

Application of Assembly Construction in Intelligent Construction Under the Background of Artificial Intelligence

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ABSTRACT

The rapid development and wide application of artificial intelligence are deeply affecting all aspects of human society, and also promoting the construction industry to move towards the era of intelligent construction. In this context, this paper first analyzes the relationship between artificial intelligence, artificial intelligence construction and intelligent construction, and focuses on the construction of artificial intelligence; Then, based on the four elements of educational artificial intelligence, this paper constructs the technical framework of educational artificial intelligence, and analyzes its typical applications; Finally, the paper puts forward the future development path of educational artificial intelligence from four aspects: strengthening interdisciplinary integration research, improving educational data ecosystem, Cultivating Educational artificial intelligence professionals and deepening the application of educational artificial intelligence, in order to further promote the deep integration of artificial intelligence and education.

Keywords: *artificial intelligence; Intelligent construction; Technical framework; Development path*

1 INTRODUCTION

In the era of digital economy, platform enterprises have become major organizations that combine data and other production factors (Wang Yong and Rong Ke, 2018). From 2008 to 2018, the market value of platform enterprises in the world's top ten listed enterprises increased from 8.2% to 77% (China information and Communication Research Institute, 2019). Thanks to the huge user group and market scale, China has bred a large number of giant enterprises with strong platform characteristics (such as Alibaba, Tencent, Baidu, etc.) and unicorn enterprises (such as didi travel, meituan comments, byte jump, etc.), and many new formats and models around the platform economy are also emerging, creating huge economic and social value. As some scholars have pointed out, if the previous industrial revolution revolved around the transformation of factories, the current transformation is centered on these digital platforms (Kenney & zysman, 2016).

In the past two decades, China's construction industry has developed rapidly and the industrial scale has been expanding, but its annual investment in science and technology R & D is at the end of various fields. The overall informatization and intelligence level of the construction industry is low, and there is a large growth space. Building industrialization itself covers the requirements of design standardization, component prefabrication and construction assembly. Compared with traditional building methods, it needs the assistance and promotion of informatization. Gao Chengyong believes that building informatization and industrialization promote and support each other, which can effectively promote the development of architectural design, construction and operation and maintenance technology. On July 3, 2020, the Ministry of housing and urban rural development, the national development and Reform Commission, the Ministry of science and technology, the Ministry of industry and information technology and other 13 departments jointly issued the guiding opinions on promoting the coordinated

development of intelligent construction and building industrialization (hereinafter referred to as the guiding opinions) "Take the vigorous development of building industrialization as the carrier, take digitization and intelligent upgrading as the driving force, innovate and break through relevant core technologies, increase the application of intelligent construction in all links of engineering construction, and form an intelligent construction industrial system integrating the whole industrial chain including scientific research, design, production and processing, construction assembly and operation." guiding opinions The core of is the coordinated development of intelligent construction and building industrialization. The construction of intelligent construction platform covering all participants in the assembled industrial chain is a solution and effective practice in response to collaborative development. This paper consists of the following parts. The first part introduces the relevant background and significance of this paper, the second part is the related work of this paper, and the third part is construction of assembled intelligent construction platform under the background of artificial intelligence. The fourth part is a pplication of assembly construction in intelligent construction under the background of artificial intelligence. The fifth part is conclusion.

2 RELATED WORK

In this paper, we aim to application of assembly construction in intelligent construction under the background of artificial intelligence.

You m et al. proposed preliminary exploration and future prospects of literary works appreciation under the background of artificial intelligence[1]. Zhu z proposed composition of online teaching and academic ability under the background of artificial intelligence and html[2]. Zhao x et al. proposed a study on the application of blended teaching to english reading course under the background of artificial intelligence[3]. Zhou g proposed research on the problems of enterprise internal audit under the background of artificial intelligence[4]. Meng q proposed research on the application of computer network technology under the background of artificial intelligence cloud technology[5]. Li f proposed cultivating creative talents of digital media art under the background of artificial intelligence[6]. Liu s proposed "iot plus" and

intelligent sports system under the background of artificial intelligence - take swimming as an example[7]. Xie w proposed the development of financial intelligence driven by financial technology in the background of artificial intelligence[8]. Liu j proposed artificial intelligence technology in computer network under the background of internet[9]. Si d et al. proposed artificial intelligence advances for de novo molecular structure modeling in cryo-em[10].

2.1 Basic concepts of intelligent construction

Intelligent construction refers to making full use of intelligent technology and related technologies in the construction process, improving the intelligent level of the construction process through the application of intelligent systems, reducing dependence on people, achieving the purpose of safe construction and improving the cost performance and reliability of buildings. It is also defined by other scholars as "A management concept and mode that takes advanced technologies such as building information model and Internet of things as means, aims to meet the functional needs of engineering projects and the individual needs of different users, build an intelligent environment for project construction and operation, and effectively improve and manage all processes in the whole life cycle of engineering projects through technological innovation and management innovation. This definition covers Three aspects are: ① the purpose of intelligent construction, that is, to improve the intelligent level of the construction process; ② the means of intelligent construction, that is, to make full use of intelligent technology and related technologies; ③ the manifestation of intelligent construction, that is, through the application of intelligent system. Intelligent construction is one of the effective ways to solve the low efficiency, high pollution and high energy consumption of the construction industry, which has been proposed and implemented in many projects Therefore, it is necessary to summarize the characteristics of smart construction. Smart construction covers three stages of construction project design, production and construction. With the help of advanced information technologies such as Internet of things, big data and BIM, it realizes the data integration of the whole industry chain and provides support for the whole life cycle management.

2.2 *Reasons for creating fabricated platform*

At present, China has gradually attached importance to the application of BIM Technology, but it has not changed the basic situation of the domestic construction industry. The information transmission of the owner, design institute and construction party is mainly in the traditional way. The information exchange and transmission in the construction industry is mainly based on drawings, while BIM relies on the information model and information application technology platform. Under this background, prefabricated buildings The whole industry chain intelligent construction platform (hereinafter referred to as the platform) establishes a unified standard, unified platform and unified management, and relies on BIM Technology and information technology to open up the whole process of assembly project design, production, transportation, construction, operation and maintenance and supervision, so as to realize the "standardization, industrialization, integration and intelligence" of assembly industry During the construction of the platform, unified application specifications and standards have been established, paving the way for the smooth use of all parties in the industrial chain.

3 CONSTRUCTION OF ASSEMBLED INTELLIGENT CONSTRUCTION PLATFORM UNDER THE BACKGROUND OF ARTIFICIAL INTELLIGENCE

3.1 *Standardized design*

Standardization and modularization are one of the core means to greatly reduce the cost of building industrialization. Domestic experts and scholars have done some research on the standardization of prefabricated buildings. Wang Changxing proposed that we should vigorously support the batch development of parts, and the batch development of parts must first be standardization. Zhang Shoufeng proposed that standardization is the premise and can be improved in building industrialization Ye Haowen and others believe that standardized design is not equal to standard design, and a series of standard basic units need to be formed into diversified construction products through module coordination and module combination.

The establishment of platform standardization system is to open up all links of prefabricated building design, production, construction, operation and maintenance and supervision through unified data standards and standard parts library, so as to realize the rational allocation of resources. By formulating BIM data delivery standards and component classification and coding standards applicable to the whole process of prefabricated building, standardize the creation of BIM model in the whole life cycle of prefabricated building Delivery and classified storage, guide the standardization and generalization of all relevant parties of prefabricated buildings in design, construction application, production, construction and other links, and meet the completeness and accuracy in the process of data exchange.

Based on cloud services, the platform establishes an open parametric prefabricated parts BIM model database and database management system, forms a data information channel upstream and downstream of the industrial chain, meets the Internet collection, storage and intelligent retrieval of BIM models of large prefabricated building prefabricated components, and makes the standard prefabricated components become the basic unit of standardized design, production, transportation and installation Cross discipline, multi-user interoperability and data integration update on the unified system.

3.2 *Intelligent design system*

The enterprise side of the platform provides a professional prefabricated architectural design system. Based on BIM Technology, the system covers the whole process of the whole discipline, and realizes the functions of intelligent component splitting, assembly rate calculation, full discipline collaborative design, component deepening and detail design, collision inspection, material statistics and so on, as shown in Figure 1. At the same time, it can call the standardized component library and directly connect the design data Force to the production and processing equipment, effectively improve the design efficiency and reduce the cost.

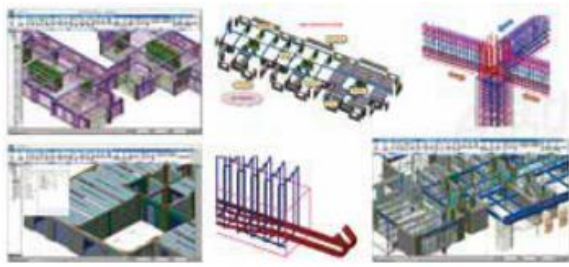


Figure 1 Prefabricated architectural design system

The software has the advantages of simple operation, fast running speed and accurate calculation results. Improve the design quality, seamlessly check the wiring diagram review system (Figure 2), generate the review report with one click, and the feedback information of problem inspection is clear at a glance. For example, a single building generates the review report through the online review system to realize automatic inspection. It is found that 5 do not meet the specification requirements and 16 have general errors.



Figure 2 Drawing review system

Integrated design to avoid mistakes, omissions and defects caused by secondary deepening design. Pkpm-bim deepens the design data to directly generate BOM production data, which is used for component processing and production, and the design and production data are integrated. Intelligent design software is used to empower design enterprises, greatly improve design efficiency, generate design drawings with one click, and effectively reduce design cycle. The number of personnel invested in deepening design is reduced by more than 50% and the construction drawing design cycle is reduced by more than 60%.

3.3 Production enabling

Provide assembly smart factory management platform in the production stage, and digital production is an important part of the building industrialization system. Through the unified BIM collaboration platform, strengthen the collaborative management between component factories and assembly design and assembly construction sites, and realize the collaborative production between multiple projects and multiple factories, so as to achieve the objectives of reducing costs, optimizing inventory, improving efficiency and adaptability, reducing human operation errors and improving product quality.

After one click drawing based on pkpm-pc design software, the project can directly import the design results such as BIM model and deepening drawings into the enterprise side production system, and automatically generate production BOM data such as component list and bill of materials without manual statistics and input, and greatly ensure the accuracy of the data. At the same time, the system can directly display the design information such as BIM model, prefabricated component model and production and processing drawings of the whole building, so as to directly and accurately guide the production. According to the production plan, each component will generate an exclusive component QR code label before production. The production management personnel can directly scan the code through PDA, mobile phone and other mobile devices to complete the real-time collection of production data in various stages such as concealed inspection, pouring and finished product inspection. The smart factory system updates the production data of each stage in real time and interfaces with the government side platform in real time to realize the transparency of supervision and traceability of component information in the whole process of component production. The system integrates sensor, radio frequency identification (RFID), two-dimensional code identification and other Internet of things technologies to realize the docking of the system with various plant equipment such as mold platform, steam curing kiln, mixer and distributor, realize automatic data transmission and equipment automatic control, and promote the intellectualization of plant component production.

The production system can count the production status of components in real time. The specific status of each component, such as pending production, production, ware-

housing and outbound, can be seen at a glance in the system. At the same time, the production system makes real-time statistics on the project production completion progress and the daily production information of the factory, and visually displays it through the BIM model. Factory managers can intuitively and dynamically understand the overall production progress of the project and the factory capacity.

The production system starts with the control of various raw material procurement and semi-finished product production and processing, strictly controls the approval of material warehousing and material outbound, and implements centralized procurement and quota picking. Warehouse managers can master the inventory and use of production materials in real time through the system, effectively avoid the increase and waste of production cost caused by wrong picking, multi picking and shortage, and realize the refinement of cost management. Focusing on factory production management, the smart factory management platform integrates the links of prefabricated architectural design, materials, production and construction upstream and downstream, promotes the optimal allocation of resources in the industrial chain in the form of "building + Internet", and provides a public platform for the combination of technology, economy and market in the construction industry.

4 APPLICATION OF ASSEMBLY CONSTRUCTION IN INTELLIGENT CONSTRUCTION UNDER THE BACKGROUND OF ARTIFICIAL INTELLIGENCE

There are many problems in the field construction of prefabricated concrete buildings. Some of these problems affect the structural quality, such as uneven joint of components, inadequate adjustment of levelness and verticality, etc; Some problems lead to the delay of construction period, such as unreasonable storage yard arrangement, improper construction organization, etc; Some problems lead to increased costs, such as excessive selection of crane model, etc. Through BIM system, component model data and smart site related technologies on the construction site, these problems can be effectively solved to realize yard optimization, hoisting simulation and management, component visual pre assembly and installation

process simulation, progress coordination and management control, quality supervision based on Internet of things, etc. in the process of prefabricated building construction, as shown in Figure 3.



Figure 3 Intelligent construction management system of prefabricated building

The intelligent construction management system can demonstrate the overall construction process and assembly construction process of the project through 3D simulation construction. On site managers and constructors can view the construction simulation animation and special construction scheme at any time in the system, clearly and intuitively understand the control points of key processes and key nodes, and optimize and adjust the construction scheme in time. It effectively avoids the disadvantages that problems can only be found in the actual operation in the traditional construction, and is of great help to improve the construction quality, reduce the safety risk and reduce the rework rate.

In terms of progress monitoring, by scanning the QR code identification of components, the construction site management personnel can collect the data of components from mobilization to construction completion in real time, and synchronously feed back to the construction system for dynamic update. On the other hand, the construction system associates the progress information with the BIM model to visually display the project progress and completion status. At the same time, the system can also dynamically compare the actual progress with the planned progress, so that the project management personnel can more intuitively understand the project progress deviation and issue progress early warning in time. Through the linkage of on-site monitoring, mechanical equipment safety monitoring, environmental monitoring, major hazard source monitoring and other equipment, the on-site information is collected and transmitted to the construction system in real time. The enterprise managers can remotely and in real time master the on-site situation and supervise the on-site safe and civilized construction, which is of great help to timely discover potential safety

hazards, investigate major hazard sources and reduce the incidence of safety accidents.

5 CONCLUSION

The intelligent construction platform of the whole industrial chain of prefabricated buildings provides a strong enabling system for all participants. For the designer, intelligent, standardized, rapid scheme design and one click drawing greatly improve the efficiency. At the same time, it can directly connect with the government review platform and deliver the review with one click. For the manufacturer, directly connect with the design information, quickly arrange the production, obtain the construction progress information, reasonably arrange the production plan, avoid the pressure of the storage yard, realize data-driven production and realize the production in the factory with no or few people. For the construction party, it can understand the factory production progress in real time, intelligently optimize the component storage yard and dynamically update the construction progress. For the government, it can realize the real-time supervision of the whole process information, trace the process, and provide the ability of big data analysis and dynamic alarm.

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