Simulation System of Digital Media 3D Art Design Based on Artificial Intelligence

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***Abstract*—With the rapid growth of DM technology, more and more people begin to pay attention to and research this new technology, including 3D art design, virtual reality (VR), etc. This paper proposes a new interactive virtual roaming technology based on the characteristics of digital media(DM) 3D art design. This system is based on 2D animation, and uses C # language to output 3D graphics. First, it analyzes and researches the 3D model, structure and contents contained in each part. Secondly, related concepts and basic principles are described in theory, and then the process and methods of interactive virtual simulation generated based on artificial intelligence algorithm are introduced. Finally, corresponding interactive DM 3D art visual effect systems are designed for different types of data sources, and the model is tested. The test results show that the time for data acquisition, image preprocessing and parameter calculation of the model is about 5s.**

Keywords—artificial intelligence, digital media, 3D art, simulation system

I INTRODUCTION

With the rapid development of computer technology, 3D design has become an indispensable part of digital media. In virtual reality, 3D art design has very strong operability and visualization ability. The growth of DM is very short, but it is very fast and fast in technology [1-2]. It can not only present the image information to users visually intuitively and realistically through 3D images; It can also connect the real world with people; At the same time, it can also enable users to get emotional satisfaction and spiritual needs, and many other advantages are worthy of in-depth study and use. 3D art design is a new emerging discipline, which can enable designers to change from complexity to simplicity, from single to multiple forms and carry out business innovation. At the same time, it can also solve a series of problems such as three-dimensional effects that cannot be expressed in traditional two-dimensional hand-painted works [3-4].

3d art design is an advanced DM technology, it can effectively integrate computer graphics, images and other multimedia information. At present, many scholars at home and abroad have done a lot of research in the field of virtual reality. Some foreign developed countries have already formed a relatively mature 3D modeling system and model making system. For example, the library of famous American artists published an article entitled "DM Technology for Multidisciplinary growth in the Future World" [5-6]. However, the research on 3D art design theory started late in China. Since the 1980s, a lot of exploration and application have been made in computer aided technology, network teaching mode and other aspects. Especially virtual reality technology. The combination of VR humanoid agent and 3D animation has become a trend, and DM 3D modeling has gradually formed a certain architecture to achieve model reconstruction, providing more possibilities for digital art design research [7-8]. Therefore, this paper studies the related algorithms and process analysis system for the creation and interaction process based on multidimensional data platform in DM.

In recent years, DM technology is an advanced means that people need to use and rely on in the new era. In this paper, the problems of interactivity, real-time and visualization in the new VR virtual scene under the current growth trend are analyzed and studied. On this basis, a set of interactive system based on the theory of artificial intelligence and 3D vision is proposed, which has multiple functional modules combined to meet user needs and has high intelligent performance.

II DISCUSSION ON THE SIMULATION SYSTEM OF DM 3D ART DESIGN BASED ON ARTIFICIAL INTELLIGENCE

A. DM 3D Art

3D art design is a new type of DM technology. It uses computer networks to transmit information, which can change the traditional 2D plane graphics to a certain extent, and make it more realistic by adjusting the modeling and structure of 3D space objects. The growth of DM technology provides a good platform for 3D art design, enabling it to better display various virtual reality for users. In this platform, users can use a variety of forms to express the content they need [9-10]. Understand these things from different angles and dimensions. For example, we can learn some abstract and non-intuitive information by watching animated movies. Through watching video or audio information to obtain relevant knowledge, etc., using 3D technology to describe the shape features of objects and other functions has greatly improved the efficiency and accuracy of work. From the perspective of two-dimensional, using computer technology, DM design can transform three-dimensional space into physical form and virtual form, so as to achieve all-round three-dimensional and multi-level description of objects. For example, they have their own unique feelings about different materials, colors or morphological characteristics. However, this design is not only one way, but also includes the novelty and novelty of many forms. It is also one of the platforms of 3D DM system with rich content and expressive force and can be widely accepted by people [11-12]. In the 3D art design of

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digital media, the task to be completed is to combine virtual reality technology with computer aided software, and use the computer screen to replace the traditional visual way to carry out various operations and action information transmission and processing required in the animation production process, using projectors and camera equipment to achieve. This method allows people to see all the information content of 3D art design works anywhere and have more understanding of them, so as to achieve a more realistic and realistic presentation of natural scenes.

B. Visualization in 3D Art Design

The visualization of three-dimensional art design refers to the use of computer software to describe the work in two-dimensional space form through graphics, text and other ways. This technology is widely used in DM. This method is a means to transform a plane image into a stereo vision model and realize the virtual reproduction effect. It can also be called 3D painting or 2D film. It can also provide the audience with a complete and real viewing process from different angles and orientations, such as perspective, distance and other information, and can conduct all-round multi-level perspective and space interactive creation of works. In the virtual reality technology of DM 3D art design, computer images can be used for simulation and calculation, and the acquired image data can be processed. Get objects, points and some figures from the original two-dimensional projection. Perspective plan is to combine the object and background into a whole. The perspective relationship is used to form a three-dimensional geometric image. In 3D modeling, it is necessary to determine the position, posture and other information of the target object for design, and to modify and process it reasonably and effectively. The visualization in 3D Art Design is as shown in Figure 1:

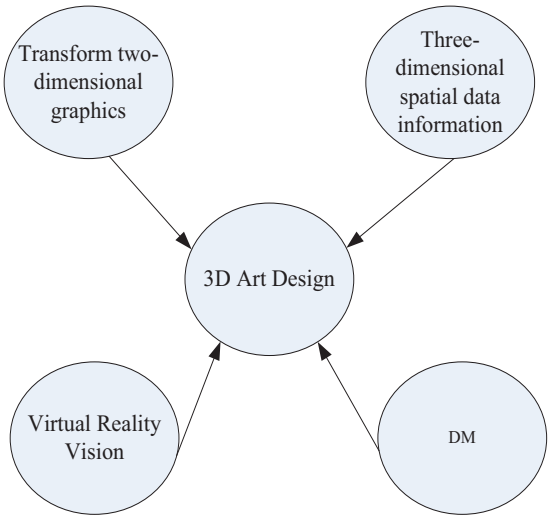

Fig. 1. Visualization in 3D Art Design

In 3D art design of DM, computers are usually used for simulation, but they need to be transmitted and represented by vision. So if we want to accomplish this goal, we must use human-computer interaction system. Virtual reality is a method of using computer software to simulate objects, which can also be said to transform two-dimensional graphics into three-dimensional spatial data information, and achieve real-time control and display functions, so that users can more intuitively feel the connotation and meaning of the works when browsing. In the process of DM 3D art design, we can intuitively display various information through computer graphics, text, animation and other forms. These images can not only facilitate people to understand and use it, but also help designers better provide users with more interactive space. It can also be seen from the visual effect that different kinds of different styles or information with different characteristics are integrated to make people associate and leave traces of imagination. In digital media 3D art design, visualization is the simulation of two-dimensional plane or three-dimensional space through computer graphics technology and virtual interaction. From the visual point of view, it is to use 3D images, images and other means to express what the designer wants. For users, what they need is to be able to intuitively understand what information the designer wants to convey and how they will do to make the right choice. At the same time, it can also display different kinds of renderings of different materials, even other materials. For DM 3D art design, it needs to be expressed through graphics, text and other forms in 3D animation, so that the design becomes more layered and appealing.

C. Artificial Intelligence

Artificial intelligence is an interdisciplinary comprehensive technology. Its research scope involves natural science, social science and other fields, and it has important applications in many aspects. For example, human body language is designed and simulated in the computer humanoid robot system, and various complex actions are completed using human visual recognition principles. As a new technology, artificial intelligence is a new and complex subject. At present, intelligent 3D art design has become one of the mainstream trends of social growth. The use of two-dimensional image processing, digital audio and video and other means in computers to carry out information transmission and interaction is what we call artificial intelligence. Humans can recognize and understand words or sounds by using existing equipment or tools, and can also convert them into more intuitive and specific visual forms. It can also use the human brain to complete some complex tasks that are difficult to describe in words.

We can use some characteristics of artificial intelligence to carry out 3D art design, which is mainly a virtual reality represented by computer software on various forms and contents of DM. Using 3D technology in 3D space can make it complicated, abstract, difficult to understand and difficult to express in language. The automatic control of the machine is realized by imitating biological cells and neural network structures. With the continuous in-depth communication and growth between science, technology and culture, as well as the gradual improvement of the level of intelligence, the research of artificial intelligence has been more and more widely penetrated into various disciplines, and it has been very well applied in social life, scientific research and other fields. In the process of 3D art design, DM technology can realize various complex structures and multi-target collaborative work through interaction of different forms and functional features.

From the perspective of visual communication, the traditional two-dimensional space information transmission is carried out by human beings. Virtual Reality Vision (VR), on the other hand, uses computer networks, multimedia devices and other terminals to complete human-computer

interaction and communication, so as to achieve the purpose of all-round communication and cooperation between people and machines. At the same time, it can also realize interactive scene simulation through 3D technology. Its probability model can be expressed as formula (1):

$$P(x,h) = e^{-Enengpv(s,h)} \tag{1}$$

$$Engergy(x,h) = -b^T x - c^T h - h^T W x \tag{2}$$

Energy (x, h) represents the energy contained in the artificial intelligence model, and x and h represent the variables of visible and hidden layers in artificial intelligence respectively. The definition of artificial intelligence refers to that the human brain analyzes and judges the natural world, so as to draw conclusions and apply them to various fields. In the development of computer technology, we can use some methods to help people understand things. For example, by observing and imitating animals, we can discover their behaviors. But it is still a strange topic for human beings - there are still many problems and confusion when human beings perceive the surrounding environment; Machine learning is a new way of thinking that uses artificial intelligence to simulate and analyze the human brain and then make corresponding processing.

III Experimental Process of Simulation System of DM 3D Art Design Based on Artificial Intelligence

A. Simulation System of DM 3D Art Design Based on Artificial Intelligence

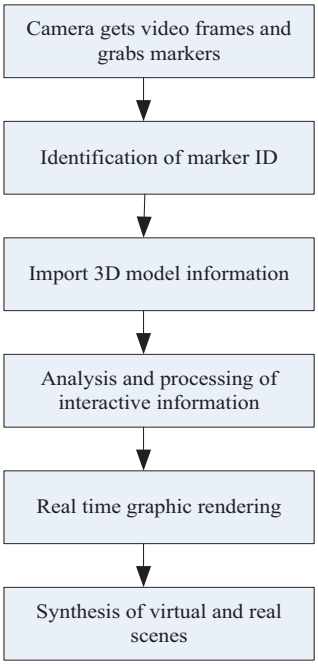

Fig. 2. DM 3Dart design simulation system

In order to solve various limitations in traditional two-dimensional spatial information processing and improve users' ability to understand and use three-dimensional art design works; We need to do multi-dimensional data fusion and interaction to achieve better, more accurate and more efficient task objectives. The DM 3D art design simulation system studied in this paper (as shown in Figure 1) is a combination of several different functional modules. It mainly uses 3D art software to achieve 3D space object modeling, and establishes a virtual scene through a series of methods such as 3D modeling and graphics processing. In this process, a large number of relevant data acquisition, rendering and extraction are required.

Digital media technology is used to realize human-computer interface interaction. Through mutual cooperation between users and computers, users can complete the acquisition and modification of various parameter information of works. Audio data acquisition and analysis processing module, video file editing and downloading management module, 3D animation model making function module, etc. can be tested on different platforms, and can also be directly uploaded to the database from user terminals. It includes data acquisition, image preprocessing and parameter calculation. This function is mainly used to edit user roles. In this interface, you can modify and add the administrator information and other permission settings. In addition, you need to provide the corresponding user name, password, login password and other basic information, so that the administrator can decide whether to delete or change according to the specific situation. This paper takes human-computer interaction interface as the research object. The system adopts a three-layer structure mode. The first layer is the communication between the user and the machine, the second layer is responsible for the interaction interface, and the third layer is the connection of the control terminal equipment.

B. Function Test of Simulation System of DM 3D Art Design Based on Artificial Intelligence

Through the user's three-dimensional space perception, you can analyze what feature information is contained in the data, such as pictures, text and videos. In the interactive digital media design, we mainly use virtual reality technology to complete. This paper tests three different functional modules, which are based on image recognition, 3D space perception and interaction design.

The process of image recognition is mainly divided into two steps: one is to extract the object motion information and convert it into two-dimensional graphics. The second is to complete a DM work according to the extracted data. The specific steps are as follows. A virtual scene model is established in MATLAB software as the basic database, and then different functional modular operation settings are made for the simulation system. Finally, the entire design process and result display effect diagram are realized through the loading engine. According to the final results, further optimize the scheme to achieve three-dimensional art design scheme. In general, the system can meet the needs of users, and also provide users with a better interactive experience.

IV Experimental Analysis of Simulation System of DM 3D Art Design Based on Artificial Intelligence

A. Functional Test Analysis of Simulation System of DM 3D Art Design Based on Artificial Intelligence

In 3D digital art design, the acquisition of test data is very important, which is directly related to the user's experience and evaluation of works. By comparing the visual effect, motion speed and other indicators under different parameters to judge. If a designer can accurately grasp the tactile feeling between virtual reality technology and human-computer interaction, they can better and more easily complete the task; On the contrary, visual fatigue and even psychological problems will occur, which will affect the normal work arrangement. Therefore, we must pay attention to the collection and analysis of test data in the design process. Table I shows the function test data of DM 3D art design simulation system.

TABLE I. Simulation and Simulation System Function Test

Test times	Data acquisition time(s)	Image preprocessing time(s)	Parameter calculation time(s)
1	3	3	4
2	4	2	3
3	3	4	3
4	5	6	5

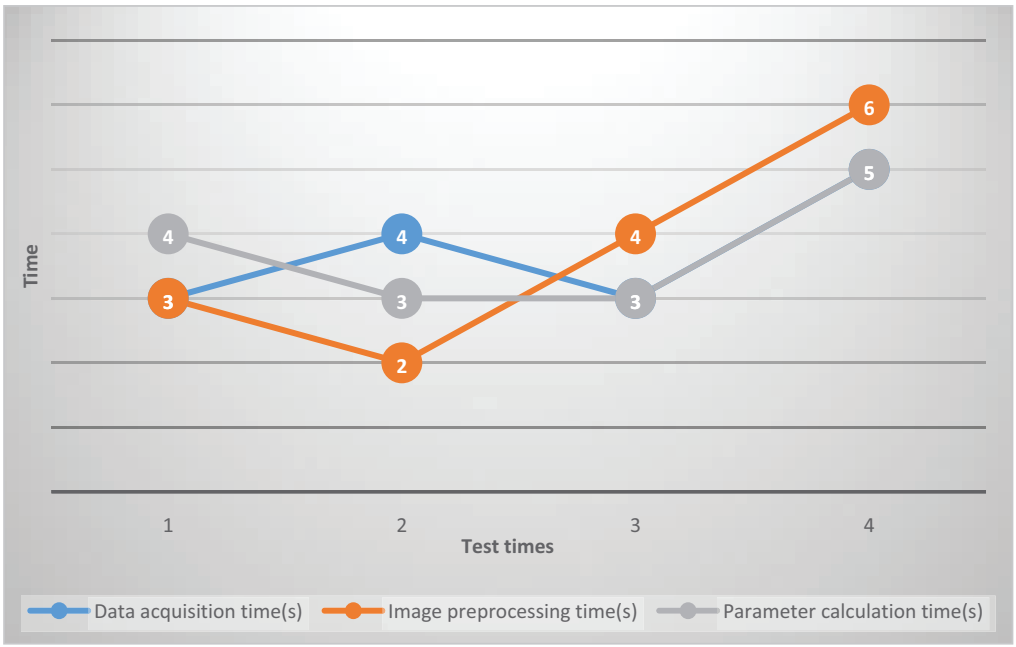

Fig. 3. System performance test

In the simulation process of digital 3D art design, there may be various interference factors in the actual working environment, so it is necessary to ensure that it can successfully complete the simulation experiment. In order to ensure the normal operation of the system and meet the needs of users, repeated cycle tests must be conducted within a certain period of time. The entire virtual reality interactive program is imported into the programming language, and then compiled and optimized by using the tool writing script language. Finally, the output data is processed by the simulation software. It can be seen from Figure 2 that the time for data acquisition, image preprocessing and parameter calculation of the model is about 5s, which indicates that the performance of the model is normal and meets user needs.

V Conclusion

In view of the problems existing in the 3D art design of DM, this paper mainly completes a virtual museum and 3D animation production platform based on artificial intelligence through the research of digital media 3D art design. This system first understands the relationship between the elements in three-dimensional space and between them and other objects or their internal relations as a whole; Secondly, in the process of modeling, parametric processing and kinematics analysis are carried out for each model. Finally, we use computer aided technology to realize virtual museum, 3D animation production platform and other functions, so as to make the whole work more layered, more rich and interesting, and let users experience the amazing and beautiful feeling when they are in it.

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Research Project: Research and Practice on Innovative Application of Digital Twin Production and Integration Between Industry and Education Based on Urban Brain.

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