Application Research of Virtual Reality Landscape Information Model based on CAD

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Abstract. 3D landscape terrain model can reproduce the real scene of city. All the digital display on the computer in the future, can be used as a navigation and positioning, archaeological research, urban important reference of general analysis, the user can in virtual environment, real-time, dynamic query information, and resources sharing and communication. However, the traditional geographic information system based on two-dimensional spatial data cannot fully reproduce the 3D scene of the scenic spot, so that people cannot have an intuitive and true impression of the overall appearance of the scenic spot. In order to overcome the shortcomings, this paper adopts 3D visual representation of scenic spots, including model construction method, digital ground model and other theoretical research on the basis of 3Dmax modeling method and virtual reality technology to build virtual scenes, and interaction with virtual scenes, can make people have the feeling of being on the scene. Users can recognize scenic spots according to the virtual scene, the use of 3D visualization can play the role of scenic spots indicator, and can provide tourists with the best path tips, realize real-time roaming and interactive control in the 3D virtual environment.

Keywords: Computer aided design; virtual reality; landscape information; modeling; interaction
DOI: https://doi.org/10.14733/cadaps.2023.S1.24-34

1 INTRODUCTION

Virtual reality is a tool to understand and analyze the digital earth, and connects global resources and all kinds of information to build a virtual reality environment with visual sense, tactile sense and auditory sense for everyone, helping people to re-understand and explore our earth. Its core

refers to the use of comprehensive digital information acquisition, storage, transmission and processing technology to control and manipulate global affairs, to achieve sustainable development and daily life services for human beings. In order to further improve the feasibility of landscape, design has laid a solid technical foundation.

3D visualization technology based on computer science, has penetrated into various disciplines, the geography, the resources environment, surveying and mapping science, oceanography, architecture, such as biomedical disciplines can be found in its place, and provides the scientific research on these subjects are extremely useful help, to a certain extent, promote the development of these disciplines. Li and Zhang [1] mentioned that 3D visualization technology, which covers a number of technologies, supports the development of spatial information industry. It has a very wide range of applications in various aspects, such as aviation, aerospace, cultural entertainment, military, medical, geological exploration, artistic modeling, education, etc. The development of 3D visualization technology has brought us more surprises, which is of great significance to the research of 3D visualization. Therefore, in view of the current scenic spots propaganda often use TV, newspaper and other forms, these ways cannot fully show the characteristics of scenic spots, research scenic spot simulation application has important practical significance. Guerriero et al. [2] mentioned that the application of virtual reality, digital exhibition and digital film can help real estate enterprises and project companies to show the real estate, the display of space. With the support of such technology, the application of 3D space effect display technology in the field of landscape design will be more and more extensive. Virtual landscape is the differentiation and integration of human thinking and dreams, and is the description and portrait of human thoughts and ideas. Different from the cold modern style and science and technology style in our impression, virtual landscape is the shadow of dream and life, exuding warmth and real emotion. The powerful advantages and unlimited development prospects of virtual landscape can only be reflected through its extensive and in-depth application.

Workers to provide high quality reference for landscape design, the virtual reality technology is applied to landscape design work, realize the user interactions with the design scheme, design scheme is the feeling of the user more intuitive, more quickly find out the deficiency in the design, to avoid the late construction problems, but also make both parties better communication each other's opinions. In this paper, 3D visualization of scenic spots is adopted, and virtual reality technology is applied to construct virtual scenes. Virtual visualization of scenic spots is designed and realized to achieve the purpose of simulating real scenic spots. The visual application of scenic spots based on virtual reality technology is a part of digital city, which is the digital reproduction and analysis of real scenic spots and all related information. Through the 3D visualization of the scenic spot and the interaction with the virtual scene, people can have the feeling of being on the scene. Users can know scenic spots according to the virtual scene, tourists arrive at the destination under the traditional plane plan instructions, the use of 3D visualization can also play the role of scenic spot indicators, and can provide tourists with the best path tips. This paper aims to discuss the architecture, principles, methods and some core technical issues of virtual scenic spot visualization application system, and establish a platform for the construction of virtual scenic spot. The generation of this interactive platform will break the original 2D landscape renderings display mode, so that users can multi-angle, comprehensive, unconstrained view of landscape design.

2 THEORETICAL BASIS OF SYSTEM RELATED TECHNOLOGY

2.1 3D Modeling Technology and Visualization

3D digital and modeling are also building floor plans and then extending them to 3D graphics, allowing people to experience real scenes in order to understand phenomena, discover patterns and disseminate knowledge. At the same time, other software cannot catch up with AutoCAD in 3D model modeling ability and accuracy, and its modeling is relatively complex, just because it

requires high precision. 3DMax has sufficient ground object models and map templates, which can make efficient and intuitive models. However, it also has disadvantages, such as poor interactivity and low accuracy. Wang [3] mentioned that AutoCAD combined with 3DMax to model the structure, the steps include: field data collection, can be total station digital mapping, or RTK mapping; Then the collected data is imported into the software, and the function of the software is used to create the model and generate the architectural wireframes. Secondly, the collection and processing of texture, and Posting; Finally, the overall output process of the model will be established, and the processed photos will be pasted on the building in the form of texture map, and then the actual effect map can be achieved by using texture coordinate correction. In the world of 3D graphics, people can directly operate the physical information and communicate directly with the computer, which is the 3D visualization technology. To a large extent, the development of 3D visualization is promoted by the development of computer graphics. 3D visualization is the basis of 3D visualization map, and the basis of 3D spatial analysis.

2.2 Geographic Information Systems

Geographic Information System (GIS) is a new frontier science integrating computer science, geography, surveying, mapping and remote sensing, environmental science, urban science, space science and management science. Shan and Sun [4] mentioned that it has the functions of spatial data acquisition, storage, display, editing, processing, analysis, output and application, etc. From the perspective of system science, it has certain structure and function, and is a complete system. To put it simply, it is a real-time technology of global spatial analysis based on surveying and mapping, using database as data storage and use data source, and taking computer programming as platform. The basic functions of GIS system include data collection and editing, data storage and organization, graphic and interactive display, spatial analysis and so on.

3D geographic information system (3DGIS) is a basic function of 3Dvisualization, storage, input, editing, management, 3Dobject, or operational analysis on them or the output, as long as it is in the building, maintenance, and use at any stage of the 3D geographic information system, will be involved in the object's 3D modeling and 3D visualization expression. Esposito et al. [5] mentioned that a new development direction of 3D is to combine 3D visualization with 3D space object to form integrated system. Since 3D data itself can be reduced to 2D, 3D can naturally contain the spatial analysis function of 2D.

Modeling is the key to 3D visualization. Modeling and terrain scene simulation is a key link of scenic spot visualization system. To complete the construction of the virtual scene , the first step is to make 3D modeling of the real objects in the scene. The virtual scene roaming system is realized on the basis of 3D model construction. It transforms the abstract data into image, and transforms the abstract data that is difficult to be understood into the visual data that is easy for people to understand, and directly affects the management, query and spatial analysis of the data. Therefore, from the perspective of the discipline, the 3D modeling of landscape is an indispensable part of the development of the scenic spot geographic information system.

2.3 Virtual Reality Technology

Virtual reality (VR) is a computer hardware, software, sensor, artificial intelligence, psychology, and the crystallization of the development of geographical science, is a man and by computer generated virtual environment can be natural interactive man-machine interface, is the use of computer and implemented a series of sensor ancillary facilities can make the person feel in real in the real-world environment, it's a simulated environment that looks real. In essence, virtual reality is an advanced computer user interface. In order to maximize the convenience of users' operation, virtual reality provides all kinds of intuitive real-time perceptual interaction means such as sight, hearing and touch to users at the same time, so as to improve users' work efficiency. A complete virtual reality system is shown in Figure 1.

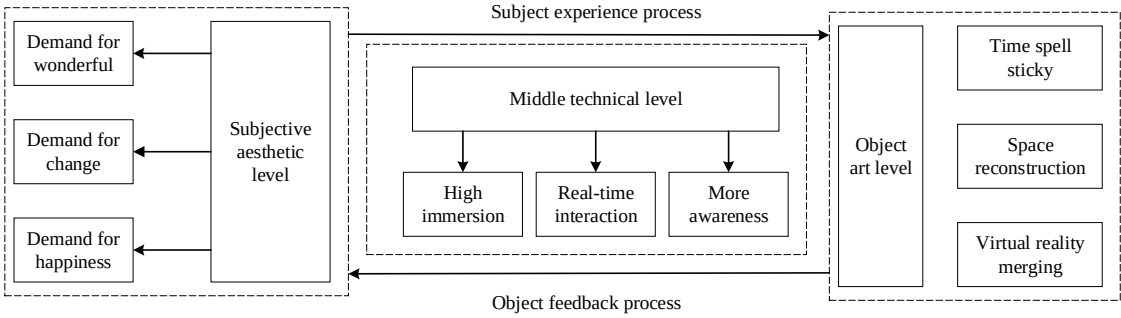

Figure 1: Virtual reality implementation diagram.

According to different functions, virtual reality system can be divided into the following two types:

Immersion is a complex and powerful system. To interact with the virtual world, users must wear sensing tracking devices such as headsets, data gloves, or a special coat in an enclosed space mounted on a sports platform to create a more realistic environmental effect. These devices isolate the user's vision and hearing from the outside world, so that they can fully immerse themselves in virtual reality without external interference, but the system equipment is expensive and difficult to popularize.

The immersion system can be divided into helmet type, hole type and remote viewing type. The desktop simple system takes the computer screen as the window for users to observe the virtual environment. The disadvantage of this system is that the sense of immersion is not strong. When users sit in front of the monitor to observe the virtual realm, they will be interfered by the surrounding real environment.

Visual simulation is divided into plane visualization and 3D visualization simulation two categories, 3D visualization simulation is divided into visual simulation and operation application simulation two categories, visual simulation is the most important form of virtual reality technology. Lei et al. [6] mentioned that it uses computer image technology to build the model required by the environment and establish an interactive simulation environment to achieve the effect comparable to the real environment, so that users can have a realistic feeling as if they are in it, and then realize the interaction between people and the virtual environment. Virtual reality is a big category including simulation technology, and 3D simulation system is a subset of virtual reality. 3D simulation technology belongs to the category of virtual reality, which simulates reality and gives priority to performance.

Good human-computer interaction ability and realistic environment is the system can provide to everyone, and the acquisition of spatial information, processing and has an amazing ability, the two fields in the research content and methods, theory, technology has become the focus of further integration and field experts and scholars. In more and more research and practice, people gradually realize that the combination of and system can effectively solve some practical problems, and this research field was born [7]. As a means of integration of a variety of technologies, the integration technology will not only provide technical support for the in-depth combination of the two systems , but also provide effective help for their application, which is beyond doubt.

3 SYSTEM STRUCTURE DESIGN

This system in view of the tourism scenic tour mode, in the places in all kinds of information such as buildings, plant information, road information, the classification of the scenic spots such as effective management, and through the interactive query, the user can query to the interested in

scenic spots and attribute information of the object, a general understanding of the landscape of the scenic spot [8].

3.1 System Requirement Analysis

Considering the performance of the system itself and future expansion, a good system must meet the following requirements:

(1) The system must be open and extensible.

(2) The system must be object-oriented and reusable.

(3) It has convenient modeling tools.

Based on the above analysis, we need to solve the following problems:

(1) Modeling methods: We have introduced several major modeling methods and their advantages and disadvantages before. In order to achieve real-time interaction, we choose geometric modeling from the perspective of users' needs.

(2) Modeling tools: 3Dmax, Creator, Auto CAD and other software are used to make 3D models.

(3) Simulation tools: this paper selects professional rendering software environment, which is widely used in real-time visual simulation, sound simulation, virtual reality and other fields.

(4) Application mode: In order to popularize more users and achieve effective publicity of the scenic spot, the scenic spot simulation application is published on the network.

On this basis, design and build the scenic spot simulation environment, give full play to its function, via the Internet or other carrier, will appear tourism landscape in front of people, people cannot leave home and travel to travel around the world, according to his own will, can, immersive appreciate any view, this is the virtual tour, it can greatly promote the development of the tourism destination, enhance the understanding of tourist sources, attract tourist sources.

3.2 System Function Analysis

The overall goal of the system is to establish a 3D visual virtual scene of the scenic spot, to provide users with an interactive, simple visual effect, more convenient, more intuitive browsing scenic spot [9]. The users of this application system are all the public, who are characterized by different levels and may not have any professional knowledge of virtual reality or geographic information system. So, the purpose of using the system is very clear and simple. The specific functions are as follows:

(1) Users can roam freely in the created virtual scene. The system allows users to conduct degree roaming, so that users can observe the effect of the whole virtual scene and enjoy the scenery in the scenic spot through 3D virtual reality.

(2) Strong sense of reality. This can also be said to be the minimum requirements of a simulation scenic area system, only in this way can truly reflect the landscape of the scenic area, as if in it, so that the user is fully integrated into the scene.

(3) Real-time interactive performance. In this way, users can be integrated into the scene, for example, users can make relevant queries, such as scenic spots, service facilities, etc. Through the introduction of virtual scenic spots, users can have a detailed understanding of all aspects of the scenic spots to roam in advance, which is a good application for optimizing travel routes, tourism management and planning.

The system structure is shown in Figure 2. At present, the work of this paper is mainly in modeling, scene creation, scene driving and roaming, and other parts such as integration with, spatial analysis and network release will be further studied in the next stage [10].

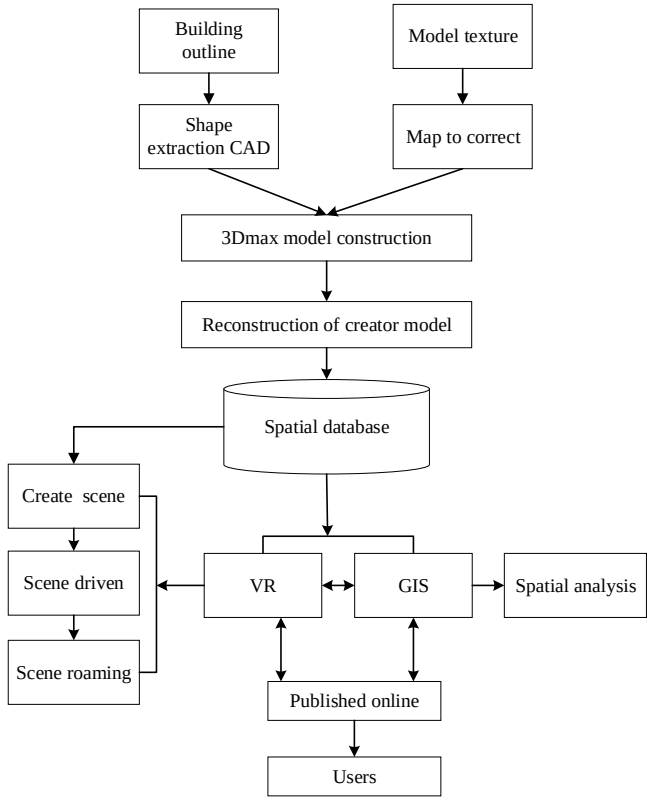

Figure 2: System structure design.

4 DESIGN AND IMPLEMENTATION OF LANDSCAPE VIRTUAL REALITY SYSTEM

Scenic spot virtual reality system creates 3D virtual scene according to the real scenic spot, realizes roaming scene through interactive or automatic way, and can query scene according to query conditions. Scenic spot virtual reality system consists of scene creation, scene configuration, scene roaming and scene query. Scene creation used to create scenes, generate files scene files. Scenario configuration obtain the model information in the ACF file and configure the scenario to create a scenario that meets the simulation requirements. Scene roaming provides interactive and automatic tour to appreciate scenic spots in the virtual scene. Scene query information about certain scenic spots in the virtual scene based on related query conditions.

This system sets up two kinds of roaming mode interactive and automatic. Users of the former use relevant knowledge and experience to operate the mouse and keyboard of interactive devices, and then manipulate the observer to locate in the virtual scene, which is flexible in use and highlights real-time and interactive. In the latter, the system sets a fixed route, and then the observer browses the scene according to the fixed route set. Scenario query refers to querying basic information about a model based on the name in a scenario and displaying the query result to users. To do this, create a data table to store the model information in the scenario, which can be created by creating a database or database. In order to achieve real-time effect, LOD technology is widely used in the modeling process. It is not enough to use this technology alone, so the VP application uses worker threads to achieve better real-time rendering effect. The landscape design scheme comparison drawing is shown in Figure 3.

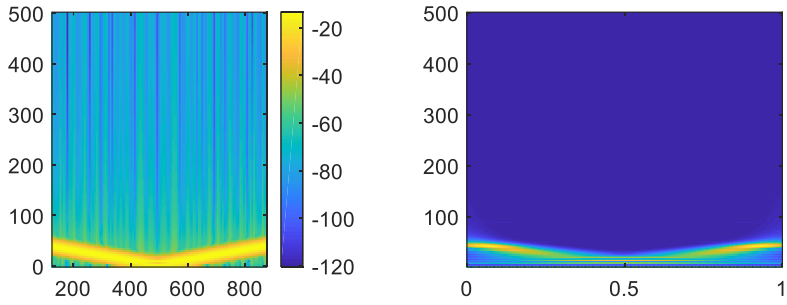

Figure 3: Landscape design scheme comparison diagram.

In order to facilitate the use of users, to achieve the purpose of simple and friendly, the system interface design for the left part of the function menu bar, in the middle of the main window 3D display window, the right corner of the eagle eye window 2D display window. The system provides two basic real-time browsing operations, including scene roaming, automatic roaming, and path roaming. Operation tour includes scene rotation, translation, view distance adjustment, landscape height adjustment and scene scaling, etc. Users can directly use the corresponding operation keys to complete the 3D scene tour. Automatic roaming uses the system's internal roaming mode for roaming. The operation mode of path roaming is to directly click the roaming path on the navigator with the mouse, and the system will automatically roam along the path. The central landscape diagram is shown in Figure 4.

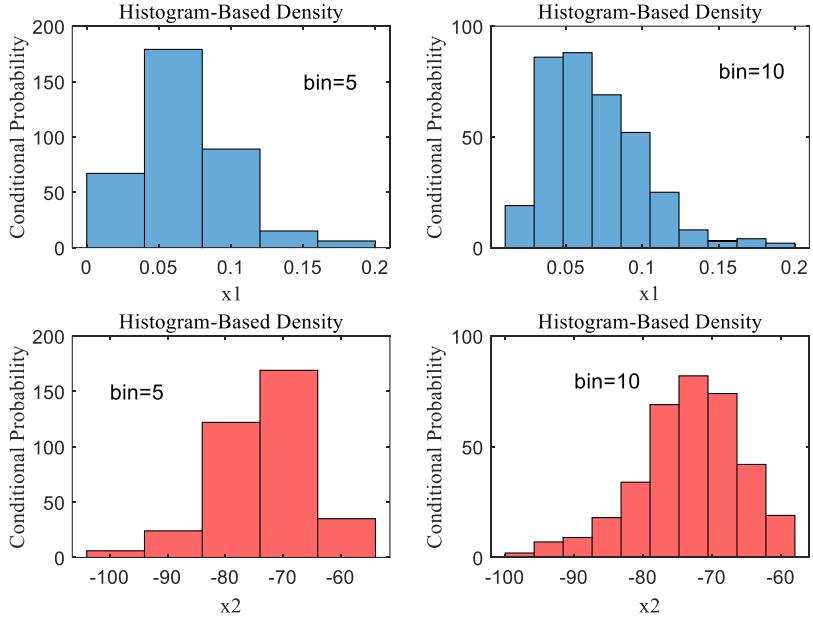

Figure 4: Central landscape diagram.

The function menu bar of the main window is placed on the left side of the main window, and there are buttons for bird's eye view, show, roam, query, analyze and exit. The display object of the main window and the hawk-eye window is synchronized to refresh. The main window presents the

3D effect observed by the current user, and the Hawk-eye window presents the 2D plan corresponding to the 3D position. The terrace grass slope effect diagram is shown in Figure 5.

Bird's eye view: according to the current mouse position, from far to near, from near to far, and so on, according to the mouse automatic traction flight.

Display: Including zoom in, zoom out and pan on the map.

Roaming: This system sets two roaming modes interactive and automatic.

Query: Queries the basic information about the object based on the model name and displays the query result to users.

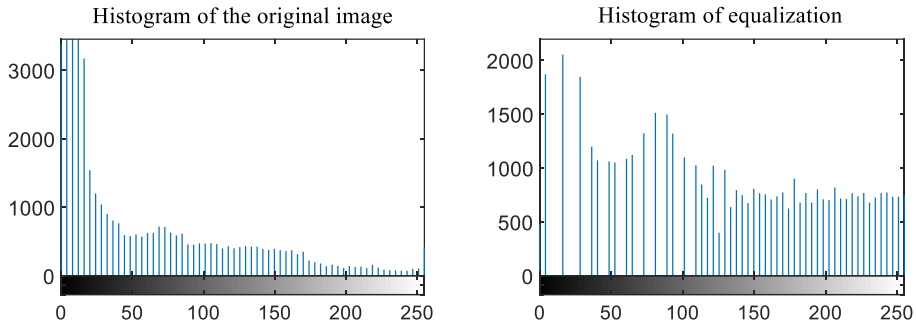

Figure 5: Terrace grass slope effect diagram.

According to the spatial data accuracy of geographic information system, the resolution of source spread detection is determined. According to the accuracy of pixel's elevation value and the inter-value of grid, the appropriate threshold is selected as the condition to judge pixel's attribution, which is called source point spread detection resolution. Obviously, the calculation accuracy of the submerged area is affected by such factors as the size of contour distance of topographic map, digital acquisition accuracy, elevation accuracy of digital ground model and the size of passing network interval, pixel detection resolution and so on. Among them, the elevation accuracy of the digital ground model and the size of grid interval have the most significant influence on the calculation results of the submerged area, so both errors will be reflected in the horizontal displacement of the boundary of the submerged area. The view of the main entrance is shown in Figure 6.

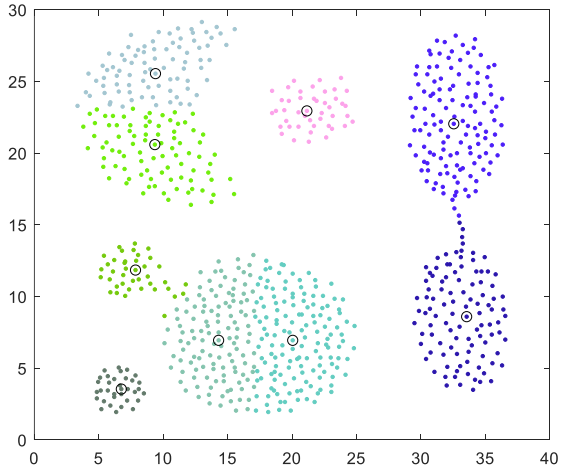

Figure 6: View of the main entrance.

Through the visibility analysis module, the visibility of a room in a building can be intuitively evaluated to determine whether it has a good view without shelter, which is of great significance for the evaluation of planning schemes. If after the completion of a building in the view of itself or other building caused the bad influence, so the planning scheme is obviously not reasonable, and in the process of traditional planning approval from drawings can't be a dynamic observation on constructing the visibility of the buildings, so the result of examination and approval may bring a certain risk, but also easy to cause disputes in hindsight, cause unnecessary losses. With the aid of visual analysis, it can be seen at a glance, thus preventing it from happening before it happens. The full rendering of the landscape design is shown in Figure 7.

Figure 7: Full rendering of the landscape design.

5 CONCLUSION

Virtual reality is a kind of advanced human-computer interaction technology which simulates human's behavior of seeing, hearing and moving in natural environment most effectively. It is the product of the rapid development and integration. In essence, virtual reality is an advanced computer user interface, through the computer to establish a simulation model of digital environment, transform data into images, sound and touch feeling, use a variety of sensing device user input to the environment, a user can 'handle' as in the real-world virtual object generated by the computer system. The introduction of virtual reality will make it more attractive. The visualization technology in virtual reality can simulate and reconstruct realistic and operable geographical 3D entities. The success of the research in this paper can enable users to remotely watch the project through the network platform and improve the efficiency of project negotiation and use; can also reduce the scheduling costs of designers and related personnel, reduce costs; it can also introduce users into the virtual reality environment for increased interactivity. 3D modeling, visualization and spatial analysis are the essential steps of virtual geographic information system. This paper focuses on modeling and visualization:

(1) Through the introduction of geographic information system, visualization technology, virtual reality and related technologies, the meaning and characteristics of virtual reality

geographic information system are studied, and the necessity of research on 3D visualization system is proved.

(2) The 3D visualization technology of landscape based on virtual reality studied in this paper is based on the combination of 3Dmax and MultiGen Creator to conduct 3D simulation of the scene model in virtual scenic spots, and then realize the roaming of virtual scenes.

(3) The process of 3D visualization is discussed, and the modeling technology, texture mapping and model optimization methods in the process of 3D landscape visualization based on virtual reality are studied.

Based on the continuous progress of modern science and technology, virtual reality technology is bound to have a qualitative leap in the next few years, which has been proved by the endless virtual reality software in recent years. At present, many researchers have introduced virtual tour technology with interactive nature into the design field. It can be seen that in the future development, it will gradually become a new technology to appear in daily work. The continuous development of digital technology and the continuous improvement of the computer hardware technology, and the introduction of a large number of scientific research talents, I believe that under the wave of the digital revolution, we will usher in an interactive virtual scene roaming and landscape scenes of the digital age, I will continue to improve myself in the applications of interactive landscape roaming to research in the field of landscape design, and continue to explore new areas of research, Apply virtual reality technology to a wider range of fields.

(1) It can only realize some basic functions of virtual reality geographic information system, such as roaming, display, bird's eye view and simple query. The next step should focus on the realization of two-dimensional functions and 3D space analysis for further development. And integrated application research, make full use of GIS spatial data processing and analysis technology, make up for the shortcomings of virtual reality technology, enhance the spatial analysis function of 3D landscape information. Integrating GIS and VR technology to establish a unified application platform is of great practical significance.

(2) The texture effect is not ideal. Due to the limited conditions, this paper mainly adopts the texture data of computer simulation, so there is a certain gap with the real world, the tone of texture and poor contrast processing, make the scene distorted in observation.

(3) Without sound effect, there should be various sounds in the scenic spot , in fact, every action will have sound. If the sound effect can be timely coordinated, it will make the system and reality more realistic.

(4) Due to the short time, insufficient knowledge reserve and limited ability, it is not possible to publish the simulation scenic spots on the Internet at present, and further research should be made on this basis.

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