

The Application of BIM in Rail Transit Cooperative Operation

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Abstract

In 13th Five-Year planning, intelligent manufacturing industry to promote the development of city rail transit industry in china. The new technology of the building information model as the construction industry has gradually been used in rail transit project. This paper introduce the development, application status of BIM technology in rail transportation, as well as in civil engineering collaborative applications and prospects in the design, and briefly introduces the BIM technology, laid the foundation for further application research.

Keywords

BIM Technology; Rail Transit; Collaborative Design.

1. Introduction

With the rapid development of China's economy, the country vigorously promotes urban traffic construction, especially the rapid development of rail transit industry. Building Information Modeling (BIM)[1], the concept of building information model, originated in the United States in the 1970s, is an intelligent process based on three-dimensional model, which can plan, design, construct and manage buildings more effectively. Originally, designers of different specialties in architectural design could only communicate with each other through traditional two-dimensional design drawings. Now, BIM technology integrates the initial planning, design and construction maintenance of construction projects into simulation to promote the overall informatization and modernization of rail transit design. BIM technology has corresponding theory and software support[2]. On the basis of CAD, it has been upgraded to a series of software such as Autodesk Revit, including conceptual design software, BIM core modeling software, BIM analysis software, construction management software, calculation and budget software, and planning software[3].

2. Application Status of BIM in Rail Transit

The application of BIM technology in large-scale construction projects on the ground is in full swing, while the application of BIM technology in Metro and underground space engineering is in the initial stage. The application of Metro BIM in Hong Kong and Taiwan is earlier than that in mainland China. At present, many metro stations in Hong Kong adopt BIM modeling in the design stage. Some of them have begun to use BIM for deep analysis of lighting, energy consumption, smoke and human flow. BIM technology has been fully introduced into Taipei MRT Wanda Line for design, construction and comprehensive management. BIM technology has been gradually introduced into metro projects in some big cities in China. BIM technology has been applied to pipeline collision detection in wind and hydropower installation projects in many stations of Shanghai Metro Line 11 phase II. BIM technology has been applied to interior decoration design of Shihuazhuang Station of Beijing Metro Line 10 phase II. Tianjin, Nanjing and other urban metros have integrated three-dimensional pipeline design with

BIM technology. These successful cases show that BIM technology can be well applied in metro engineering and has broad prospects for development.

Wuhan Metro Line 2 can be said to be a "commercial road". It integrates several core business circles in Wuhan, such as Wuguang, Jiangnan Road, Zhongnan, Jiekou and Guanggu Square, and makes Wuhan experience the sublimation from "business circle" to "business zone"[4]. In 2013, Zhang Chengfang and Li Chao faced the problem of frequent safety accidents in the process of subway construction because of the urban ground traffic congestion and the increasing scale of underground rail transit. Using BIM technology and information to construct the space and time model of metro, the safety management of metro construction site is carried out, and the construction space is managed as a very limited resource to avoid potential safety hazards caused by metro construction as far as possible.

3. BIM technology in the design of collaborative application in Civil Engineering

3.1 Advantages of BIM in Project Implementation

Taking Revit as an example, the simultaneous design and collaborative design of architecture, equipment and other specialties are realized on the same simulation platform. In the implementation of the project, due to the inadequate communication between professional designers in the early stage, various problems may arise. Through BIM design, in the early stage of the simulation design, the collision errors of various specialties such as ventilation and impact structure, smoke exhaust and ventilation, water supply and drainage and air conditioning can be detected, and these problems cannot be adjusted on site in the construction process.

3.2 BIM Collision Examination Case

BIM model contains abundant information and has the advantage of visualization. It is an excellent medium for project participants to communicate with each other. Visualization can enhance communication efficiency, the consistency of the information it can avoid the problem of information island project participants and between different departments, timely and effective information transfer can improve the efficiency and quality of decision making and so on. We can detect the collision in BIM like we do it in fig1.

The collision detection results in fig2, most can not be adjusted at the construction site in the process of error. According to the characteristics of these errors, BIM engineers adjust the pipeline model rationally and optimize the pipeline model, which provides an accurate and reliable construction basis for actual construction and improves the feasibility of project construction. Through the collision inspection, we can find and solve the need to change or modify the design drawings in advance, reduce the possibility of a large number of changes in the construction process, avoid a large number of rework, and ensure the quality of the project. Through 3D construction simulation, the construction process is simulated according to the construction progress, and the four-dimensional visual construction progress simulation of civil engineering and installation specialty of metro station is realized. Through construction simulation, it provides more intuitive progress control basis for managers; provides visual construction simulation construction process for the construction site, avoids the problems occurring when the construction process crosses, and achieves the effect of optimizing the progress and shortening the construction period. Provide the statistical basis for the project investment controllers in stages, make scientific preparations for materials, and make timely statistics on the completion of project investment.

Through various simulation in the stage of scheme design, it provides decision-making basis for the project side and multimedia material for various reporting meetings. At the beginning of the design, it simulates the real operation, effectively finds the design defects and shortcomings, and improves the design quality and the later operation level.



Fig 1. The collision detection case

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Fig 2. The collision detection results

4. Summary and Prospect

BIM technology is more widely used in construction industry than in urban rail transit industry. Although BIM technology is widely used in pipeline design and pipeline collision detection in urban pipeline transportation industry, BIM technology is rapidly applied in all stages of rail transit engineering projects. BIM technology will become the core of future construction industry informatization. During the Twelfth Five-Year Plan period, the government requested to improve the level of information technology in the construction industry, vigorously advocate the development of green buildings, promote the technical research of construction industrialization, and strive to promote the application of BIM technology in engineering.

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