

Research on Application of BIM Model in Bridge Engineering

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Abstract

BIM (Building Information Modeling) has received widespread attention due to its outstanding advantages in visualization and synergy. In recent years, the application of BIM in the engineering construction industry has become more and more extensive, especially in the field of industrial and civil construction, and has now formed a more mature application system. However, the application of BIM in bridge engineering is still in its infancy. The article first sorts out the development process of BIM at home and abroad, and then analyzes and summarizes the application research status of BIM in the bridge engineering design phase, construction phase, and operation and maintenance phase, and elaborates the advantages of BIM in each phase; finally according to The status quo of BIM application in bridge engineering puts forward a prospect.

Keywords

BIM; bridge engineering; status of application research.

1. Research status

1.1. The development history of BIM abroad

In the 1970s, American scholar Dr. Chuck Eastman proposed the "Architectural Description System", which can simulate construction projects and is therefore regarded as the prototype of BIM. In 1986, American scholar Robert Aish first proposed the concept of "Building Modeling". In 1999, "Building Information[1],The concept of "Modeling" was formally put forward by Professor Tolman. After 2000, major foreign software companies, such as Autodesk and Bentley, have successively developed BIM-related software. At the same time, the US General Services Administration took the lead in launching the "3D-4D-BIM" plan and released BIM application guidelines and guidelines[2]. The U.S. federal agency, the Army Corps of Engineers, launched a BIM development plan for the period from 2006 to 2020[3].

1.2. The development history of BIM in my country

The research on BIM technology in my country started relatively late. In 2002, the concept of BIM was introduced, and it was not until 2006 that BIM began to be truly valued. my country vigorously supports and promotes the application of BIM from a policy perspective. The Ministry of Housing and Urban-Rural Development has successively promulgated the "2011-2015 Construction Industry Informatization Development Outline", "Guiding Opinions on Promoting the Application of Building Information Models" and "2016-2020 Construction Industry Informatization Development Outline"[4].

Improve the level of construction industry informatization and strengthen the application of BIM [5]. The Ministry has successively introduced BIM national standards to promote the popularization and application of BIM. In December 2015, the Ministry of Housing and Urban-Rural Development issued an announcement to approve GB/T 51212-2016 "Uniform Standard for the Application of Building Information Models" as a national standard. This standard is the first engineering construction standard for BIM application in my country and has laid a good foundation for the subsequent development of BIM. basis;

In May 2017, the Ministry of Housing and Urban-Rural Development issued an announcement to approve GB/T 51235-2017 "Building Information Model Construction Application Standard" as a national standard. This code mainly guides the application of building information models in the construction phase and the creation of building information models in the construction phase. , Use and management put forward various requirements; In November 2017, the third national BIM standard GB/T 51269-2017 "Building Information Model Classification and Coding Standard" was officially released, which serves as the basis of the construction engineering information exchange and sharing platform , Standardize the classification and coding of information in the building information model. At the same time, various industries actively promote the research and application of BIM in related fields[6]. For example, the China Railway Corporation takes BIM as the main development direction of railway engineering information construction, and has carried out a number of professional BIM standard research based on scientific research projects.

1.3. Two application modes and their characteristics in the design stage

Through the building information model, a reasonable operation and maintenance plan can be customized with the help of the information model and construction information of the bridge project to ensure the reasonable operation of the bridge project. At the same time, in response to the national call for energy conservation and emission reduction, the maximum use of resources was made during the operation phase of the bridge project to avoid energy waste. Generally speaking, this work requires high professional quality of personnel, and the operation difficulty is not low. Therefore, building information models can be used to monitor the real-time energy consumption of bridge equipment and upload the data to the evaluation website to formulate the maintenance plan with the lowest energy consumption. The service life [7]. The combination of building information model and GPS technology manages the entire bridge project in sections according to different conditions, and then develops in-depth operation and maintenance plans for specific sections. The building information model can digitize various information of bridge engineering and build a consistent data information model[14-15]. Through this model, computers can be used to analyze and process data, and unified management of this information. At the same time, according to this model, the traditional operation system is optimized and adjusted to establish a brand-new and efficient system. The establishment of the system has also made up to a certain extent for the inadequacy of the operation plan caused by the lack of professional capabilities of the personnel.

2. Research system

2.1. BIM-based safety management system

The bridge has accumulated a large amount of data in the design, construction and other stages before operation, and data information in the operation and maintenance stage will continue to be input in the later stage. The traditional management model is difficult to efficiently process such a large amount of data, so the management efficiency is low. Applying BIM with informatization and visualization functions to the bridge operation stage can realize the unified management of bridge design, construction information, regular information in the operation stage, and structural safety information. Managers can view the status of the bridge at any time in a three-dimensional form, and can refine each component, trace back to all components according to its code [13].Basic Information . The BIM-based information management system can classify, sort, store, update, extract, and visualize information in real time, and provide maintenance personnel with dynamic and effective information. In addition, all parties share information resources through a collaborative work platform based on BIM, communicate online at any time, and make joint decisions in a timely manner[8]. Relevant decisions facilitate the safe operation of the bridge.

2.2. Bridge safety assessment system based on BIM

The BIM platform obtains real-time environment, load and bridge structure response [9-11]. However, due to the amount of data acquired. Many, complex and random, if the data is not processed, it may cause the distortion of the monitoring data [12]. Therefore, the BIM platform also needs to perform monitoring data Screening and mining to extract effective information.

3. Conclusion

The advantages of building information models can be fully utilized in bridge engineering, effectively improving efficiency, reducing workload, saving costs, and creating huge social and economic benefits. However, the application of building information models in bridge engineering is still in its infancy, and it is necessary to further deepen the connection between building information models and bridge engineering, and continue to tap the huge development potential of the combination of the two.

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