

The Application of BIM Technology in Bridge Engineering

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Abstract

This article focuses on the application of BIM technology in bridge engineering. Through the use of BIM technology, it considers the difficulties that may be faced in the construction process in advance. Through construction simulation, hidden dangers in the quality, safety, and feasibility of the construction are discovered in advance, thereby Taking effective preventive and strengthening measures to reduce on-site errors, reduce rework and waste, and promote the optimization of the entire project.

Keywords

Bridge engineering; BIM technology; Construction simulation; Engineering optimization.

1. INTRODUCTION

Building Information Modeling (BIM) is the latest product of informatization in the construction engineering industry nowadays, commonly known as "Building Information Modeling." BIM uses various relevant information data of construction projects as the model basis to establish the building model and communicate, coordinate, simulate and optimize the whole life cycle [1]. It has visualization, coordination, simulation, optimization and exportability. The five characteristics of graphics are the trend and inevitable result of the development of the construction engineering industry in the future [2].

BIM technology can provide strong support for the smooth implementation of bridge projects. Use advanced information technology to strengthen project process management, collaborative work, and information communication, and promote the integration and innovation of project digital management and production technology.

2. CURRENT STATUS OF RESEARCH AND APPLICATION OF BIM TECHNOLOGY IN BRIDGE CONSTRUCTION

2.1. Research Status of BIM at Home and Abroad

BIM technology was developed from the United States and gradually expanded to developed countries such as Europe, Japan, and Singapore. The United States has been studying the development of building informatization from a very early time. BIM was also first proposed by the American company Autodesk in 2002. BIM technology will lead building information technology to a higher level, greatly improving the integration and informatization of construction engineering. It can be said that BIM is triggering an unprecedented revolution in the world.

Our country's engineering construction industry began to introduce BIM technology in 2003, and the current application is dominated by design companies [3]. In terms of the breadth and depth of application at this stage, the application of BIM in China has just begun, but it will be gradually promoted and penetrated into various fields of the construction industry. From the perspective of international globalization, the application of BIM has become the mainstream [4].

2.2. Status Quo of Research and Application of BIM Technology in Bridge Engineering

The emergence of building information modeling technology is an important milestone in the history of CAD development. Before BIM became mature, there had been researches that reflected the technical ideas of BIM. At present, the application of BIM in construction management is mostly housing construction projects, and there are relatively few studies in bridge construction.

3. VISUAL SIMULATION

3.1. Implementation of Visualization

Visualization is the form of "what you see, what you get". The use of BIM digital technology can not only realize the visual establishment of building models, but also establish a visual effect before the construction project starts.

In order to better understand the construction environment, the drone can be used as an aerial photogrammetry platform to quickly and efficiently obtain high-quality, high-resolution environmental images, and generate high-precision three-dimensional environment models. Then use the modeling software Revit software to build the bridge model, and complete the integration of the two models on the navisworks software platform.

The traditional bridge construction plan is based on two-dimensional drawings, which is not intuitive. The application of BIM technology in bridge engineering transforms the form of previous two-dimensional drawings into three-dimensional physical drawings, which are intuitively displayed in front of people.

3.2. Advantages of Visualization

BIM technology transforms the expression of engineering from two-dimensional plane elevation drawings to three-dimensional thinking, and uses visual simulation to realize the dynamic link between engineering components and time schedule, visually and intuitively describe the entire organization and operation process, giving people a sense of reality.

Using BIM technology to visually simulate the bridge construction process and construction process, convert various working conditions from a two-dimensional perspective to a three-dimensional perspective, visually and intuitively describe the entire organization and operation process, giving people a sense of reality. Through visual simulation, it is possible to focus on the technical difficulties and key points of bridge engineering, to find out the difficulties that may be faced in the construction process in advance, and to adjust the construction plan to provide strong support for the smooth implementation of the project.

4. APPLICATION OF BIM IN PROJECT SCHEDULE MANAGEMENT

4.1. Problems with Traditional Project Management

The biggest problem with traditional construction schedule planning is that it is difficult to judge the rationality and applicability of the schedule. Many construction schedules cannot be completed smoothly in the end because of the unreasonable preparation of construction schedules.

Similar problems exist in traditional construction schedule control. Although the traditional construction schedule control also attaches importance to schedule information collection and dynamic adjustment, due to the low efficiency of manual information collection, the accuracy rate cannot be guaranteed, and the construction schedule control is lagging.

4.2. BIM 4D Model

Comparing the construction schedule of the construction industry, the advantages of the 4D model are obvious. The use of the 4D model can enable all construction personnel to quickly understand the important nodes of the schedule. At the same time, the schedule can be expressed through the corresponding representation of the physical model, which can help find construction gaps, take timely measures, and make corrections and adjustments.

In engineering construction, the use of 4D models can enable all construction personnel to quickly understand the important nodes of the schedule; at the same time, the schedule can be expressed through the corresponding representation of the physical model, which can help find construction gaps, take timely measures, and correct deviations; even if we In case of design changes and construction drawing changes, the schedule can also be modified quickly.

The 4D model can be applied to many aspects of schedule management and construction site management during the construction process, mainly manifested in the visualization function of schedule management, monitoring function, recording function, progress status report function and plan adjustment forecast function, as well as construction site management Planning visualization function, auxiliary construction general plane management function, auxiliary environmental protection function,

4.3. Application Value of BIM 4D Model

4.3.1 Intuitive image, greatly improving the efficiency and accuracy of understanding

Through 4D schedule simulation and visualization, managers have an intuitive understanding of the construction schedule, which improves the efficiency and accuracy of the overall schedule control, and reduces unnecessary problems caused by information transmission errors.

4.3.2 Timely feedback on site construction progress and provide communication efficiency

By updating the actual progress in time and visually displaying it at monthly project meetings, a unified communication platform is formed to avoid misunderstandings caused by mismatched information or insufficient understanding of existing conditions, and improve communication efficiency.

5. BIM-BASED COLLABORATIVE WORK MECHANISM

5.1. Overview

Collaborative management is based on the idea of synergy theory. From the perspective of management, there are decision-making and strategic activities. The use of BIM technology can well realize organizational collaboration, information collaboration, and process collaboration, reduce conflicts between the parties involved in the project progress, and make the project proceed smoothly. Organizational collaboration is the basis and guarantee of process collaboration and information collaboration.

The BIM-based collaborative work mechanism means that project participants can share data through a shared database (ie, BIM database), and can extract the data they need at any time to improve the efficiency of the entire team.

5.2. The Value of Collaborative Work

5.2.1 Reduced the omission of information between stages

BIM collaborative work provides a platform for information sharing for all participating units of the project. The participating units of the project are all based on BIM technology to carry out their work, which effectively reduces the problems caused by information asymmetry among majors. At the same time, since each participating unit can obtain the materials and information

of the early stage of the project through BIM, each participating unit can understand the early stage of the project when participating in the project, and reduce the omission of information between various stages.

5.2.2 Improved the quality and efficiency of management

BIM collaborative work provides a platform for information exchange and collaborative work for each participating unit of the project. Each participating unit can obtain the required information according to its own needs, digest and absorb the information, and directly communicate with each unit through BIM Communication, and take corresponding measures to avoid the delay and loss of information transmission caused by paper and other transmission methods, thereby improving the quality and efficiency of management.

5.2.3 Effectively Control the Overall Progress of the Project

Make full use of BIM collaborative work to make the project information transparent, and the work collaboration between the participating units can help the owner clearly understand the actual progress of the project, so that the owner can pre-evaluate the unexpected situation that may occur in the project, and Formulate emergency measures to reduce their occurrence and ensure the normal progress of the project.

6. CONCLUSION

The use of BIM technology in bridge engineering is still lacking in the industry, and the superiority of BIM technology is also very obvious. Therefore, the promotion of BIM technology in bridge engineering needs to be further carried out in order to better serve actual engineering projects in future project applications and fully reflect the value of BIM applications.

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