Research on 3D Animation Design Based on VR Technology

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Abstract: Judging from the initial time of animation production, China started relatively late in this area. Driven by the advancement of computer technology and social needs, 3D animation and virtual reality technology have made significant progress. Domestically, it has achieved good results in the production of three-dimensional animation, and has been widely used in various online games and many TV works. Virtual reality technology has diversified development forms. Compared with traditional three-dimensional animation technology, it has obvious interactive and real-time characteristics, and can bring the audience a good perception experience in many aspects. The application of virtual reality technology in the creation and design of 3D animation can break throughly improve the interactivity of 3D animation, which is beneficial to promote the animation industry to a higher level. Under the current circumstances, the integration of technology and media is in a stage of rapid development. One of the important directions of future animation art creation is virtual reality immersive content, which is increasingly noticed by the society. This article introduces the basic characteristics of virtual reality technology and three-dimensional animation design, studies three-dimensional animation design based on VR technology, and analyzes the application of virtual reality technology in three-dimensional animation design; We discuss how to give full play to the advantages of virtual reality animation interaction within the scope of existing technologies, analyze the narrative laws, and provide references for the use of virtual reality technology for three-dimensional animation creation.

1. Introduction
In the long-term development and evolution of economic society, technology and art have gone through different stages of historical development. At the same time, the two have also experienced the process of production, cross-development and continuous integration from shallow to deep and interpenetrating. Under the current circumstances, the product of the fusion and development of science, technology and art can be reflected in all aspects of life. The continuous advancement of computer and network technology has made the Internet society present typical digital characteristics. Under the impetus of industrial and agricultural production and social life, a large number of new multimedia technologies have been born, which have been widely used in the field of art design. The traditional three-dimensional animation design can bring people a colorful animation world to show. However, each process node of the three-dimensional animation design is pre-set, and in the process of showing to the user, it does not have the feature of interacting with the user. Virtual reality technology combines artificial intelligence, computer virtual simulation technology, image display technology and sensor technology. The virtual world environment created by Sun, a virtual reality technology, can bring people immersive content and has become an important development direction in the art field, which has gradually attracted widespread attention in the society.

In changing the way people experience three-dimensional animation display, virtual reality technology has great potential for development. Compared with the traditional three-dimensional
animation scene narrative media, through the effective use of modern scientific and technological means, virtual reality three-dimensional animation design can effectively achieve the breakthrough of traditional three-dimensional animation video, fully demonstrate the situation that traditional video images cannot achieve, and create an audience Multiple sensory experiences such as perception, interaction, vision, and hearing.

In the development process of animation art, by combining science and technology, it can bring unprecedented development space and pattern to 3D animation design. Fully apply virtual reality technology in 3D animation design and production, which can create a sense of picture from a new perspective, fully integrate graphic design and multimedia interaction and other technologies, so as to produce high-quality animation works, so that the use of virtual reality technology in 3D animation design the importance and necessity are fully reflected.

2. Virtual reality technology and 3D animation

2.1. Virtual reality technology overview
Virtual Reality, abbreviated as VR, is a type of computer technology, also known as spiritual, phantom or immersive technology. It uses common virtual reality electronic devices such as virtual reality headsets and glasses, combined with physical space or multi-projection environments, to generate realistic sounds, images, and other feelings, and simulate the presence of users participating in the experience in a virtualized environment. Virtual reality technology is rich in content and covers a wide range, including environment, perception, and natural skills. In the virtual reality environment, through the human-computer interaction operation process, the stereo of hearing, vision and touch can be vividly realized, and through the multimedia device, the participants can experience the immersive feeling.

At present, a variety of modern advanced technological achievements have been integrated into virtual reality technology, including graphics and image processing technology, computer technology, multimedia technology, network and sensor technology, etc.; These technologies can provide strong technical support for people to fully experience the virtual world, and make virtual reality technology develop rapidly and be widely used in various fields. The emergence of virtual reality technology has changed the way people interact with people; It transforms the human-computer interaction information from one-way communication to two-way information communication, truly realizes the interactive communication between humans and machines, the interactive content develops from information to "environment", and realizes the ability to output interactive effects from audiovisual input to perception surroundings. The change process of human-computer interaction is shown in Figure 1.

![Figure 1. Human-computer interaction methods and content changes](image)
2.2. Basic characteristics of virtual reality technology

With the help of various input and output devices, the virtual reality environment is transferred to the user's vision, hearing, and body sense. From the perspective of current virtual reality technology, it mainly has the following characteristics.

Immersive. Immersion is a sense of presence for participants in the virtual environment. When the people participating in the experience use the supporting equipment in the virtual reality environment, they can get a feeling of being in the virtual world. When this sensation reaches the ideal state, the experiencer can obtain the same feeling as in the real world, unable to distinguish the virtual environment from the real situation, and has completely immersed himself in the virtual environment world. During the operation of the corresponding object in the virtual reality experience, the feedback of the operated object can be obtained, which is no different from the feedback of the real-world object.

Interactivity. The interactivity of virtual reality is mainly reflected in allowing users to participate in operations, making physical contact with objects in the virtual environment, and being able to get feedback from the operated objects, giving the experiencer the same feedback experience as operating real objects. For example, when the experiencer touches the water in the virtual environment, he can feel the temperature of the water and touch the flowing water to feel the natural impact of the water flow. At the same time, he can also feel the touch from the visual point of the experiencer Water ripples produced after water. These interactive visual and tactile feedbacks are completely consistent with the true laws of nature, and the feedbacks obtained are indistinguishable.

Immersive. In the virtual reality environment system, the immersion obtained from the support of interactivity and pluralistic perception. The increased immersion of virtual reality requires the use of computer simulation technology and three-dimensional image processing technology to achieve effective playback of environmental sound effects and three-dimensional animation. Usually, hardware sensor equipment is used to transmit people's movement information to the computer system, and the data information processed by the computer system is then transmitted to the virtual reality related hardware equipment, so that the experience can be completely immersed in the virtual reality environment and get complete immersion.

2.3. 3D animation

The development of current computer technology has enabled 3D animation to accurately imitate and reproduce real things. Three-dimensional animation technology has developed along with computer software technology. Three-dimensional animation technicians use computer tool software to create three-dimensional animations of virtual characters, and use multimedia such as movies or television to display three-dimensional animations. Three-dimensional animation can realize the action control of each character in the virtual environment. In the actual application process, 3D animation technology is less affected by objective factors. With the continuous improvement of various technical levels, 3D animation design has a broad development and application space. Three-dimensional animation focuses on creating and expressing art, but lacks interactivity. After the three-dimensional animation is interactive, it can fully enhance the expressive power of art design and make up for the shortcomings of three-dimensional animation design.

3. Three-dimensional animation design based on virtual reality technology

Modern network technology and information technology can support the creation of 3D animation design. After acquiring a large amount of material in 3D animation design, make full use of related software and hardware to fully display the animation effect. We apply virtual reality technology to 3D animation design, make 3D animation design interactive, and provide strong support for the development of 3D animation industry. Integrate various types of advanced equipment and technology to form a new style in 3D animation design. We fully combine virtual reality technology with traditional 3D animation technology to strengthen the continuous optimization and improvement of the problems in 3D animation design, which can effectively improve the fidelity and flexibility of 3D animation design and production, and greatly improve the work efficiency.
3.1. 3D animation interactive design process
According to user interaction experience, three-dimensional interaction methods are usually divided into direct, indirect and mixed types. The hybrid interaction mode combines the advantages of direct interaction and indirect interaction. On the premise of ensuring basic interaction functions, the interaction experience and efficiency of the experiencer are greatly improved.

In the three-dimensional animation design, the interaction process is mainly divided into three parts: user operation, sensor device, and virtual model. The user interacts with the model in the virtual three-dimensional environment by using relevant interactive equipment; In the interaction process, real-time detection and feedback of virtual and real environments. The three-dimensional animation interaction process based on the virtual reality system is shown in Figure 2.

![Figure 2. Three-dimensional animation interaction process based on virtual reality system](image)

3.2. Three-dimensional animation interactive node and overall frame design
In the interaction process of 3D animation, the interaction node is the core feature of virtual interaction. Our definition of 3D animation interaction nodes mainly refers to the selection of appropriate interaction trigger nodes during 3D animation playback, so that the viewer can naturally interact with objects in the 3D animation virtual environment. The three-dimensional animation virtual interaction design mainly includes specific features such as rationality, timeliness, promptness and guidance. According to the story content structure and specific viewing requirements displayed by the three-dimensional animation, the interactive node also has different functions. Generally, if the three-dimensional animation interactive node is used to guide the development direction of the new route of the animation story, the interactive node is the starting point for displaying the new branch of the three-dimensional animation. In the process of displaying the overall plot of the three-dimensional animation story, different story fragments are interspersed, so that the viewer can generate different animation stories according to different interaction behaviors. The overall interactive node composition framework design of the three-dimensional animation virtual interaction is shown in Figure 3.

![Figure 3. The overall interactive node composition framework design of 3D animation virtual interaction](image)
connect the animation storyline of the virtual environment. The selection and design of the interactive node of 3D animation needs to fully consider the optimization of the virtual scene displayed by the 3D animation. A good 3D animation interactive node selection design can enable the experiencer to start the interaction from any location, according to the specific experience of the experiencer, enter a new virtual scene, and finally make the experiencer feel the beautiful mood of the 3D animation virtual scene.

3.3. Interactive narrative design of 3D animation

The interactive narrative design of 3D animation includes games, narratology, interactive design and so on. As a narrative method in the digital media environment, 3D animation interactive narrative combines traditional narrative structure and modern media narrative, enabling the experiencer to interact with participating stories in a variety of dynamic narrative environments. The three-dimensional animation narrative design does not fix the story content in advance, it changes constantly during the interaction between the audience and the three-dimensional animation display story. The interactive narrative design of three-dimensional animation is to design the interactive system so that the audience can participate in the interactive narrative process and obtain an interactive story experience. 3D animation design utilizes the interactive narrative design of virtual reality technology to design an interactive system in the virtual reality medium to enable the audience to produce a valuable animation story experience. Similar to the design of artificial intelligence systems, in the design of three-dimensional animation interactive narrative, it can provide the audience with an intelligent environment and perception of the virtual world. Through the interactive narrative design of three-dimensional animation, the audience can have a story experience in a real environment. Interactive narrative animations and games share interactive features. The interactive narrative design of games is based on interactive experience, supplemented by narrative; the interactive narrative of 3D animation interactive design is based on narrative, supplemented by interactive experience.

3.4. Design of 3D animation narrative interactive node

In the three-dimensional animation narrative based on virtual reality technology, the narrative interaction node connects and triggers related events. Interactive nodes have a greater impact on the story process, narrative rhythm and audience experience. In the virtual reality environment, in order to ensure that the audience can keep up with the rhythm, the rhythm is not fixed in advance. Related events and interaction nodes are shown in Figure 4. The audience in the picture starts from appearing in the exhibition hall and designs five key interactive nodes to trigger different moments. Taking into account the need for new experiencers facing 3D animation virtual scenes, information interface prompts are set at each key interaction node.

![Figure 4. Related events and interaction nodes for 3D animation design](image)

Among them, the first interactive node is designed through tactile feedback, allowing the audience to press the mechanical device cover, and the mechanical device becomes a small robot. audience felt the vitality of the object. The robot instinctively expressed the fear of meeting for the first time. It hid in the warehouse behind it and waved to the audience. At this time, the key interactive node designed by gesture interaction is designed to make the audience wave out to the robot out of instinct. After two waves, the robot runs to the audience shyly, takes out the small card box, and inserts it into the computer optical drive according to the guidelines. The little robot is magically taking out a lot of card boxes, letting the audience get various 3D printed toys and gain different experiences, so that the audience is completely immersed in the virtual world, everything seems natural.

At present, the virtual reality technology is essentially unable to recognize the movement of the user's eyes.
3.5. 3D animation visual guide design

In a virtual reality environment, non-interactive 3D animation and interactive 3D animation are very important for the visual guidance of the audience. In three-dimensional animation interaction, the sight guidance and auditory guidance before the interaction node is triggered are the key parts of the interactive narrative design. After the audience's experience feedback, most of them noticed these guiding messages, but due to the different preferences and concerns of the audience, some audiences will ignore it. After a lot of audience experience process collection, these guides can attract the audience's attention and promote the progress of the storyline during the interaction between the audience and the virtual world, so that the audience can naturally enter the virtual space, while interacting freely, they can also promote the normal development of the story. The three-dimensional animation visual guidance design is shown in Figure 5.

![Figure 5. 3D animation visual guidance design](image)

4. Conclusion

The birth of virtual reality technology, combined with traditional film and television art, can bring powerful energy in the field of 3D animation. Based on this, this article starts with the elements of lighting, sound, object contact, emotional communication and other elements created by 3D animation design, studies the effective integration of 3D animation technology and virtual reality technology, and studies the 3D animation design based on virtual reality technology. The interactive drawback of 3D animation technology creation has important practical significance.

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