

Research on Deformation Analysis and Prediction Technology of Civil Engineering Buildings Based on Bim Technology

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ABSTRACT. Introducing BIM technology into construction engineering can make up for the deficiency of traditional work of construction engineering specialty, and at the same time improve work efficiency. Under the background of information technology, the civil engineering industry should set strict standards and high requirements. In the actual construction project management process, if the relationship between each link and branch direction can not be handled and coordinated well, it will easily lead to information transmission errors, thus affecting the quality of construction projects and bringing many problems to the whole management process. Through the deformation monitoring of civil engineering construction, the deformation data related to deformation body can be obtained accurately, and the time characteristics and spatial state of deformation body can be studied in depth. This paper discusses the necessity of deformation monitoring of civil engineering buildings, analyzes the application of BIM Technology in deformation monitoring and prediction of civil engineering buildings, and looks forward to the development trend of deformation analysis technology of civil engineering buildings.

KEYWORDS: Bim technology, Civil engineering, Deformation monitoring, Construction engineering

1. Introduction

With the development of the times, science and technology are also showing rapid progress. Young people in China do not know why they have inexplicable feelings for houses, and the domestic construction industry has achieved sustained and stable development [1]. The progress of science and technology and the development of social economy have accelerated the process of project construction. There will be more and more hydraulic structures, underground structures, structures, large bridges, and high-rise buildings. The safety of buildings is very important [2]. BIM is the abbreviation of building informatization model. It builds a model based on various relevant information data of construction projects, and simulates all digital information obtained by simulating the real information of the building through digital information [3]. BIM technology was first proposed by the construction industry as a new data processing method. The data processing function can realize the realization and expression concept of engineering construction with required physical characteristics. Deformation monitoring is an extremely important means for checking the stability of various engineering buildings and their geological structures. Through the deformation monitoring of civil engineering buildings, the related deformation data of the deformable body can be accurately obtained, and the time characteristics and spatial state of the deformable body can be studied in depth. So that it can scientifically explain the causes of deformation, and on this basis, further accurately predict the deformation status [4].

The traditional architectural engineering model can no longer meet the needs of the background of the times and has been abandoned by the times. Therefore, we should actively seek another architectural engineering model that can adapt to the background of the information age [5]. BIM can ensure the consistency of engineering information at different stages, eliminating the need to repeat the adjustment process, and can make combined calls to data according to the requirements of different stages [6]. In order to adapt to the background of the information age, it is necessary to ensure the accurate and efficient transmission of information in all aspects of construction engineering. In the actual construction project management process, if the relationship between each link and branch direction cannot be handled and coordinated well, it will easily lead to errors in the transmission of information, which will affect the quality of the construction project, and will affect the entire management process. Brings many problems [7]. With the continuous development and in-depth application of BIM technology, the application level of BIM technology will be greatly improved, the value potential of BIM technology will be more realized, and BIM technology will surely bring greater benefits to construction companies [8]. Based on this, this article discusses the necessity of civil engineering building deformation monitoring, and analyzes the application of BIM technology in civil engineering building deformation monitoring and forecasting, and looks forward to the development trend of civil engineering building deformation analysis technology.

2. Overview of Bim Technology

2.1 The Meaning of Bim Technology

BIM technology is to use module parameters to build a model, and confirm the practical operability of architectural design by simulating the building construction process. BIM is a basic modeling tool, and the core modeling software can usually interface with many types of software, such as visualization software, sustainable analysis software, construction management software and operation management software. BIM technology is a software data simulation technology independent of computer software. By understanding the data before construction, the learned data will be transmitted to the calculation and terminal, and the possible problems in the construction process will be displayed on the computer screen through computer software [9]. BIM, as an information resource, can provide accurate and objective basis for projects involved by enterprises or individuals in various stages of construction and operation by establishing a perfect information sharing platform for all types of users. The application of BIM technology has changed the traditional design and construction process to a certain extent. In the traditional design process, all kinds of designers carry out flow design, usually by architectural designers, while structural designers carry out structural design on this basis, and then hand it over to plumbing and electrical engineers. The integration of BIM tools can greatly reduce the problems in the process of repeated modeling, and at the same time avoid the traditional problem of information exchange among participants in the process of engineering project design. The simulation of the construction stage by BIM technology can not only improve the construction efficiency and shorten the construction period, but also scientifically and effectively avoid the possible problems in the construction process and ensure the smooth progress of the construction.

2.2 Characteristics of Bim Technology

The most prominent feature of BIM technology in engineering project construction is its simulation, which helps this technology to be better implemented in various engineering construction links. The working idea of BIM technology is to use the virtual characteristics of computer to maximize the simulation effect of computer software. Using BIM technology can realize the visual construction of building model, and show the project as an intuitive sand table model at the beginning, which can give us the most intuitive and authentic visual experience. In the construction of engineering projects, the application of this technology has obvious three-dimensional visualization characteristics, which can also promote the smooth progress of construction. BIM technology itself is divorced from computer technology, so it is possible to use the powerful data processing technology of computer to coordinate all links, processes and stages in the construction of building engineering to ensure the smooth construction of building engineering [10]. BIM technology can provide systematic and comprehensive building information resources, which can ensure the communication and decision-making of the project in the whole process of construction, construction and delivery during the whole project implementation period. Traditional design methods can only be processed according to two-dimensional design drawings in subsequent construction operations, which makes it difficult for constructors to understand the information conveyed by designers more accurately, resulting in deviation and understanding problems.

BIM technology can present three-dimensional visualization model by means of information model, and the model established by this technology can realize the high-precision visualization effect of spatial design. With the change of diversity and complexity of architectural design, it is impossible to realize it only by manpower. At this time, designers should realize the design tasks of each link according to relevant science and technology. The application of BIM technology can scientifically and reasonably solve the problem of unreasonable connection of various stages in engineering construction to a certain extent, communicate and coordinate the two construction stages in time, and avoid the unreasonable connection of the two stages in the construction process. BIM technology can meet the needs of coordination, avoid the situation that problems are difficult to deal with due to the untimely communication between the construction unit and the owner, coordinate relevant problems before construction, and provide some solutions. After the completion of the whole project, the BIM model can ensure the owner to provide concrete and intuitive simulation during the future maintenance tasks of the whole project. In this way, the whole life cycle of the project can be simulated, so as to solve the problem of information isolation in the past project management and promote the improvement of project cooperation ability.

3. Visual Application of Bim Technology in Deformation Analysis of Civil Engineering Buildings

3.1 3D Geometric Modeling

The reasonable application of BIM technology can help the construction of civil engineering to effectively reduce

the problems in the construction and improve the construction efficiency of civil engineering. With the rapid development of modern technology and the increasing level of computer technology application, it has become possible to apply various theories and methods to deformation analysis and deformation prediction. Because the deformable body has extremely diverse and complex deformation mechanisms, in actual research, in order to effectively simulate, approximate and accurately reveal the deformation law and dynamic characteristics of the deformable body, the research method of effective model must be used. Using BIM technology to simulate the data flow before civil engineering construction, the problems that may occur in the civil engineering construction stage are displayed on the computer in a three-dimensional visualization manner, and the problems that may occur during the construction process are avoided in time [11]. Processing and analyzing deformation data, and physical interpretation and prediction of various aspects of deformation are the main research content involved in deformation analysis. The state of the system can be described by the Kalman filter model, namely the state equation and the observation equation. If the state equation includes state vector parameters such as the position, velocity and acceleration rate of the monitoring point. In the process of applying hybrid model to building deformation analysis and prediction, back analysis method can also be applied. This kind of back analysis is based on imitating the theory of system identification, using positive analysis results as evidence to carry out corresponding theoretical analysis.

In the traditional civil engineering construction mode, drawings are mainly used to show the effect of civil engineering construction from the drawings in a two-dimensional manner. When the civil engineering renderings are more complicated, there is usually a drawing showing part of the civil engineering construction renderings, and finally there is an overall outline drawing with the civil engineering construction effect on the drawing. The construction renderings of the project are connected in series from front to back. In the process of time series analysis, a single measurement point is usually analyzed first. If the deformation analysis can be associated with multiple points, the monitoring analysis and forecasting of the building will be better. BIM technology displays the construction renderings of civil engineering in a three-dimensional view, which is easy to understand, and it is more convenient to calculate the approximate construction cost of civil engineering from the three-dimensional construction renderings displayed on the computer.

3.2 Virtual Construction

In the development process of civil engineering, the influence of BIM technology is not only reflected in the construction control process, but also in the pursuit of the project itself, the details of the construction activities, that is, the details of the simulation of the engineering activities, so as to realize the control of the promotion of the entire project. Completed, as planned. BIM virtual construction technology is based on a complete three-dimensional model. By setting time parameters and visualizing the construction dynamics reflected in the construction process, it is beneficial to support the application prospects in engineering construction. With the continuous development of information science and technology, some software systems that integrate different professional information have been spawned. However, these systems still cannot truly realize the information exchange and sharing between various links of construction engineering, which makes the various professional information The synergy between the two is very poor. When using BIM technology, building a building model requires a lot of engineering information. In the construction project on the construction site, remote sensing technology is often used to combine the imaging data of the entire project to accurately and automatically construct the information and improve the quality of the entire project. BIM technology has a wide range of applications. It can not only be realized by software, so there will be different software platforms and different software combinations to realize the role of virtual construction [12]. In the process of technological development, the planning model was calibrated in time, so that the three-dimensional data can be matched with the model, which promotes the urgency of finding problems, and can be quickly modified to achieve project control capabilities.

BIM technology can realize the transmission and sharing of data information in the initial stage of construction engineering design, and can realize the timely update of data information in all links of construction engineering, so as to ensure the timely and accurate transmission of data information. In the development stage of construction engineering, BIM technology can solve a series of problems in construction by processing partial details of the structure by analog quantity. In the construction activities of civil engineering, BIM technology as a new processing method and the promotion of construction engineering is obvious to all. However, as a new information technology, in its use process, it cannot do without stable platform support [13]. In dynamic deformation analysis, if the wavelet analysis method is used, the wavelet-based multi-resolution Kalman filter model can be successfully constructed, which provides good conditions for the deformation analysis and prediction of civil engineering buildings. In the design process of each link, because there is not a unified platform, the confidence resources of each link in the design cannot be shared, and the information exchange is blocked. Therefore, when some links are adjusted, other links cannot be changed in time. It will affect the design quality of each profession.

4. Conclusions

As an important pillar of the national economy, the construction industry has also made rapid development and progress. With the continuous expansion of the scale of various construction projects and the complexity and diversity of architectural forms, the functions of construction projects have become increasingly complex. BIM technology is a good cutting-in software for understanding the construction industry, which can save time and effort, and complete a building safely, efficiently, quickly and practically. As a new software technology with digital flow modeling as its core technology, BIM technology can not only effectively improve the construction efficiency of civil engineering, but also avoid possible problems in the construction process. It is a complicated systematic project to analyze and forecast the deformation of civil engineering buildings. With the support of information technology platform, all parties can share and exchange information at any time, which greatly improves work efficiency. A more in-depth study and summary of the deformation analysis and prediction technology of civil engineering buildings plays an extremely important role in ensuring the safety of all kinds of civil buildings in China and promoting the sustained and stable development of China's construction industry.

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