Research on Innovation of Urban Planning System Based on Virtual Reality Technology

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Abstract: With the rapid development and expansion of urbanization, the use of traditional two-dimensional GIS data technology, drawing design and other urban planning can not meet the requirements of urban design and planning. Virtual reality technology is a kind of computer technology which can create and experience virtual world. Using this technology, we can provide better perceptual knowledge for urban planning and design. Innovating the concept of planning, developing and utilizing virtual reality technology will play a great role in promoting China's economic construction and cultural development. The three-dimensional modeling technology and virtual reality technology of professional objects realize the automatic three-dimensional modeling of planned and designed objects in the process of two-dimensional design and real-time virtual rendering of three-dimensional design scenes. Building a realistic 3D environment with high-performance computers allows the experiencer to immerse themselves in the virtual world and interact with the object in different ways in the virtual environment. The key technologies and current problems of web-based multi-user, roaming and visual 3D virtual cities are pointed out, and the application trends of virtual reality technology in urban planning and design are pointed out.

1. Introduction

Urban planning plays an important role in urban development. It is closely related to urban development strategy, urban regional function and human living environment, and has a great impact on people's learning, life and work [1]. In the process of planning and design, it is not only necessary to link up with the relevant functional departments such as surveying and mapping, municipal administration, water, electricity and gas, but also to consider how to meet the needs of the upper-level planning such as general planning, Sub-planning and regulatory planning [2]. Virtual reality technology is a comprehensive technology that integrates multiple technical achievements. The virtual city created by virtual reality technology not only truly reproduces the real city but also surpasses the real city. It has the dual characteristics of virtualization and intelligence, and provides a very convenient research platform for researchers [3]. The renovation of the old city is a problem faced by many cities. Virtual reality technology can use the hardware operation panel to carry out intelligent interaction and calculation between human and machine, thus giving the audience an immersive virtual experience [4]. It uses computer technology and the latest sensing devices to simulate a completely new environment. The user interacts with and interacts with objects in the virtual environment in a natural way with the necessary equipment. The essence is that in the process of urban development, in order to maintain a good public environment and order, the overall consideration of the various elements of the living space, design and processing, to meet the will of future space arrangements. And through a variety of sensing devices to enable users to invest in the environment, in order to achieve direct interaction between the user and the environment [5].

Urban planning is a very complex process, which involves multi-specialty, multi-type of work, huge investment, irreversible and other characteristics [6]. The traditional technical characteristics are easy to cause waste of resources, loose links in all links and so on. Researchers can truly simulate the impact of construction activities on the spatial form of history and culture, and identify potential problems as soon as possible, so as to avoid the irreversible destructive activities that may occur in actual construction [7]. To improve the living environment of human settlements, so that

the layout of the city is more reasonable and the city is more beautiful. Planning decision makers, planners and the public play different roles in urban planning. Effective cooperation is the prerequisite to ensure the ultimate success of urban planning [8]. A simpler object model can be used to increase the display speed. The choice of the model in real-time display depends on the importance of the object, and the importance of the object is determined by various factors such as the area occupied by the object in the image space. Although the renderings can represent the visual effects of normal viewpoints, they only provide a partial and static visual experience. The combination of display and sensor technology can bring real and immersive viewing experience to users [9]. For example: using visual sensors, auditory sensors, and tactile sensors. The stereoscopic effect is not as strong as the model computer animation, but it does not have real-time interactivity. The person is a passive observer, and the subtle changes in the observation route change and the modification of the program details must be recalculated. By using virtual reality technology to display the planning and design results, the visual and visual effects that are difficult to achieve by traditional design methods can be achieved, which can be directed to the public as a propaganda need; and the program can be announced to the public [10].

2. Materials and Methods

Urban planning can be divided into general planning, zoning planning, detailed planning and special planning. For the modeling of 3D virtual graphics, real geographic information and urban building data should be input into the modeling software to complete the three-dimensional virtual simulation of the city. It has two forms of immersion and non-immersion, three-dimensional display, data gloves, stereo headphones, high-performance computers and graphics workstations and other special equipment, so that operators can get real stereo experience, and can interact and operate with the virtual world naturally. It can not only experience the effect of urban planning in advance, but also help designers adjust the design scheme dynamically. Based on the above characteristics, virtual reality technology can assist all aspects of urban planning and construction, and play a cost-saving and efficiency-enhancing role.Real-time interaction, truly see the effect of planning innovation, better grasp the shape of the city and understand the design intent of the planner, so that the decision-maker's macro decision-making will become an integral part of urban planning. In the planning process, it is necessary to consider whether the buildings and the surrounding environment are harmonious and harmonious. Only from the overall planning to the architectural design, the future environment is visualized in various stages. The same hardware architecture for graph generation and various effective techniques for accelerating in the generation of virtual reality's realistic graphics are also key. The characteristics of virtual reality technology are shown in Table 1 and Figure 1.

Table 1 Characteristics of Virtual Reality Technology

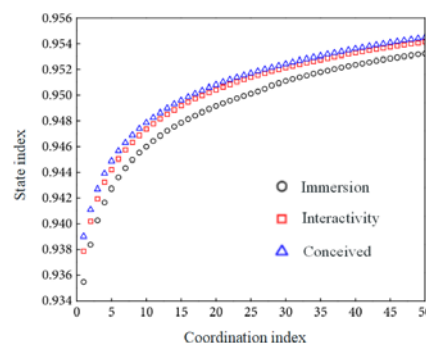|	Coordinate	State
Immersion	16.94	20.35
Interactivity	15.17	19.73
Conceived	15.02	16.77

Figure 1 Characteristics of Virtual Reality Technology.

Compared with the traditional two-dimensional digital map, the three-dimensional urban model incorporates spatial data infrastructure so that it can cover the whole city. Because of the combination of reality and reality, we use on-site photography to obtain surface texture for the current urban landscape. After art treatment, we use texture to simulate the status quo very vividly. On the basis of creating a good virtual scene, add the interactive function between users and scenes, so that visitors can more truly integrate into the virtual scene, to achieve the overall design requirements of "people-oriented". In the planning and design stage, road design mainly plays a controlling role, such as road red line control, road plate type, road elevation control, etc. Users can realize some functions by controlling the virtual characters in the scene. To complete the simulation of object texture information. For other small components in the city, the project is depicted before and after the project is completed, so that the imperfect parts of the design are discovered, repeatedly modified, and then according to the modified parameters of virtual reality, until the expected effect is achieved in virtual reality, available in 3DMAX software. Extrusion, turning, and lofting operations, and simulation of objects through textures or rendering. Using virtual reality technology, three-dimensional simulation of urban traffic, urban geographic structure, and underground pipeline network can be completed. It is possible to observe the influence of the design scheme on the existing buildings around the building, such as whether the color of the facade of the building is coordinated with the surrounding area, whether the height of the building affects the lighting of the surrounding buildings, etc. and during the roaming process, various design schemes can also be realized. Real-time switching comparison of various environmental effects.

The urban planning is not only limited to the layout planning and design of urban roads and architectural forms, but also can use the data of population density and air quality to guide and analyze the rationality of urban planning. The two-dimensional effect maps and distribution maps are mainly generated here. Geometric model files stored in virtual environments can provide accurate information. Shape is composed of polygon, triangle and fixed point, including house, tree, car and so on. Appearance is the surface texture, color, shadow and illumination coefficient of the object. At the same time, for each discrete point, it is necessary to collect elevation from the vertical curve of the road, and then discrete the lane sidelines according to the discrete breaks of the central line to generate a consistent number of discrete points. An immersive, all-encompassing look at future planned buildings or urban areas with dynamic interaction: buildings can be viewed from any distance, angle and level of detail. can choose from a variety of sports modes, such as walking, flying, etc. and you can freely control the route you browse. The quality of the innovative planning scheme and the impact on the surrounding environment after the completion of the construction plan directly affect the decision-making of decision-makers. However, it is difficult for traditional technologies to simulate and simulate the effects of the surrounding environment after the project is completed. In the design process of each module of urban planning, it is not only necessary to construct a visual simulation environment that conforms to the actual space, but also to match the existing urban design scheme. It is necessary to collect the drawings of the buildings, the floor structure, and the precise data at the coordinates of the buildings, which will help to grasp the whole picture of the whole city.

3. Result Analysis and Discussion

The level of detail changes the level of detail of the model through pilot switching, thus improving the display speed. The most essential feature of this technology is that it does not change the visual effect of the picture. Under the limitation of hardware rendering capability, on the one hand, it is necessary to explore the functions of various software and optimize the combination. On the other hand, more advanced and efficient algorithms need to be developed. For ordinary producers, creating real scenes is mainly to make full use of various existing software tools. Inline nodes in the three-dimensional simulation platform can fuse various scenes in urban residential areas, thus realizing instant preview and roaming of users in different scenes. The query of spatial information can be realized. When the user roams in the scene, any building can be selected from the database to find the corresponding textual introduction, including the building number, the date

of completion, the architectural features, and the use. In order to change the current centralized urban planning and design innovation, the ideas of multidisciplinary experts, government decision-makers and the general public are fully absorbed, and the enthusiasm of all parties is widely mobilized.

Visual analysis can be used to visualize the data obtained from the analysis and calculation, and the analysis results can be expressed graphically, which makes the analysis results easier for people (especially non-professionals) to understand. The system can vividly and vividly display the urban environment and natural and cultural features. Visitors can visit the city according to the established route and walk around freely in the scene. When they encounter objects, they will develop collision sensing. Extension plug-in renders space scene to achieve a more realistic effect. Usually, urban residents are divided into small space scenes to complete the rendering of each scene in turn. Designers can modify the control elements of the design scheme, as long as the parameters of the virtual reality application system are changed, and the modification effect of the design scheme can be viewed at any time. For example, the height of the building can be changed to meet the control height requirements of the building. In each render loop, traverse renders each object and its children. In the system, the virtual environment 1:1 simulation reality environment, customers can immerse into the system and enjoy the future living environment. Through a certain combination of methods, to achieve fast drawing, real-time rendering effect; develop the corresponding client browser plug-in, read the scene data from the server, generate corresponding scenes on the client, thereby increasing the drawing speed and so on.

After completing the three-dimensional spatial modeling of urban residential areas, it is necessary to import the virtual space scene into the visual interactive platform to realize the real-time interaction between users and computers. Real three-dimensional graphics bring new experience to users'senses, and make the operation of virtual city system intuitive, simple and convenient. It is a necessary exploration of virtual reality system from display function to practical function to realize fast interactive spatial information query in complex three-dimensional scenes. You can also observe the image of the bridge from any point of view, any angle, or even drive through the bridge to get the feeling after the completion of similar bridges. The structural design scheme can also be displayed intuitively and vividly by means of three-dimensional modeling.Architectural 3D renderings can only provide static local visual experience; although 3D animation has strong dynamic 3D expressiveness, but does not have real-time interactive, people only passively observe along the established route. When encountering a complex scene database, the external reference technology and its convenient organization and management of the entire scene, which saves the system's space memory, also improves the rendering speed.

4. Conclusion

This paper studies the innovation of urban planning system based on virtual reality technology. In the process of urban planning and design, collaborative urban planning and design system and related technologies are applied to enable urban planning and design to interact in a three-dimensional virtual environment. In the process of design, virtual reality technology is guided to realize the real simulation design ability, which meets the technical needs of planners and designers in an all-round way, and has a good application prospect. The physical model of the proposed building in the virtual world is obtained, and then the building is placed according to the real three-dimensional position, taking into account the contour of the surrounding terrain, together with architectural details. The design and adjustment of the virtual 3D scene, and finally modify and optimize the module parameters of different buildings. And some of the landmark buildings are introduced with the way of real-life pictures, so that users have a more realistic understanding of the building and enhance the interaction with the surrounding environment during the roaming process. With the further development and improvement of virtual reality technology and further integration with GIS technology, it is believed that virtual reality technology will play a more important role in urban planning in the near future. Virtual human-computer interaction and roaming will become the mainstream trend of urban planning in the future.

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