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Research on Dynamic Visual Simulation of Hydropower Project Construction Based on Virtual Reality

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Abstract:In this paper, the basic theories and algorithms of virtual reality technology are studied, and the key technologies for drawing outdoor large-scale virtual scenes, realistic terrain simulation, virtual sound field simulation, and traffic layout in the construction site, three-dimensional road design, and dam construction simulation Visualization has been studied, and the system simulation information and graphics are closely combined to provide a new environment for the design and management of water conservancy and hydropower projects, and to provide decision-makers with a more scientific and intuitive basis.

Keywords: Dynamic Visual, Hydropower Project, Virtual Reality, Visual Simulationd

1. INTRODUCTION

Our country's machinery and equipment are mainly used in various industrial fields, engineers always hope to reduce the construction cost and shorten the construction period under the premise of ensuring the quality of construction. Usually, with the help of the knowledge and experience of experts and engineering technicians, the mathematical model and the knowledge model are combined well, and simulation is carried out for optimization. o mechanical design and manufacturing are usually called industrial machinery, and various types of technical equipment are continuously delivered to various industries to promote the rapid development of my country's industry. [1-6].

Mechanical automation technology was first developed and applied in the mass production process of mechanical manufacturing cold working in the 1920s, and after the 1960s, it was adapted to the needs and changes of the market. Mechanical automation refers to the use of automation technology in the mechanical manufacturing process to make the production and processing process more continuous, continuous improvement and optimization to form an automatic production process. Automation technology cannot be limited to the simple repetitive actions of machinery. It should set relevant programs from the source to make machinery intelligent. When problems occur in the system, it can self-diagnose and maintain. However, only the combination of mathematical model and knowledge model cannot directly reflect the characteristics of the object, and cannot fully display the cognitive ability and subjective initiative of engineers. Technology is a kind of emerging engineering technology in the field of information science. It is an interdisciplinary development adjust the operation according to the actual situation to accurately complete the task., sensor technology and multimedia technology, network communication, object-oriented technology and intelligent decision support system [7-12].

At present, corresponding results have been achieved in applications in navigation, flight simulation, military training simulation, entertainment industry, and medical treatment. How to apply the existing advanced scientific and technological concepts for hydropower engineering scientific research is a question that all scientific and technological workers think about. In China, the research on dynamic visualization The purpose of mechanical design and manufacturing and its automation design is to meet last century, and many universities and scientific research institutions including Wuhan University, Tianjin University and Zhejiang University have done in-depth research and discussion. Due to the complexity of the construction scene itself and the construction process, how to realize the combination of graphics and water conservancy and hydropower engineering simulation calculation theory has not been completely resolved. Based on the unique advantages of virtual reality in visualization, this article introduces it into the the functional requirements of mechanical equipment, so that it can play its role in industry or engineering, showing virtual construction scenes with a sense of reality, dynamic and intuitive display of changes in construction process conditions, in order to improve the design and management level, and explore new Management, design methods and theories, re-examine the construction management of the project, and completely get rid of the limitations brought by traditional management methods and ideas. form a high-quality, high-efficiency mechanical equipment system is complex, the scale of construction is large, the external environment is changeable, and the cost is huge. Therefore, repeated demonstrations and sufficient investigations are important tasks for the construction of the project. During the construction process, the scientific rationality of various schemes is continuously analyzed comprehensively. So as to form innovative or new programs [13-16].

Through intuitive and accurate evaluation and analysis of several different schemes, the design scheme suitable for local conditions is finally selected, which is not only a major scientific issue of shortening the engineering cycle and improving the level of design management, but also meeting the urgent requirements of rational design of construction organization. Based on this, this article introduces virtual reality technology (Virtual Reality, referred to as VR) to provide a new environment for t and fundamentally improve the economic benefits of industry or engineering, so as to explore new management methods and theories, re-examine the construction management of the project, and completely get rid of traditional management limitations brought by methods and ideas [17-21].

2. THE PROPOSED METHODOLOGY

2.1 The Virtual Reality

The original design of any mechanical equipment is to meet people's needs, and different products will have their core performance due to different needs. For example, the central performance of a crane is lifting and emergency rescue. When people apply automation technology in the machinery manufacturing industry, they must fully consider the core needs of users, and reflect product information and functions to meet people's different needs. There are certain differences between mechanical design and manufacturing and its automation and other mechanical manufacturing theories, which require continuous innovation and improvement on the basis of intelligence, automation and information technology to ensure the maximization of mechanical equipment production and manufacturing benefits. Machine automation is the combination of products by means of rational mechanical functional measures. From planning, to performance debugging and final production, a mechanical automation system is gradually formed, and the mechanical design process needs to meet the functional requirements of the machine. Manual operation often has the shortcomings of low precision and difficult quality control, which is very disadvantageous to production efficiency and product quality.

2.2 The Construction Dynamics of Hydropower Projects

The general layout Mechanical automation must improve the accuracy of the equipment is an important link in the design of construction organization. Its design is wider and its influencing factors are also more complicated. Especially in order to solve some uncertain things in the layout process, it is possible to lay out safe, reliable, economical and reasonable construction facilities that are suitable for production organization and management with the help of the knowledge and experience of experts and engineering technicians. Based on this feature, some it can run stably and continuously, which can liberate the operators from the complicated assembly line work site evaluation, optimization and layout of major temporary facilities, they have discussed theoretically and methodically, and put forward the procedures, procedures, and layout of facilities layout. The method of project evaluation and the corresponding mathematical model.

Based on the achievements of the predecessors, we introduced technology and adopted an object-oriented method to model each building entity to make it have a realistic geometric shape. At the same time, we can closely contact the physical concept and functional requirements of the design, and reflect the operation brought in time. Response, and provide corresponding program evaluation. In this way, designers can operate the space entities in a natural way, and carry out the spatial arrangement of large-scale temporary facilities and major auxiliary enterprises according to different design requirements. The simulation of the actual system operating status over time is the numerical calculation of visual simulation. The basic characteristics and output parameters of the simulated system are determined through statistics and observation of the simulation operation process, and the actual performance and parameters of the actual system are inferred and estimated. According to the characteristics of state continuity, it can be divided into discrete and continuous systems. The state change of each construction object at a time point is the focus of the simulation calculation of the water conservancy and hydropower construction system, such as the cumulative amount of completed square meters, service objects, machinery, elevation, etc. As time changes, these variables show jump-like discontinuous changes.

2.3 The Dynamic Visualization Of Hydropower Project Construction Based On Virtual Reality

Nevertheless, technology-based visualization has its unique charm and market prospects for cartography. The general layout of construction is an important part of the design of construction organization. It involves a wide range of areas and complex influencing factors. Large-scale water conservancy and hydropower projects are generally located in mountainous areas, with complex terrain and relatively large undulations. There are usually complex high-, medium-, and low-line traffic roads or tunnels. It is difficult to reflect the impact of topography on the layout of buildings in a two-dimensional environment. These factors can be fully considered in the construction simulation VR system. The space position parameters of the material yard, living housing, mixing building, parking lot and other still life can be edited through operations such as zooming, translation, and rotation; On the basis of the transportation node, the feasible area is divided into connected network nodes, considering the balance of earth and stone excavation and filling, cost, and linear quality (including exercise safety and comfort indicators), combined with material allocation and transportation, the route cost model is established according to quantitative evaluation indicators, and dynamic The planning method is optimized. The parameters of the transportation road need to be designed according to the current address and topographic characteristics in accordance with the basic requirements of transportation, and determine its slope, width, foundation thickness, etc.

The interior of the construction site of a large-scale water conservancy and hydropower project can generally be divided into the following main areas, the main project construction area, auxiliary enterprise area, warehouse, station yard, transfer station, wharf and other storage and transportation center construction management, and main construction section area, building material mining area, electromechanical, metal Structure and large-scale construction machinery and equipment installation site engineering spoil storage area living and welfare area. The construction areas are not completely separated in layout. They are connected with each other in construction, production technology and layout, and sometimes interspersed with each other to form a unified, flexible scheduling and convenient operation.

3. CONCLUSION

In this paper, an object-oriented method is used to develop a virtual scene simulation system for hydraulic and hydropower engineering construction. The graphics are extremely expressive, easy to operate, and have good scalability. It can be widely used in the general layout of water conservancy and hydropower projects and various dam construction simulation dynamics. The visualization helps decision-makers quickly and intuitively grasp the construction status and improve the management level. On the premise of classifying the virtual scene model objects of hydropower projects, the modeling techniques are studied respectively.

4. REFERENCES

[1]Wang Chang. Research on application of visual simulation technology in construction closure of water conservancy and hydropower projects[J]. Groundwater, 2020, v.42; No.202(01):238-240.

[2] Cheng Guoyi, Liu Zhongzheng. Research on dynamic visual simulation of bridge construction based on secondary development of Navisworks[J]. Inner Mongolia Highway and Transportation, 2019, 000(003): 8-12, 38.

[3] Zeng Peng. Visual simulation technology and its application in water conservancy and hydropower engineering [J]. Commodity and Quality, 2019, 000(021): 86.

[4] Lin Yijiang. Research and Application of Hydropower Plant Simulation System Based on Virtual Reality——Taking Zhejiang Tongji Vocational College of Science and Technology as an Example[J]. Modern Vocational Education, 2019, No.161(23):222-224.

[5] Li Yifan, Wang Dekuan, Zhang Qiaohui, etc. A hydropower plant simulation training system and method based on virtual reality technology:, CN110491232A[P]. 2019.

[6] Zhang Junjie, Cheng Naiwei. Research on 3D Simulation Method of Toxic Gas Leakage and Diffusion Based on Virtual Reality[J]. 2021(2013-19):216-217.

[7] Wang Xiaoling, Ou Liwen, Ren Bingyu, et al. Dynamic visual simulation of water diversion tunnel construction based on CATIA[J]. Journal of Hydraulic Engineering, 2018, 49(003): 369-378.

[8] Xian Wei. Research on the application of BIM technology in visual simulation of water conservancy and hydropower engineering[J]. Urban Architecture, 2019, 016(030):149-150.

[9] Su Mo. Research and Application of Key Technologies of 3D Visualization Service Platform [D]. University of Chinese Academy of Sciences (Shenyang Institute of Computing Technology, Chinese Academy of Sciences), 2019.

[10] Xia Xia Ci. Application research on virtual reality visualization of washing machine assembly and drop test [D]. Anhui University of Engineering, 2019.

[11] Zou Yongxin, Chen Xiaoying. Research on Visual Modeling of Scene Design Based on Virtual Reality Technology[J]. Modern Electronic Technology, 2021, v.44; No.576(01):91-95.

[12] Zhou Qiqi. Wind power simulation system based on virtual reality technology [D]. North China Electric Power University, 2019.

[13] Yuan Mengqi. Interactive architectural animation application research based on virtual reality technology[J]. 2021(2020-1):60-62.

[14] Sheng Jing. Distributed visual analysis system of ship navigation based on VR technology[J]. Ship Science and Technology, 2020, v.42(06):41-43.

[15] Zhang Dejian, Jiao Zhigang, Wang Luobing. Drive and implementation of 3D projectile model based on virtual reality platform[J]. Chinese Journal of Ordnance Equipment Engineering, 2018, 000(003): P.89-91.

[16] Fu Pengqiang, Ben Fei, Cui Nan, et al. An industrial robot simulation and real-time control system based on virtual reality:, CN108762112A[P]. 2018.

[17] Huang Shaowei, Li Chunlai, Chen Ying, et al. Power system dynamic simulation visualization method based on manifold learning:, CN106227919B[P]. 2020.

[18] Yang Jie, Gao Hongtao, Zhang Cunyou. Development of a dynamic simulation system for ship refrigeration based on virtual reality[J]. Ship and Ocean Engineering, 2019, v.48; No.251(03):159-164.

[19] Ye Yuntao, Liang Lili, Gong Jiaguo, et al. Research on the realization platform of real-time control of water transmission (transfer) system based on three-dimensional simulation[J]. Water Conservancy Informatization, 2018, No.143(02):5-14 .

[20] Jia Peng, Li Zhenbo. Research and discussion on visual simulation of construction progress of pumped storage power station based on BIM[J]. Science and Technology Innovation and Application, 2018, 000(030):70-72.

[21] Zhan Ping, Mei Liangfei, Zhan Tianyang, et al. Visual interactive simulation and application of pumped-storage power plants based on VR[J]. Journal of Wuhan University: Engineering Edition, 2019(5):391-398.

[22] Yu Xia. Research on the Visualization of Archives Information Retrieval Based on Virtual Reality Technology[J]. Shanxi Archives, 2018, 000(003):81-83.

[23] Yang Haibo, Zhang Xiaoqing. Exploration and Research on Teaching Mode of Water Conservancy Information Visualization Technology[J]. Journal of Higher Education, 2018, 000(020): 67-69.

Yin Hongsheng, Liu Jinlin, Zeng Fanming. Research on collaborative simulation technology of waterjet propulsion power plant based on virtual reality[J]. Ship Science and Technology, 2018.