

The Application and Prospect of Virtual Reality Technology in the Future Architecture Design

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Abstract: the rapid development of computer technology has accelerated the progress of construction technology, and the application of virtual reality technology has become more and more common, which has caused earth-shaking changes in the thinking and mode of traditional architectural design. It plays an important role in optimizing the construction design scheme and improving the science and rationality of the architectural design. In order to realize the effective application of virtual technology in the future architectural design, it is necessary to intensify the research on its application and give full play to its application value and advantages. This paper discusses and analyzes the application and realization of virtual reality technology in the future architectural design, and predicts its future application prospects.

Keywords: Virtual reality technology; Future architecture; Architectural design; Application; Prospect

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1. Introduction

The integration of virtual reality technology and architecture is a historic innovation for the development of the construction industry. It can present the architectural design scheme in a three-dimensional form and make up for many defects in the traditional design model. The use of virtual reality technology can not only improve the efficiency and design quality of architectural design, but also reduce the workload of designers and reduce the appearance of design irrationality, and can effectively ensure the scientific nature and feasibility of architectural design solutions. In addition, It can also reduce the cost of building design and bring more considerable economic benefits to construction enterprises. It can be seen that it is very important and necessary to increase the research on the application of virtual reality technology in architectural design and apply it effectively.^[1]

2. A Brief Introduction to Virtual Reality Technology

Virtual Reality(VR) refers to providing users with a simulated reality operating environment, using computers to generate a realistic three-dimensional vision, hearing, and tactile perception of the world, so that people can obtain their own experience of the object and environment stud-

ied. The feeling, thus, the breadth and depth of human cognition will be enhanced, and the "understanding space" and "method space" of human understanding of the objective world will be widened, and finally the essence of the objective world will be reflected more fundamentally. The nature of virtual reality technology is a new type of computer technology. It has strong integration and comprehensive characteristics and covers many technologies such as computer graphics, simulation, artificial intelligence, sensing, display, and network processing. It can achieve effective fusion of vision, hearing, and feeling, and present the real situation with a realistic three-dimensional virtual situation. People and the virtual environment can interact well, and then optimize and perfect the deficiencies in the design plan. Make the real product more consistent with people's various sensory experiences. Virtual reality technology uses different angles, and its human-computer interface interaction process is also different. From the user's point of view, virtual reality technology allows it to enter directly into virtual reality and observe the steps of interactive operations. The observation method is mainly called by the first person, and the hidden interface will only appear when used. From the perspective of monitors, users can monitor the reality of virtual reality in a third-person manner and monitor and control virtual objects in the environment. However, the interface generation has no absolute relationship with the type of virtual

reality. Based on the many advantages embodied in virtual reality technology, it has been widely used in many industries and fields and is an inevitable development trend of future architectural design.

3. The Application and Prospect of Virtual Reality Technology in the Future Architecture Design

In the future architectural design, virtual reality technology will become an indispensable and important technical means; its specific application is mainly reflected in the following aspects.

3.1 Application and Prospect in Animation Display

With the help of virtual reality technology, it is possible to present architectural effects maps in a more comprehensive and detailed manner, making various architectural information at a glance. At the same time, it can also present architectural design intuitively and three-dimensional in the form of three-dimensional models. Supplementary information, in addition, it is also possible to use VR equipment to transform the architectural effect map into a virtual architectural space structure, give people a sense of real space experience, and deepen the understanding and control of architectural design details. Taking terrain design, landscape planning, road layout, etc. as an example, virtual reality technology can be used to construct a three-dimensional architectural model, which is convenient to examine the architectural design scheme from any one angle, and find out the shortcomings to improve and optimize it. At the same time, the user can watch the virtual reality animation, master the final effect of the architectural design, propose amendments to the unsatisfactory areas, and communicate with the designer to improve the science and operability of the architectural design. In addition, it can make up for the defects in the plane display diagram, and show the architectural structure in a three-dimensional and intuitive form. The problems in the design will also be revealed. The adjustment and optimization of the design plan will become more convenient. It can significantly improve the level of architectural design.

3.2 Application and Prospect in Program Comparison

For architectural design, it is not only the only design plan. When the design idea is different, the design plan given is also different. This makes the same construction project often have multiple design ideas. Therefore, it is necessary to determine the most suitable one through the comparative analysis of multiple design schemes and the

actual construction requirements in order to maximize the architectural design and construction benefits. The comparison and analysis method of the original architectural design scheme is relatively backward and the efficiency is low. Using the virtual reality model technology, the construction of the architectural model can present different design schemes. The adjustment of the model by computer software can realize the real-time switching between multiple design schemes. Designers can compare the advantages and disadvantages of different design schemes by observing the changes of a certain position or component of the model, and select the most suitable design scheme based on the final comparison results. In this way, not only can the efficiency of comparison and analysis of architectural design schemes be improved, but also the optimization and improvement of design schemes have become more convenient. The status before and after the modification of architectural design can be compared in real time, providing there are the best design solutions for construction projects to ensure building quality.

3.3 Application and Prospect in Construction

There are many factors affecting the construction. In the actual construction process, it is often necessary to adjust the construction plan to ensure the smooth progress of the construction. However, this will easily cause delays in the construction period and reduce the construction efficiency. At the same time, it will also increase the construction cost due to rework problems.. In this regard, virtual reality technology can be used to simulate the construction process, find out the possible problems in the construction process and make adjustments, and avoid adjusting the construction plan in the construction process as much as possible. The specific operation is to demonstrate the construction operation in accordance with the construction plan and the construction organization plan before the formal construction is carried out. The defects and shortcomings are found to be optimized, and targeted preventive measures and emergency measures are taken to reduce the impact of construction problems as much as possible. And make a rapid response after the problem occurs, control the harm caused by it to a minimum, and provide guarantees for the smooth and orderly construction. It can be seen that virtual reality technology also has a high application value in the construction process, and plays an important role in improving construction accuracy and construction efficiency, and can significantly improve the actual construction quality and construction level.

3.4 Application and Prospect in Real Estate Sales

Real estate sale is also an important aspect of virtual reality technology applied to architectural design. For ar-

chitectural design, the ultimate goal is to obtain customer recognition and achieve more ideal sales results by improving customer satisfaction. In order to seize the sales market, pre-sale has become the most important means of real estate sales, especially high-end construction projects. In order to bring customers a more realistic architectural experience before the completion of the project, the construction company will make it easier to sneak a peek. Usually use virtual reality technology to display the entire picture of real estate, including the appearance of real estate, landscape gardens, sample rooms, so that users can objectively and truly understand the specific situation of real estate, get a good home purchase experience, and improve users' recognition of real estate. As shown in Figure 1, the prototype room is presented using VR technology. In this way, after the formal opening of the stock market, the real estate can be quickly cleared and help the building developers to correct and better their sales performance. For construction developers, who can master advanced technology, the effective application of virtual technology science to real estate sales, who can occupy the initiative and advantages in the sales link.



Figure 1. VR Sample Room

3.5 Application and Prospect in Building Renovation

Interior decoration design is also an important branch in the field of architecture, but there is a large space for improvement in the current level of architectural decoration design, and it is difficult to achieve a more ideal decoration effect. In addition, the renovation design workload is large, and large errors often appear in the cost and budget link. Based on this, it is necessary to use virtual reality technology to simulate the decoration process. Relying on the three-dimensional model, the expected decoration effect will be presented. According to the shortcomings, it will be improved and adjusted to improve the decoration design level. At the same time, it can also reduce the in-

tensity of the renovation staff and make a more accurate budget and control of the renovation costs.

4. Implementation of Virtual Reality Technology in Future Architectural Design

In order to realize the effective application of virtual technology in the future architectural design, we should consider three aspects: three-dimensional scene, hardware system and software system construction, so as to better serve the architectural design and fully demonstrate the power of advanced technology.

4.1 Construction of a Three-dimensional Virtual Environment Space

The construction of three-dimensional virtual environment space is the core and key to the application of virtual technology in future architectural design. It can provide basic guarantees for the follow-up work. This requires the collection of various types of building information, including floor plans, facades, and profiles. Then all the information is presented in the three-dimensional model. The construction of a three-dimensional architectural model is usually done using 3D Studio MAX software. The establishment of the model is first completed using geometric and two-dimensional graphics using editing commands to create a precise image scale architectural model, including characters, plants, and landscapes. Then edit the attributes of the architectural model, such as color, shade, bump, reflection, and transparency, and create animations by setting objects, cameras, light sources, and paths, changing the light source and camera position, and performing simulation drills in animation to simulate real visual effects.

4.2 Construction of Virtual Reality Hardware Systems

The effective application of virtual reality technology in the future architectural design needs corresponding hardware system as the foundation support to build a virtual reality system. Under normal circumstances, if the requirements for real virtual systems are low, the hardware system configuration is relatively simple. It only needs input and output functions to achieve good human-computer interaction. However, if the virtual reality system requires higher functions and truly embodies its various technical features such as visualization, interactivity, and immersion, it needs to use more specialized hardware equipment to complete the construction of the hardware system. Information input equipment and information output equipment are the main hardware devices that make up the virtual reality system. Keyboards, mice, etc. belong to input

devices, display adapters, impact instruments, polarizers, stereoscopic glasses, etc., all belong to the more common professional output equipment. With the help of sensing devices, users can present their behavior in the real world by mapping in the virtual environment. The realization of this process requires user incarnation to complete. This is also the key point of the virtual reality technology interaction function. When the user makes specific actions in the real world, the azimuth tracker in the virtual reality system will use its own measurement function to collect user behavior and map it in the virtual environment in the form of user incarnation. Then in the virtual environment, using the geometric collision detection algorithm, combined with the force feedback technology of the sensor, the measurement information of the virtual environment can be fed back to the user in real time, and then the interaction between the real scene and the virtual environment can be realized. In this way, users can not only experience a more realistic visual experience in the virtual environment, but also can obtain feedback effects from the tactile aspect, which can ensure the scientific and rational nature of the architectural design scheme, and facilitate the control and optimization of the design scheme., It has significantly improved the level and quality of architectural design.

4.3 Construction of a Virtual Reality Software System

For future architectural design, when applying virtual reality technology, the most important thing is to build a virtual three-dimensional scene based on the design plan and follow the objective law as the basic principle, and then create a feeling of being in the field. It truly embodies the characteristics of virtual reality technology and brings into play its application value and advantages in architectural design. The establishment of a three-dimensional model of architecture needs to be achieved with the help of professional software. It is not only necessary to be able to truly express the objective world of architecture, environmental layout, and indoor space, but also to color, darkness, and material. Improve the fidelity of the model. This requires the assistance of related software to complete the construction of a three-dimensional model of the building in three steps, including geometric modeling, image modeling, and behavior modeling. It mainly completes the establishment of geometric configurations, the editing of attributes such as model materials, colors, and so on. The motion and behavior description of geometric modeling is the basis for constructing a three-dimensional visual architectural model. It mainly refers to the geometric transformations of objects in three-dimensional space such as convergence, intersection, difference, and rotation,

translation, and scaling, resulting in the more complex three-dimensional model that the designer hopes to obtain. The process of, 3DSMAX, AUTOCAD, SKECHUP, REVIT, etc., are all widely used 3D modeling software at this stage. By performing operations such as parallel, intersection, and difference on simple geometric objects, they are translated, rotated, and scaled. The composition forms a complex geometry that presents a complete picture of the building project. Moreover, these modeling software have the characteristics of interactivity. When the basic geometry of the three-dimensional architecture model is a triangular surface, the introduction and exchange of three-dimensional architecture models are unrestricted. In addition, the more the number of vertebral bodies and the smaller the volume, the more sophisticated the architectural model will be. Its fidelity will be significantly improved, but the amount of software computing will also increase, and its computational efficiency will be reduced. Therefore, in the application of virtual reality software, according to the architectural design requirements, the mesh density of three-dimensional model should be controlled, and the efficiency of software operation should be improved as much as possible on the basis of ensuring the fidelity of the model.

5. Conclusion

The design of construction projects is highly specialized, the entire design process is complex, the overall cost is high, and it has irreversible characteristics. Once there are design mistakes or mistakes, it will cause greater losses and serious impacts, and the effective application of virtual reality technology. Such problems can be avoided. By applying it to architectural animation display, scheme comparison, construction, real estate sales and other aspects, it can significantly improve the efficiency, design level and design quality of the architectural design, and ensure the scientific and operability of the architectural design scheme to the greatest extent. Moreover, with the continuous deepening of research, virtual reality technology also has good application prospects in the mechanical design and decoration design of buildings, and plays an important role in promoting the development of the construction industry.

References

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