Research on the Application of BIM Technology in Virtual Construction of Prefabricated Building under Computer Environment

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Abstract. With the rapid development of computer technology, BIM has become the most common tool in the construction industry, which occupies an important position in the virtual construction of Prefabricated building (hereinafter referred to as PB). Through the establishment of virtual construction engineering model, we can provide a complete construction engineering information base combined with digital technology. In the virtual construction of construction engineering, we can check the collision through BIM. At the same time, through BIM, we can carry out 3D model drilling of virtual construction. Through collaborative management, we can improve the production efficiency, which will save the cost and shorten the construction period. At present, the application of BIM in China is still in the exploratory stage, which requires us to give full play to BIM Technology. Through the Revit software, this paper simulates the construction site, buildings, tower crane, secondary masonry, etc., which can make the application of PB more clear. Firstly, this paper analyzes the related concepts. Then, this paper analyzes the application of BIM in the virtual construction of PB. Finally, some suggestions are put forward.

Keywords: Internet of Things, Library, Books and Materials, Long-Term Preservation

1. Introduction
With the continuous development of China's economy, people's living environment and living place requirements are higher and higher, which requires us to constantly improve the level of the construction industry, especially PB [1]. In PB, BIM has become the most commonly used tool, which constantly improves the safety and coordination of construction. BIM has been applied to the whole life cycle of PB, which improves the ability of information sharing and collaborative processing [2]. With the rapid development of BIM, many countries have developed a series of application software to support BIM architecture platform. For example, the building platform developed by halfwary in Canada integrates the functions of project management, graphic editing, component statistical budget, etc. Bdis, developed by Salford, UK, realizes the future development direction of digital city construction. BIM can be used in many kinds of construction operations, such as collision detection,
construction schedule simulation and so on, which has been widely recognized in the market. Through the visual model, we can simulate the design layout, construction conflict and component collision, which will improve the construction speed of PB [3].

2. Related concepts

2.1. Common prefabricated components

We need to build a library of prefabricated components, which is the focus of BIM PB design. Through the prefabricated component library, we can extract component information at design time, which has the characteristics of standardization and generalization. Standardization requires that the size information of components meet certain modulus, which will be more convenient for the processing and production of components. Generalization can meet the requirements of a variety of buildings [4]. In the production stage, we can enter the information expansion area of prefabricated components. Through vr virtual design platform, we can transform 3D model into spatial model, which will realize virtual roaming. PB can complete the design of the model room in the virtual design platform, which can improve the experience effect of the observer [5]. Common precast elements are shown in Figure 1.

![Figure 1. Precast elements are commonly used.](image)

2.2. Features of PB

PB is the final product of construction industrialization, which is a manufacturing method through standardized design and factory production. Through assembly construction, the production mode of traditional construction industry will change greatly, which has very obvious characteristics, as shown in Table 1.
Table 1. Main features of PB.

| NO. | Characteristic            | Task description                                                                 |
|-----|---------------------------|----------------------------------------------------------------------------------|
| 1   | Environment protection    | 1) Through mechanized production, the installation is carried out on the construction site.  
       |                            | 2) Reduce wet work.                                                              |
|     |                           | 3) Reduce a lot of construction waste.                                           |
| 2   | Energy conservation       | 1) The wall has a prefabricated insulation layer.                                |
|     | Shorten the construction  | 2) Reduce energy consumption.                                                    |
|     | period                   | 1) It has changed the traditional method of on-site pouring.                     |
|     |                           | 2) A large number of processes are reduced.                                      |
| 3   |                           | 3) The work intensity of the construction site is reduced.                       |
|     |                           | 4) The overall construction period is shortened.                                 |
| 4   | Reduce labor costs        | 1) High degree of mechanization.                                                 |
|     |                           | 2) Reduce field operation personnel.                                             |
|     |                           | 3) Save a lot of labor costs. Improve the construction efficiency.               |
| 5   | Security                  | 1) Improve the working environment of workers.                                  |
|     |                           | 2) Avoid casualties during construction.                                         |

2.3. Concept of Virtual Construction Technology

This virtual environment is a kind of construction process based on virtual environment. Through 4D and 5D technology, we can carry out simulation analysis in time, space, safety and other aspects through virtual construction [6]. Through the visual simulation of the real construction project construction scheme, we can carry out feasibility demonstration before the project starts. By simulating the complex structure, we can guide the actual site construction, as shown in Figure 2.

![Figure 2. Virtual construction flow chart of PB.](image)
3. Virtual construction of PB based on BIM

3.1. Collision simulation
Through BIM, we can improve the design efficiency, which will reduce the occurrence of errors. In the project, we may encounter the problem of collision between various disciplines, which will call on all professionals to consult [7]. Through BIM, we can build relevant models. Through the collision detection, we can find the design problems, which is more convenient to modify in time. Figure 3 shows various virtual construction collision situations.

![Figure 3. Virtual construction collision.](image)

3.2. Construction simulation
During the hoisting of prefabricated wallboard on site, we are easy to find some problems, such as large deviation of reserved inserting position, inaccurate height of reserved joint bar, omission of reserved joint bar, large deviation of hoisting axis and large deviation of installation elevation of prefabricated wall panel. Therefore, in the construction site, we must ensure the rationality of component hoisting sequence arrangement. In the process of hoisting, the collision of wallboard will cause the change of wallboard position. Through the Revit software, we can simulate the construction of the model [8]. Finally, by importing the DWG file into NavisWorks, we can make construction simulation animation, as shown in Figure 4.
3.3. Dynamic simulation of construction process
In the control of schedule, the dynamic simulation of construction process is a very important function. After the project plan is made, the dynamic simulation function can simulate the project schedule in three dimensions according to the schedule. Through construction simulation, project managers can control the progress of the project in the whole process, which can clarify the overlapping relationship between the overall situation of the project in different stages. At the same time, according to the dynamic simulation process, we can adjust the plan appropriately. Through the dynamic simulation function of the construction process, we can carry on the three-dimensional dynamic observation to the modified model. Through the dynamic simulation of the construction process, BIM can assist the planner to modify the plan, which will reasonably arrange the project work and exit plan. By giving the construction personnel a more comprehensive understanding, we can help them to complete the construction tasks more efficiently and accurately, which will reduce rework and avoid construction delay.

4. Conclusion
Through BIM Technology, PB construction can improve the design efficiency, which will help the visual production of components. By ensuring the collision inspection of virtual construction, we can find problems in advance, which will improve the progress, cost and safety control of the whole construction. BIM plays an important role in virtual construction of PB, which requires us to strengthen intelligent construction.
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