Research on the Application of Computer BIM Technology in Geotechnical Engineering

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Abstract. BIM Tech on account of its three-dimensional, intuitive, visual, reconfigurable and other aspects of the typical characteristics, has gained more and more attention in the field of architecture and civil engineering, and obtained more in-depth research and application. On account of this, this paper first analyses the concept of IM tech and its utilization value, then studies the specific utilization of computer BIM Tech in geotechnical engineering, and finally gives the utilization strategy of computer BIM Tech in geotechnical engineering.

Keywords: BIM Tech, Geotechnical Engineering, Utilization

1. Introduction

With the development and maturity of computer tech, it has been widely and deeply researched and popularized in many fields, especially the utilization of BIM Tech as representative computer related software and hardware tech in geotechnical engineering has greatly accelerated the design and development level of geotechnical engineering. On account of the typical characteristics of stereo, intuitive, visual and reconfigurable, BIM Tech has been studied and applied in the field of architecture and civil engineering. Geotechnical engineering involves many materials and links that need to be developed and designed. This requires the integration of BIM Tech and geotechnical engineering, so as to realize the scientific modeling of geotechnical management, to build a three-dimensional info model, and to ameliorate the utilization depth of BIM Tech in geotechnical engineering.

BIM Tech has several utilization advantages and typical characteristics as shown in Figure 1 below. Its utilization in the field of geotechnical engineering can greatly ameliorate the level of geotechnical engineering development, design, construction, management and operation and maintenance. The use of BIM Tech to store the structural info of geotechnical engineering into the database can ameliorate the visualization of the whole process and the whole link of geotechnical engineering, and bring users more intuitive info experience. BIM Tech realizes the coordination of geotechnical engineering by means of the function of computer info sharing, especially the development of functional modules suitable for geotechnical engineering by BIM Tech, which can realize the efficient development of many links of engineering management.

In addition, geotechnical engineering will produce a lot of data and info in the relevant work links and processes, which need to be processed and analyzed. The use of BIM Tech can significantly reduce the potential risks in all aspects of geotechnical engineering; realize the efficient flow and
sharing of info and resources, and reduce the cost of info communication and the waste of resources and materials. With the help of the three-dimensional operation mode of BIM Tech, the info of geotechnical engineering can be displayed visually, which can effectively ameliorate the quality and efficiency of geotechnical engineering management. It can be seen that the in-depth utilization of BIM Tech in geotechnical engineering is in line with the development goal and concept of green engineering and it is the trend of geotechnical engineering research and utilization in the future.

In short, with the increasing complexity of geotechnical engineering, the efficient operation of its whole life cycle and process is increasingly inseparable from the support and assistance of BIM Tech [1]. The utilization of BIM Tech in geotechnical engineering can not only accelerate the reconstruction of its value chain, but also enhance the scientificity and rationality of the feasibility analysis of geotechnical engineering development, so as to enhance the market competitive position of civil engineering enterprises and the establishment and acquisition of competitive advantages. Therefore, it is of great practical value to study the utilization of computer BIM Tech in geotechnical engineering.

![Figure 1. Utilization advantages and typical characteristics of BIM Tech](image)

### 2. The concept and utilization value of BIM Tech

#### 2.1. The concept and characteristics of BIM Tech

As a geotechnical engineering info process on account of 3D digital tech, the whole project is modeled through multiple info databases, including various info and parametric models [2]. BIM Tech model can build an integrated and digital engineering model for geotechnical engineering related units, including design, construction and construction parties. The utilization of BIM Tech in geotechnical engineering can provide a comprehensive collaborative platform for project decision-making, bidding, construction and operation and maintenance, so as to accelerate the effective management of geotechnical engineering projects in all stages. In addition, because the info model on account of BIM Tech is completely digital, various engineering info of the model can be modified and added at any time in different stages of its use process, so as to meet the various needs of geotechnical engineering projects.

#### 2.2. Typical characteristics of BIM Tech

BIM simulates the real info in all links of geotechnical engineering through digital info simulation, mainly including several aspects as shown in Figure 1 below. BIM Tech constructs the info model of geotechnical engineering through digitization, and establishes a single, complete and consistent engineering logic info database. Secondly, BIM Tech also includes the design scope, schedule and cost info of geotechnical engineering, and can ensure the integrity, accuracy and coordination of the info [3]. By keeping the info constantly updated and providing scope in the integrated digital environment, all parties involved in geotechnical engineering can have a clear understanding of the project. It can be seen that BIM Tech can make the process of geotechnical design, construction and management more transparent, the decision-making process more scientific, and the quality of geotechnical engineering project more reliable.
2.3. Utilization value of BIM Tech in geotechnical engineering

The 3D solid model of geotechnical engineering is directly generated by BIM Tech, which runs through all stages of the whole life cycle of geotechnical engineering, and is shared among construction enterprises involved in the project [4]. The utilization of BIM Tech in geotechnical engineering can make the relevant parties more clear about their responsibilities and status. As shown in Table 1, BIM Tech is constantly ameliorated among the relevant parties in the whole geotechnical engineering industry from upstream to downstream, so as to realize the info management of the whole life cycle of geotechnical engineering projects and maximize the value of its utilization.

In addition, the visualization characteristics of BIM Tech can realize that all activities and links of geotechnical engineering are carried out in the visualization state. The coordination feature enables it to solve the multi-party coordination problem. The simulation feature is to express the state of geotechnical engineering by design analysis simulation, and to simulate various states efficiently, which provides the basis for info decision. The optimization features can optimize the project plan, special design and limit of geotechnical engineering, so as to make the design scheme clearer.

Table 1. Connection content of related parties in geotechnical engineering under BIM Tech

| Stakeholder          | Position and working contents                                      |
|----------------------|---------------------------------------------------------------------|
| Designer             | Generate 3D solid model                                             |
| Structural side      | Material strength calculation                                        |
| Equipment side       | Energy, acoustics, optical analysis                                  |
| Construction party   | Concrete type and reinforcement info                                |
| Developer            | Project cost budget and product order                               |
| Property owner       | Visual property management                                          |

![Diagram](image_url)

Figure 2. The content of BIM is simulated by digital info simulation

3. Utilization of computer BIM Tech in geotechnical engineering

3.1. Utilization of BIM Tech in different stages of geotechnical engineering

The utilization of BIM Tech in geotechnical engineering runs through the whole life cycle of geotechnical engineering, including bidding, design, construction and operation [5]. In the bidding stage of geotechnical engineering, the visualization features of BIM Tech are used to help the owner to choose the final scheme. Secondly, in the design phase, the utilization of BIM Tech can establish features on account of 3D model to refine the design scheme. In addition, in the construction stage of geotechnical engineering, BIM makes it possible to use the time-based and capital flow based construction management in practical engineering, which makes the management tech of geotechnical engineering possible. In the operation stage of geotechnical engineering, the utilization of BIM Tech can establish a true geotechnical engineering info model, and realize the rapid location and solution of engineering problems.

3.2. Utilization advantages of BIM Tech in geotechnical engineering
Using BIM Tech can make the designers of geotechnical engineering management abandon the traditional two-dimensional drawings, and directly build an intuitive, three-dimensional 3D model, which greatly expands the visual display of the whole engineering form [6]. The free form of engineering is no longer limited to the imagination of designers, but digital construction to realize the modeling of special geotechnical engineering. Secondly, the engineering model established by BIM Tech can be processed by computer, which makes the communication and sharing channels of resources and info more smooth, and makes the info represented by geotechnical engineering material info, process equipment info and cost info better optimized and shared [7]. Moreover, the utilization of BIM Tech can significantly reduce the changes in geotechnical engineering, make the conflicts and collisions between equipment appear intuitively, facilitate the inspection of relevant parties, so as to avoid the waste and cost increase caused by the rework of the project.

In addition, BIM Tech makes the design modification of geotechnical engineering more convenient, which can automatically coordinate and modify various modifications in the project, eliminate the errors in coordination, and ameliorate the overall quality of work [8]. In the construction stage of the life cycle of geotechnical engineering, BIM can provide the quality, progress and cost info of the project at the same time, realize the direct display of the info needed in the construction process, such as the bill of quantities, budget, material preparation in each stage, and realize the visual simulation and management of the construction cycle.

4. Utilization strategy of computer BIM Tech in geotechnical engineering

4.1. Utilization strategy of BIM Tech in geotechnical engineering
The utilization of computer BIM Tech in all aspects of geotechnical engineering mainly includes geotechnical engineering exploration, geotechnical engineering design, geotechnical engineering construction and geotechnical engineering monitoring [9]. In the exploration stage of geotechnical engineering, BIM Tech is mainly used to carry out the construction of 3D structure and 3D geological model of geotechnical engineering. In the design stage of geotechnical engineering, BIM Tech is used to build the engineering component model and visualize it, so as to realize the virtual display of design scheme and ameliorate the efficiency and level of scheme design.

In addition, in the construction stage of geotechnical engineering, the use of BIM Tech can effectively control the quality of engineering projects, and achieve real-time dynamic management. In the monitoring stage of geotechnical engineering, BIM Tech can be used to timely understand and analyze the status of the project site, timely adjust the scheme, and ameliorate the quality of the project.

4.2. BIM based value chain model of rock engineering info
The utilization of BIM Tech in geotechnical engineering on account of geotechnical engineering investigation is the establishment and effective utilization of 3D geological model [10]. The utilization in geotechnical engineering design is on account of the same BIM platform with the help of its collision detection function and visual inspection to strengthen the connection and cooperation of various specialties. In addition, on the basis of the basic structure of geotechnical engineering info value chain, the central database and network platform on account of BIM model and sub model are established to reorganize the process of geotechnical engineering participants and each stage of work, and realize the visualization of info input and output end and process domain of info value chain.

5. Conclusion
In summary, using BIM Tech to store the structural info of geotechnical engineering in the database can ameliorate the visualization degree of the whole process and link of geotechnical engineering, and bring users more intuitive info experience. This paper analyzes the utilization value of BIM Tech in geotechnical engineering by studying the concept and utilization value of BIM Tech. Through the analysis of the utilization value of BIM Tech in geotechnical engineering, the utilization advantages of
BIM Tech in geotechnical engineering are studied. Through the study of the utilization strategy of computer BIM Tech in geotechnical engineering, the paper analyzes the construction strategy of the info value chain model of rock mass engineering on account of BIM.

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