The development and application of BIM and virtual reality technology in the field of architectural design in the information age

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Abstract: With the continuous development of modern information systems and computer network technology, digital building technology and virtual reality technology have emerged. In the field of architectural design, BIM technology and virtual reality technology have changed the traditional architectural design methods. They can effectively improve the efficiency of architectural design and the overall effect of architectural design. The article aims to provide a reference for the sustainable development of my country's architectural design through the elaboration of the status quo of the development of digital building technology and virtual reality technology in the field of architectural design, the analysis of its advantages in the field of architecture, and the discussion of its application in the field of architectural design.

1. Introduction
Multimedia is an important modern technology, and the economic model, thinking model and lifestyle of the information society also involve the field of architecture. Traditional architectural design expression methods generally can only show a single angle and path (such as two-dimensional visual effects and three-dimensional models), which will cause the lack of expression of architectural design information and the incomplete information feedback to the owner, which leads to the architect Deviations from the owner’s understanding has caused the inequality between the design plan and the final construction result. With the continuous development of modern information technology and biotechnology, traditional buildings also have better preservation methods in the development of modern technology and social progress. No longer limited to the load-bearing model of traditional buildings, breaking through the limitations of conventional load-bearing models is an advancement in the development of architectural forms.

2. About building information modelling and virtual reality technology

2.1. BIM philosophy
The building information model simulates a building, which actually contains all the information of the whole building. In a sense, BIM is not just a software, a technology, but a new working method and design method, from the planning, design, construction, operation and demolition of the construction project during the construction and management process. Digitization. The drawings are not just simple lines, but cover all the real information of the building components. For example, the representation of a wall in a traditional CAD drawing is two lines. In the BIM model, you can view the
size and thickness of the wall and basic materials, wall decoration materials and engineering costs. All
digital information constitutes the model component.

2.2. Virtual reality technology
Virtual reality technology refers to the use of modern methods with computers as the core to generate
three-dimensional, non-static images. It can be created by itself and is a computer simulation system.
Designers can use the information and functions of computers to create an immersive virtual
environment that includes human sight, hearing, smell and even touch and taste, and simulate the real
world to form a diverse three-dimensional space. Users can interact with the created objects in the
virtual world in real life, and use equipment capable of information transmission and feedback to make
a natural and lifelike space. And VR technology can respond to the needs of users to meet the
environment required by customers.

2.3. Basic characteristics of virtual reality technology
Immersion, also known as the sense of presence, refers to the degree of realness that the user exists in
the virtual environment established by the computer in a natural way, which is the main feature of
virtual reality technology. Everything in this environment from sight, hearing, touch and other
sensations seems to be real, making people feel as if they are in the natural environment. The computer
system creates a realistic three-dimensional dynamic image, and the users are exposed to the virtual
world through professional information interaction equipment.

Interactivity refers to a real-time operation performed by users on objects created in the virtual
environment. For example, the user can pick up, move, or place items in the virtual environment
through the handle or feel the weight of the item; switch lights, walk and replace materials in the
virtual scene. This three-dimensional interaction is richer and more intuitive than two dimensions.

Imagination is due to the reality of the virtual environment and the real-time interactive state of
users, resulting in richer imagination. It is a necessary condition for getting a sense of presence.
Through physical and psychological feelings in the virtual environment, people understand and
actively explore information, deepen their initial cognition and generate new ideas and ideas, thereby
enhancing the imagination of participants.

3. BIM and the development of virtual reality technology
BIM technology originated in the United States. Later, Japan also began to implement BIM. Under the
influence of my country's information technology development, BIM Technology was introduced into
China's construction industry in 2003, and various BIM training courses and architectural design
competitions that encourage the use of BIM technology modelling began to appear in China. Universities and design institutes have also begun to set up their own BIM design centers.

Computer graphics began to be used in architectural design in 1963. However, in the 1990s,
architectural design was still dominated by hand-painting, with the development of computer network
technology, 3D modelling gradually replaced the traditional hand-painting method and became the
mainstream in the field of architectural design. The field of architectural design has experienced from
manual drawing of traditional plane drawings to computer drawing; from two-dimensional computer
drawing to three-dimensional modeling; from three-dimensional modeling to digital model
three-dimensional modeling (BIM). In the practice of construction engineering, the powerful
computing power of computers has helped people and greatly improved engineering efficiency.

4. Advantages of building information model and virtual reality technology in the field of
architectural design
Compared with the traditional two-dimensional CAD design method, BIM+VR has a powerful
synergy and integration capabilities. Traditional CAD design can only do planar design and has weak
coordination capabilities, only two-dimensional line drawing, while BIM can perform
three-dimensional component layout. The visual building information model can be rendered and
roamed to demonstrate the project from planning to completion and operation in advance, so as to find the missing points in the design process, communicate and understand before construction, ensure construction safety, and improve construction quality. In the integrated BIM system, drawings can be stored in a three-digit mode, and each department can directly view the construction process, progress and quality, so that they can cooperate efficiently and have clear rights and responsibilities. From the perspective of Party A, the components in the construction process can be made according to the needs of customers, and customized to meet the needs of different customers. However, the current domestic BIM collaborative design is mainly used from the beginning of the construction stage after the completion of the design to the operation management stage after the end due to the imperfect software system. However, with the continuous advancement of the information age, simple architectural functions and shapes are increasingly unable to meet the ever-increasing requirements of the public. At this time, only the designer’s spatial imagination and logical ability to think about vast and complex scenes are correct. The designer’s requirements are too high and reduce efficiency. At this time, it is much more convenient and faster to express the output scene by linking with VR technology.

From the initial design of the building plan to the final effect display, users can roam freely in the realistic virtual environment created by VR, and experience the four seasons of the realistic green plants in the site; feel the impact of wind, rain, snow and sunlight on the building in the natural environment; Experience the spatial scale and lighting atmosphere of the building, have a sense of touch to feel the material of the furniture, the comfort to the human body, etc. It can also obtain BIM coverage and reflect data information such as size, material cost, etc. Designers can mark the unsatisfactory parts of the customer's experience in real time, and designers can receive information feedback at any time, so as to make improvements based on the information feedback. It is not only a convenient tool for designers, but also a suitable product experience device for Party A.

5. Application of BIM and virtual reality technology in the field of architectural design

5.1. Building model construction
The building information model realizes the transformation of the measured object from a two-dimensional drawing to a three-dimensional model, and can be used to show the entire product life cycle of the building, including the construction process and the operation process. Moreover, the building information model is not necessarily limited to a certain link. It can be applied to the entire life cycle of the construction project. His data is not a static state, but a dynamic update, and it is a constant supplement. the process of. The data is constantly updated, and at the same time, the model also changes in real time according to the constantly updated data.

5.2. Display the overall information of the building.
In the process of architectural design, the traditional two-dimensional plane and cannot fully present the overall information of the building, and BIM technology can truly understand some relevant data of the building, including building height, building quality, and building structure. The design can present the real building with strong authenticity in front of people, so that people can clearly see the overall model of the building, so that the designer and the experiencer can achieve more accurate communication, The designer can receive the experiencer in real time. The ideas and concepts of the company can be improved to meet the different needs of different users.

5.3. New architectural expression
The traditional way of architectural expression is based on manual hand-drawn drawings. The three-dimensional image of the building is projected into a two-dimensional flat line figure and drawn on the drawing. The content of the drawing includes the plan, elevation, and cross-sectional views of each layer. As well as showing a fixed-angle axonometric view and a bird's-eye view of the rendered effect. To display the architectural form and space. However, in this case, Party A may use the
expression effect of the drawings as the final plan choice, causing some designers to blindly pursue the expression effect of the drawings and ignore the three-dimensional space experience of the building. The final result does not match the drawing effect. After entering the information age, virtual reality technology has brought a new way of expression to architectural design. The presence experience lowers the threshold for customers’ perception of space experience. Designers can receive customer experience feedback in real time, making it possible to It can meet the individual needs of customers at any time, and it can also incorporate materials and details into the experience at the beginning of the design, which enhances the efficiency of communication and saves the cost of changing drawings back and forth.

5.4. Interactive optimization design
Interactive design is the transmission and feedback of information. The design of the building must coordinate with the city, place, culture and history. Clients can actively obtain the information content expressed by the building, such as the arrangement of functions, the feeling of the atmosphere, and the spiritual connotation expressed by the building, and then feedback the information to the designer. The architect passes effective comparative analysis and refers to the design requirements of the client from multiple parties. Afterwards, timely and effective adjustment of relevant data, and systematic modification of specific parts, through virtual reality technology to compare the modified program with the previous program, so as to further meet the objective needs of customers. The client can participate in the planning and design of the building, determine the spatial scale of the building, use materials, and the architect can then adjust his design, thus forming an interactive process.

6. Conclusions
In the future, the way of architectural design will change with technological changes. Traditional design ideas will better guide design due to the emergence of new methods and the development of new technologies. Because with the continuous improvement and development of BIM and virtual reality technology, the integrity of future architects’ design results can also be greatly improved. Not only in the architectural expression, but also in the architectural design itself. It can also help designers improve the overall design efficiency and promote communication between designers and users, thereby helping designers improve their architectural design plans and make the design meet the needs of users. Although BIM and virtual reality technology still have shortcomings, as they continue to improve, it is hoped that they can be more widely used in future architectural design.

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