

The Application of BIM Technology in Construction Stage of Bridge Engineering

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Abstract: In the current construction industry, the bridge design work is gradually complicated. At this stage, in the construction of bridges, many large-diameter bridges are often generated. Therefore, there are great requirements for bridge construction design. However, the general CAD drawings show the plane form of the project, which will not only affect the designer's own technical work, but also make the cost of the bridge itself. To this end, people have proposed to use the BIM technology commonly used in construction engineering, which is intended to improve the quality of some aspects such as bridge design. Based on the basic concept of BIM technology, this paper analyzes the application and measures of BIM technology in bridge construction.

1. Introduction

The rapid update and advancement of information technology has promoted the development of BIM technology, and has gained widespread use and application in engineering construction. This technology is based on information technology and concentrates information at each stage of the project life cycle. A three-dimensional information model to better master and control all aspects of the project, and effectively improve the efficiency and quality of the project construction [1].

With the acceleration of urbanization and the continuous development of social economy, urban infrastructure construction projects have received more and more attention. Among them, bridge infrastructure provides great convenience for people to travel. For this reason, the construction of bridge infrastructure While the project is gradually increasing, some problems are gradually highlighted. For BIM technology, this problem can be handled very well. Therefore, in this case, strengthening the research on BIM technology is very important compared to bridge engineering design work.

2. BIM technology overview

BIM technology refers to the effective application of building information model. Specifically, it is based on three-dimensional digital technology to establish a simulation data model of a construction project to realize the collaborative management of the whole life and all aspects of the building. It is a brand-new construction project. Construction management method [1]. As a visual representation of all aspects of construction projects, BIM technology has a strong positive value for the implementation of various construction projects, especially for the construction of bridge projects. As a representative of information technology, BIM technology has been widely promoted and applied in developed countries. Many regions have clearly defined the implementation standards of BIM technology, and they have already obtained certain standards in China's construction industry [1]. The extent of the application, and the effect is significant. The application of BIM in China's construction can be said to mean that China's infrastructure sector has officially entered the era of big data.

3. Advantages of BIM technology

3.1 The three-dimensional model can realize information specification.

The BIM technology constructs a three-dimensional model to visualize the relevant information, which can show the engineering structure, the name of the component and the construction materials,

and can also represent the logical relationship between the building components [2].

3.2 The three-dimensional model has a certain relevance.

Because the three-dimensional models are closely related to each other, the computer system is used to analyze and count the three-dimensional information model and then obtain the electronic information diagram [2]. If any of the components are changed, the related components are also changed to ensure compliance. The correct logical relationship.

3.3 The 3D model has visual features.

Scientific and rational use of BIM technology in bridge construction can realize visualization and visualization of engineering projects. After visualization of the project, it is possible to visually observe the key points that need to be paid attention to during the construction process, so as to develop evidence-specific construction plans and solutions [3]. Ensure the standardization of the construction, so as to avoid the problems of engineering quality caused by human factors during the construction phase, and more effectively ensure the construction quality.

3.4 Automated calculations can be used to increase productivity and accuracy.

Because the three-dimensional model built with BIM technology has a large amount of specific information data, when determining the engineering quantity of each sub-item, it can realize the automatic calculation and then only need manual inspection, saving a lot of manpower and effectively improving the work [2]. Efficiency, and largely avoids and reduces the problem of manual calculation errors.

4. Advantages of BIM technology in bridge construction

4.1 Provide technical support and data support.

In the process of carrying out the bridge design work, there are often large fluctuations, and the appearance of the problem will affect the progress and quality of the project construction. BIM technology has a strong visualization, and its accuracy can be adjusted during the process of using its bridge design work. BIM technology can be realized through three-dimensional design, and the interaction between different parts can be enhanced during the design work using this technology, shown as Fig.1. Virtual simulation technology is also an important part of BIM technology. In the process of designing bridges, simulation models can be built to make the design work more precise and provide strong data support [3]. In the process of applying BIM technology to carry out bridge design work, the function of the bridge can be analyzed through the virtual simulation model, so that the bridge construction meets the requirements of greening to a certain extent. In this case, it is possible to query related data information and usage functions, and provide strong technical support to optimize the bridge design work.

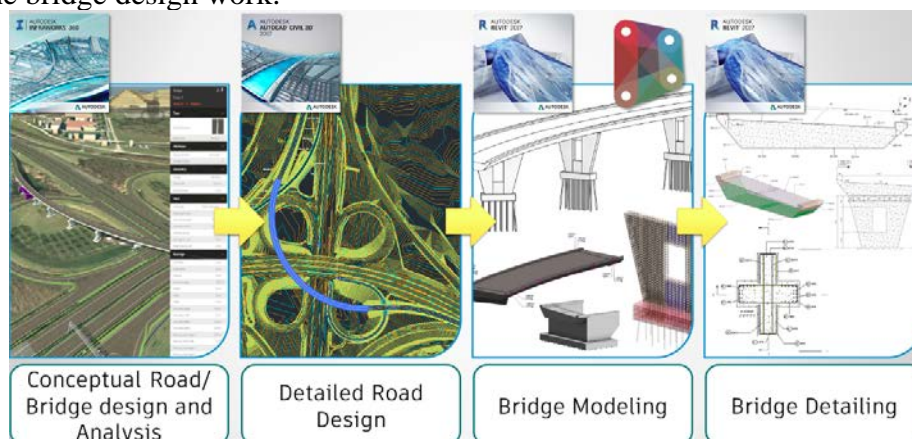


Fig.1 BIM simulation technology

4.2 Implement intensive management.

BIM technology can express relatively advanced design concepts, and can carry out more accurate simulation analysis in the actual bridge process. Some designers have potential problems in the process of bridge design work [4]. Therefore, BIM technology can be used to intuitively understand and analyze problems and propose effective solutions. BIM technology can simulate the work of the system, so that the construction of each part can be fully presented during the design process. In this process, it is necessary to make auxiliary custom parameters to solve the construction problem. This method can effectively reduce the trouble caused by inconvenient communication during the construction process, and then accurately guide the construction plan to achieve intensive management.

5. Application of BIM technology in bridge construction

5.1 Application of the feasibility phase.

The design of the scheme serves as the main stage of the feasibility of the bridge to determine the bridge scheme and the overall concept, such as determining the plane, section and elevation of the bridge. In the feasibility design, the comparison analysis of multiple schemes often takes a long time, and the design essence of the scheme needs to be transmitted to the owner very accurately [4]. At this time, BIM technology embodies the advantages of 3D visualization. The BIM model of different bridge schemes directly provides the designer's idea method, and can be easily converted into elevation, plan and section. In addition, the BIM model implements a refined model of all components, not only can present the details of the three-dimensional information model, but also achieve material statistics, saving a lot of time.

5.2 Optimize the construction design.

For bridge engineering projects, the design of the project is particularly important. Whether the construction design plan is scientific, reasonable and accurate will directly affect the development and effect of the construction [5]. The application of BIM in bridge construction should be applied to the design and optimization of bridge construction schemes from the very beginning, which is a very necessary and especially critical link. In the aspect of optimizing the design scheme, BIM technology is used to process all aspects of the bridge engineering data, and the specific components of the bridge and its engineering logic relationship are all presented in a digital way [5]. The designer can carry out further analysis by means of its data model. Furthermore, it is helpful for designers to discover the deficiencies and defects that may exist in it. Based on the evaluation of the design scheme, optimization and improvement are carried out, and finally the reliability and feasibility of the design scheme are ensured as much as possible, so as to better implement the construction of the bridge. Lay a solid foundation, as shown in Fig. 2.

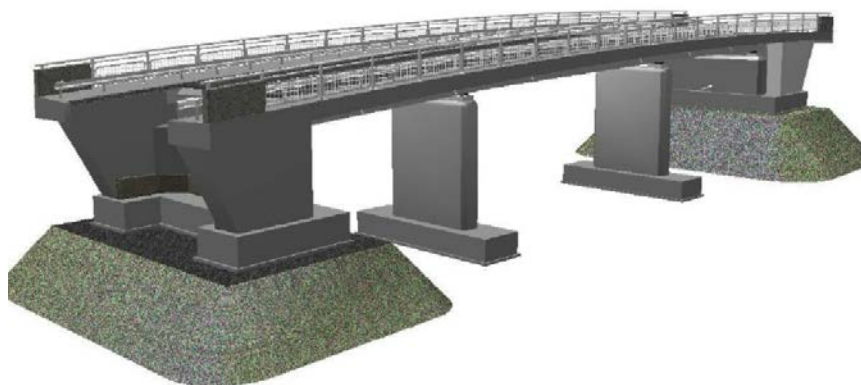


Fig.2 Bridge construction design and optimization diagram

5.3 Promote multi-angle synergy.

In the process of bridge construction, the use of BIM technology to promote multi-angle

cooperation is one of the important links to improve the efficiency of the entire bridge construction. On the one hand, BIM technology can promote synergy between the various participants [6]. A bridge project usually requires the participation of multiple parties. The communication between the participants has not been efficient, which directly increases the difficulty of the entire project construction. Through the application of BIM technology, each participating unit is managed in a unified manner, thereby effectively promoting communication and cooperation between the various participants [6]. For example, the construction unit can input the required building materials information into a unified project management platform, and the material supply unit can obtain relevant information at the first time by using its own authority, and accordingly prepare the corresponding materials and deliver them to the construction. Specifying a location will directly reduce the time delays that may result from communication problems and speed up construction. On the other hand, BIM technology can promote synergy within each work team. For example, the design team of the bridge project can use the BIM technology to realize the sharing of the design model in the process of optimizing the design. Each designer can design and optimize the bridge construction model in a sub-item [6]. The dynamics of personnel, if they conflict with their own designs, can communicate with them and adjust them in time, thus greatly improving the efficiency of the design.

5.4 Planning and management of construction processes.

For the specific construction and construction process, whether the project construction process is scientific and reasonable directly affects the construction progress and construction effect of the bridge project [7]. This means that scientific planning and management of the construction process is very necessary. Applying BIM technology can be a great help in planning and managing construction processes. On the one hand, the relevant staff can use BIM technology to simulate various construction processes, through such comparison, analysis and verification work, find and select the best construction process, and implement it into the actual construction work [7]. On the other hand, based on BIM technology, the relevant staff can realize a visual simulation of a specific construction process and its related construction process, so that the workers involved in the actual construction can fully understand the design intent and construction structure of the bridge project, and then ensure the accuracy of each process in the actual construction, achieve orderly advancement of construction, and further ensure the construction efficiency of the project.

5.5 Management and control of construction progress.

Strictly controlling the progress of project construction is the most important goal and task in bridge construction. In the concrete bridge construction process, it is not an easy task to effectively manage the construction schedule. The application of BIM technology can solve this problem well [8]. By simulating the whole process of bridge construction, it can effectively realize the management of each step and details in the construction, so that each construction step can achieve the expected construction progress. The goal is to minimize the possibility of delays in the construction period. Specifically, using BIM to simulate the construction progress of the project, based on the three-dimensional model of the bridge project, the construction time as the unit behavior dimension, combined with the actual project construction environment, continuously adjust the construction plan dynamically to ensure that the project construction is always in accordance with expectations [8]. In addition, for the difficult and difficult work of engineering construction, BIM technology can be used to simulate and visualize it [7]. On this basis, material planning and mechanical arrangement can be carried out, which can effectively optimize resource allocation and realize effective management of construction progress. control

5.6 Project management optimization.

The basic model of bridge life-time decision making is the core of bridge BIM technology. In the design stage, it not only provides more comprehensive information in the construction and operation phases, but also provides optimization basis for management. First, a construction organization method is provided. BIM technology enables various bridge information to be dynamically presented

[8]. Therefore, modeling and simulation can be used to determine the reasonable division of work types, so as to determine the most suitable distribution of people, machines and materials, optimize the construction process, and optimize the allocation of resources. Improve construction efficiency. Second, it provides cost, schedule, and quality management methods. The raw materials, construction machinery and equipment used in the bridge construction, the wages of the workers and the expenses incurred in the construction management can be accurately calculated through the BIM model, and the corresponding construction period can be easily determined [8]. Finally, an optimization method for management and maintenance is provided. Based on BIM technology, the management and maintenance cycle can be determined, and each maintenance focus can be achieved.

6. Summary

By studying the BIM technology and the construction stage of bridge engineering, this paper uses BIM technology to realize the site planning, information sharing of prefabricated components, and compare and optimize the construction plan to realize the three-dimensional visualization of the construction site. And management of the construction site. Finally, according to the application of BIM technology of this project, the implementation framework of BIM in bridge engineering application is summarized. It is hoped that through this research, it can provide reference for other large-scale bridge construction, inspire enterprises to explore new project management ideas, and contribute to the promotion and application of BIM in the field of bridge engineering. It is believed that through the continuous development and improvement of BIM technology, it can better improve the construction technology and management level of bridges in China.

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