increase the direct interactive feedback between virtual characters and their objects and viewers; pay attention to all kinds of information transmission methods except visual sensory stimulation information. The development of virtual reality technology is very bright, of course, there are some big or small problems. Simply considering whether immersion is authentic or not, the basic requirement is not only to control the quality of the model, but also to improve the display of virtual devices, that is, the definition and resolution we often say. In recent years, the development of virtual reality technology has spread to all walks of life, and it can be clearly seen that virtual reality technology has become one of the indispensable science and technology in people's lives. China has gradually begun to increase its investment and attention to virtual reality technology. It can be seen that the future development of virtual reality technology will have unprecedented advantages in various industries and fields. By improving the quality of its production and shortening the investment of funds as far as possible, it will bring a broader development path for the virtual reality technology industry.

Acknowledgment

Science and Technology Research Project of Jiangxi Education Department in 2020: Research on the Application of Immersive Virtual Reality Technology in Public Art Design（No. GJJ201337）

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