Research on Environmental Art Design System Based on Virtual Reality Technology

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Abstract. Traditional environmental art geographical environment is described by two-dimensional image, and the environmental information obtained is lack of intuition and interactivity. This paper takes the application of computer virtual reality technology in the construction of environmental art design system as the starting point. According to the three-dimensional virtual reproduction of environmental art, different entity models and terrain models in virtual environment are molded by Creator modeling software. At the same time, the application of computer virtual reality technology in the construction of environmental art design system is simply analyzed.

Keywords: Computer Virtual Reality Technology, Environment Art, 3D

1. Introduction

Virtual reality technology is the product of the development of modern science and technology. Through the intelligent interaction between people and computers, the simulation of real things is realized, and then a near real scene is presented to customers.

With the rapid development of information technology, the development of its technology application has been combined with many fields in the social development of our country. As a kind of modern information technology application and development, virtual reality technology has also realized the overall transformation of its technology application under the application of its development technology. The application of virtual reality technology and modern environment art design is the most direct manifestation of its technology application development. According to the integration of modern environmental art design and virtual reality technology application, the demand relationship between the two technology applications is clear, which is used as the key technology to enhance the ability of modern environmental art design. The application of virtual reality technology in environmental art design can present a more real scene feeling, which is conducive to the improvement of the overall level of environmental art design. In the past environmental art geographical environment analysis process, most of the use of two-dimensional images to describe, lack of a certain intuitive, interactive, the analysis effect is poor. By Creator modeling tools, the 3D
virtual reproduction of environmental art can be carried out by constructing the solid model and terrain model in the 3D virtual environment[1]. Not only can visual display environment art geography environment, but also can carry on interactive operation. Therefore, it is necessary to analyze the application of computer virtual reality technology in the construction of environmental art design system.

2. Space model based on virtual reality technology
In the new period of rapid development of science and technology, virtual reality technology has begun to be widely used and become a new design tool. Compared with the traditional design tools, this new design tool can quickly construct the original model in the process of spatial model construction.

Under the background of the development speed of modern economic construction in our country, more and more attention is paid to the development of modern environmental art design. According to the integration demand of modern environmental art design, the application ability of environmental art design technology should be improved. With the help of the three-dimensional display technology in the application of virtual reality technology, the environmental design work in the whole technology application can be carried out well in practice, which ensures the scientific promotion of the whole technology application. At the same time, according to the model construction and analysis of modern environmental art design in the application of virtual reality technology, it can show the scientific nature of the whole design, which is a very important technical application for the development of modern environmental art design [1]. In addition, under the background of the gradual transformation and upgrading of the development process of modernization urbanization in China, new requirements have been put forward for the development of modern environmental art design. The application of virtual reality technology is a key factor to transform and promote the design of modern environmental art. In the process of building the spatial model, the designer can input the data into the system, and the system can output the spatial model quickly with its super computing and design ability. For example, in the process of space building design, wall design is a difficult point[5]. By introducing virtual reality technology into it, designers only need to accurately define the starting point and end point of the building wall. And input the length and width of each section of the building wall into the system. After the development of wall doors and windows and other devices batch production.

First, we can design the door hole and window hole on one side of the wall, then open the "opening hole" in the system, and determine the starting point and end point of the wall door hole and window hole, so we can complete the batch design and manufacture of the door and window. In the same way, the designer can complete the construction of other types of environment component models by corresponding commands, and only need to start the corresponding command program in this process. On the current development of the actual situation, AutoCAD、3dsMax、Lumion and other 3D of software can achieve the introduction of 3DS、Mesh and other format materials, can be very convenient to home elements, furniture elements, decorative elements and other documents into the system. And then improve the timeliness of environmental art design, cost savings in the design process [2].

3. Three-dimensional reconstruction system for virtual reality technology environment design

3.1. Formation of three-dimensional environmental topography
Creator modeling software is used to shape each entity model and environmental terrain model in the environment.

The software adopts the modeling function module to Terrain the corresponding format *. ded files are modeled independently, the texture and color of the model are processed, and the model of environmental features is constructed. The DFD format of environmental terrain model data is obtained by GeoFeature module [4].
3.2. Processing of environmental design edge data
The elevation data from the two-dimensional electronic environment map is messy, so it is necessary to correct the initial map data and get the grid data of the same area.

The data supplement method is used as distance weighted interpolation method to predict the value of each uncertain point. Through the weighted calculation of the known point value of the nearest neighbor, the value of the uncertain point is obtained, and the weight value is obtained based on the distance. The formula is as follows:

\[ f(x, y) = \frac{\sum_{i=1}^{n} W(d_i)z_i}{\sum_{i=1}^{n} W(d_i)} \]  

(1)

The formula: \( W(d) \) is the weight function; the \( z_i \) represents the number of the known points; the \( d_i \) is the distance between the unknown points and the uncertain points. Table 1 shows some of the data.

| Interrelation | \( z_1 \) | \( z_2 \) | \( z_3 \) | \( z_4 \) |
|---------------|---------|---------|---------|---------|
| \( d_i \), \( W(d) \) | 3       | 9       | 2       | 7       |
| \( W(d) \) | 0.111   | 0.012   | 0.250   | 0.020   |

By collecting the longitude and latitude information of the elevation points of the two-dimensional map, the gridding results are obtained after the Deluanya division of the latitude and longitude, which is described by figure 1, in which the dark color range is the data intensive range and the obvious range of the environmental terrain fluctuation. Three-dimensional triangulation of environmental topography is obtained.

![Figure 1. Three-dimensional triangulation of environmental terrain and process.](image-url)
3.3. Transformation of the world coordinate system
All vertices need to be processed by world coordinate transformation in building environment 3D model with Creator software.

When the geometric center of the model is the origin, the right, upper and lower directions of the model are the X axis, the Y axis and the Z axis, the model in the process of carrying out the transformation of the world, should be the model coordinate system corresponding to the initial value of the implementation of setting the world coordinate system, and to coordinate the model processing services such as translation. Finally to obtain the position of each vertex in the world coordinate system model.

4. Application of computer virtual reality technology in environmental art design system
First, it is necessary to use the Creator modeling tool to model the functional module Terrain, the corresponding format *. ded data for independent modeling.

At the same time, the environmental feature model is processed from the aspects of color and texture. Then the environmental terrain model data in DFD format can be obtained by GeoFeature module processing. Secondly, considering that the elevation data of two-dimensional electronic environment graphics are not systematic, the Creator modeling tool can be used to correct the initial environmental graphics data [3]. After obtaining the grid data of the same area, the distance enhancement interpolation method is used as the main data supplement method to predict and analyze the uncertain data in the grid. The weight is obtained according to the distance, and the value of the known point in the nearest neighbor is weighted.

Finally, the longitude and latitude information of two-dimensional elevation points is Deluanya divided according to the numerical weighted calculation results of known nearest neighbor points. Different colors are used to represent the different data density in the grid, that is, the range of environmental terrain fluctuation. The latitude and longitude information of the elevation points of the two-dimensional map can be gradually completed after obtaining the three-dimensional triangulation map of the environmental terrain. And it can be transformed into the curve fitting data of the DED format supported by the Creator.

5. Conclusion
The space model of environmental art design based on virtual reality technology is built, which is mainly realized by the following four steps:

- Designers need to work out a set of model design plan in advance, at the same time using AutoCAD software to achieve three-dimensional spatial form of plan drawing work;
- Designers need to import the designed 3D spatial map into the SketchUp software for calling, copying and other operations to complete the 3D model framework [5];
- The designer needs to simplify the documents that have been completed modeling, and import the simplified documents into the 3 dsMax. Lumion and other 3 D software tools, and then complete the construction of various material materials, lighting and so on. And make relevant adjustments in combination with the design concept and objectives;
- Combined with the specific requirements and objectives of environmental art design, designers need to adjust the size and material of the object, and then realize the optimization of the effect of environmental art design.

Because the terrain modeling module brought by the Creator modeling software does not have the environment graphics format analysis module, the initially set environment graphics can not form a perfect three-dimensional environment model. During the specific operation, the relevant course teachers can use the Matlab operation software to convert the collected environmental data. At the same time, the converted format of the environment graphics data stored in the BIN folder. Using 3 dem data format conversion tool, the data in BIN folder is processed [6]. It should be noted that in the process of 3D modeling of environmental terrain, the relevant course teachers should make rational use of Creator modeling tools to set up the database of environmental terrain model. In addition to the
basic terrain, geographical attributes and other characteristic data, the relevant course teaching staff also need to use the Creator modeling tools Polymesh module terrain change algorithm. Combined with the terrain information of the initial digital elevation point, the model database in the form of rectangular network is set up.

To sum up, the application of virtual reality technology in environmental art design is the need to improve the efficiency of design and is the need to improve the overall level of environmental art design.

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