Research on application of BIM technology in municipal road construction

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Abstract: Taking the yanjiang avenue (minquan road ~ qingchuan bridge) project as an example, this paper aims at the characteristics of tight construction period, high quality requirement and multi-section collaborative construction of municipal road. Based on the application characteristics and advantages of BIM technology, this paper aims to study some details of BIM technology in municipal road construction. For the national municipal road construction to make the corresponding contribution, and for the practice and research of the latter to provide technical guidance.

1. Introduction

BIM technology is the core technology to promote the management upgrade of construction enterprises. Extensive management has become increasingly inadequate to the modern construction enterprises to pursue the fundamental starting point of value, and even threaten the survival of enterprises[1]. However, BIM technology can improve the level of refined management of enterprises and achieve dynamic cost control. The visualization, collaboration, interaction and integration of BIM technology can make the project management and control accurate to each construction participant and improve the management communication efficiency, which reflects the use significance and value of BIM model. In the construction process of the whole project, all the new technologies must be matched with the virtual building in order to truly know the actual construction on site and finally realize the improvement of project benefits[2]. Compared with developed countries such as Europe, America and Japan, BIM technology started relatively late in China's architectural development, and it still needs to be further improved from theory to practice. For example, BIM technology is still in the exploration stage in project information integration management and construction plan integration determination. The application of BIM technology in the field of housing construction is far greater than that in other construction fields. With the application and development trend of BIM technology, BIM technology...
starts to be applied in municipal fine construction. Based on the application of BIM technology in municipal road design, Shuai peng combines the traditional 2d CAD drawings with BIM model to share the digital design information for the designers involved in this project, modify the model and optimize the construction drawing of structural design, thus improving the level of municipal road design\(^3\). Chang-liang du project based on BIM technology and AR technology field management idea, to a large number of BIM data exchange with the environment in real time, design, construction and operation of three module integration, to further improve the information flow of system framework, and through the staff to the framework of process, define the overall framework of the system\(^4\). Gao Zengkui based on BIM technology, port avenue project in nanchang exploratory municipal bridge construction field, introduced the BIM technology, using the model of municipal viaduct, has carried on the design drawing review, engineering quantity calculation and visualization analysis and technical clarificaion, construction simulation analysis, the analysis of the engineering application practice, such as collision in cost control has achieved good economic and social benefits\(^5\). FuXiang and zhangyu innovative the BIM technology application in the construction of municipal sewage treatment, cross major for municipal wastewater treatment engineering, large volume, high precision, more ground concentration and other technical difficulties, the progress in the construction process, resource, arranging the dynamic integration of management and process visualization simulation, make the municipal sewage treatment project construction the completion of high efficiency, high quality. In view of the above, BIM technology is also feasible in municipal road construction\(^6\).

2. Characteristics of municipal road construction

From the point of view of construction, municipal road construction involves road engineering, traffic engineering, greening landscape engineering, etc., the biggest characteristic of which is the coordination difficulty of long and narrow construction body and multi-section construction. The main features are as follows.

1. the engineering geology is complex. As most municipal road construction is carried out in areas with large urban traffic flow, the use of construction machinery is restricted and traffic diversion is difficult.

2. the supporting measures of the foundation pit are large in quantity, complex in structure, and close to the surrounding buildings in depth. The foundation pit has great disturbance to the land and great influence on the surrounding buildings.

3. great organization and coordination. It is difficult to adopt methods to connect professionals for orderly construction, and the biggest technical problem is how to avoid unnecessary rework caused by mistakes in design drawings and ensure to reduce the waste of materials during construction.

Based on the construction characteristics of the above subway project, the project department decides to use BIM technology to guide the construction.

3. Application of BIM technology in municipal road construction

3.1 project overview

This project is classified as a maintenance and renovation project. According to the spirit of the municipal conference, this renovation maintains the original road design standard, section and traffic organization, improves pavement pavement, and implements the integration of multiple poles. The project starts from minquan road in the east and qingchuan bridge in the west, with pile no. K0+000 as the design starting point and pile no. K1+901.230 as the design stopping point. The road is a two-way 4-lane road with a design speed of 40km/h. It starts from minquan road in the east, passes through dongjia lane and longwangmiao, crosses qingchuan bridge and ends at the intersection of baoqing street in the west. The construction includes road engineering, traffic engineering, drainage engineering, electrical engineering and landscape engineering.
3.2 Construction schedule control and construction plan
By comparing the traditional construction process with the BIM construction process, figure 2 is the determination of the traditional construction plan, and figure 3 is the construction plan of BIM technology. We can see the application advantages of BIM technology. After adopting BIM technology, Navisworks carries out virtual tour of the 3d model. In the early stage of construction, the technical problems encountered in the construction are solved, the effect of preview is achieved, the model is constantly optimized and the final implementation plan is determined, and the model is used to guide the construction. Figure 4 is the BIM virtual tour. Through virtual tour, the status quo of the project can be well presented in the progress of project report and project meeting, which is another major advantage of BIM technology.

Figure 1. road layout

Figure 2. flow of traditional construction scheme

Figure 3. BIM construction program flow
3.3 Drawings came
In this project, the east triangle ecological parking lot is the highlight of this project. In the early stage of construction, the Revit software is used to establish the three-dimensional layout, and the construction unit can well understand the design intention and reduce the time for map reading. The process of 3d modeling is actually the checking process of 3d model. During this period, it can skillfully solve the problem of insufficient understanding of traditional 2d drawings in design space. Municipal engineering involves many specialties, various construction components and limited underground construction space. In conclusion, BIM model can greatly reduce the time of drawing review and improve the accuracy of drawing.

3.4 disclosure of 3d visualization technology
Prior to construction, drawings and design changes shall be communicated to the construction company in the form of disclosure. Traditional two-dimensional drawing expression ability is limited, in order to avoid the municipal road engineering construction components, underground space more narrow, the configuration of the complicated problems such as professional, make full use of the advantages of BIM 3 d visualization, when the pavement laying brick construction, the construction of complex nodes on the space of three dimensional positioning through the BIM model shows the construction of complex node animation, construction team to establish the optimization of construction scheme to guide the scene of fine construction, not only shorten the construction period, reduce the safety and quality accident event happened at the same time.
3.5 Integrated BIM management

BIM5D USES the data integration ability of BIM model to integrate and visualize the information of project schedule, contract, cost, quality, safety, drawings and materials. It can realize the visualization, process and archival management and application of data, and provide data support for the progress, cost control and material management of the project. To achieve effective decision-making and fine management, so as to reduce construction changes, shorten the construction period, control the cost, improve the quality of the purpose. BIM5D is an effective tool for construction units to realize fine project management on construction site. This project is mainly based on PC and web to import the municipal road model of this project into BIM5 platform to realize the dynamic management of the construction site.

4. conclusion

Riverside avenue (civil rights road ~ qingchuan bridge) application of BIM technology to municipal road construction project management, the use of Revit software established municipal road 3 d model of body structure, ecological three-dimensional arrangement of production field, and some parts of the pipe BIM model, to solve the municipal road construction in the construction process simulation, model of information management. It includes construction simulation, construction scheme determination, 3d visualization construction and other aspects. BIM model is used to display the construction animation of complex nodes, and the construction team establishes the optimized construction scheme to guide the fine construction on site. Coordinate the construction process, save a lot of time to read the map, understand the municipal road construction components of the allocation of resources. Let the original extensive construction management mode to achieve orderly construction. It shows that the application of BIM technology will be more significant than the traditional construction project management model.

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