The Application of Computer-based BIM Technology in Garden Architecture Design

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Abstract. With the development of computer technology, all walks of life have begun to combine computer technology for industry development, including the garden industry. The garden industry mainly uses computer-aided technology for garden design. The main technology currently used in garden planning and design is BIM technology. It is an important means to achieve two-dimensional construction drawings and three-dimensional landscape models in garden planning and design.

Keywords: BIM, Landscape Architecture Design, Three-Dimensional Model

1. Introduction

At present, the relationship between garden construction and people's life is very close. And the development of the garden industry affects the social economy. First of all, we should attach great importance to the construction of urban gardens during urban construction. Secondly, we must apply computer technology to garden construction reasonably. In this way, technology can effectively check and improve many shortcomings and loopholes in the construction process. Finally, when building a garden, we should not only pay attention to the construction planning, but also the artistic aesthetics of the garden construction. These problems are quite special, so it is necessary to continuously improve the support of computer technology in garden construction [1].

2. The meaning of BIM technology

Building information model refers to a new type of computer technology newly developed by the construction industry after computer-aided design. This technology can set up a three-dimensional model with all the information. The spatial information, material information and equipment information of the building, as well as the relevant information of the building or the staff, will be in this model. This model has a relationship with the entire project life cycle. Certain connections, including planning and
design, construction and operation, and maintenance and protection, can effectively complete conflict detection and cost management, strengthen the control of progress, and provide more reliable guarantee for operation management [2]. Designers can share this data model, and use this model to effectively complete information exchange and information sharing.

2.1. Visual 3D model

BIM technology does not rely on the general two-dimensional form of horizontal and vertical section to display. The three-dimensional model established using BIM technology can show more comprehensive information to relevant personnel.

2.2. Digital information

Three-dimensional BIM contains a lot of information, and this information can be calculated. For example, ordinary engineering cost is the manual calculation of relevant engineering quantities by the cost staff according to the drawings. BIM technology can not only pre-input the relevant construction attributes for 3D BIM, but also calculate the engineering quantities and engineering costs independently to facilitate cost management [3]. Not only that, but also use the information of building components to carry out quality management and simulate the entire construction process.

2.3. Full life cycle management

The role of BIM technology in different periods of the project is also different. The control personnel and management personnel need to maintain the The end of the journey. The whole process of building development includes planning period, design period, construction period and maintenance period. After the analysis of the site is completed during the planning period, the relevant surveyor needs to propose a unified surveying and mapping result, and the designer needs to use this model to in-depth design. The results obtained also need to be communicated to the relevant construction personnel in a standard format, and then the three-dimensional model is used to carry out the later management work. The information included in one link will provide reference for the next link, so it is necessary to strengthen the connection with each period [4].

2.4. Working together

BIM technology can integrate the information of the whole process of building development and set up engineering data sources. All participants can use this model to obtain relevant information. Then they need to improve their own work and information, so that the participants The connection becomes closer.

3. Application of bim technology in landscape architecture design

At present, the software used in garden planning and design is still very few, and most of them are limited to the establishment of plant database. Among the established plant databases, most of them stay at the stage of pure storage and extraction of information and data, and rarely cooperate with graphics and images at the same time. The most regrettable thing is that the design process and design drawing are not integrated. Coordinate the analysis and processing of operational information with design information. The software commonly used to draw garden drawings can be roughly divided into two categories: plan drawing software and performance drawing software. At present, the mainstream design
software includes AutoCAD and drawing software based on its secondary development. 3DS MAX, SketchUp, Photoshop, 3D landscape, etc., have not yet combined the advantages of various software, based on an independent graphics platform. And can convert two-dimensional Design and three-dimensional design system-in the same-professional garden design software under the circle platform. "Good garden" Garland landscape design software (hereinafter referred to as "Garland") uses a pure Chinese three-dimensional graphics platform with completely independent intellectual property rights, and closely integrates two-dimensional design and three-dimensional design. The software uses general modeling, terrain design, Planning design and planting design are the main content, integrating architectural modeling and road design. While completing the graphic design, Open-GL dynamic browsing of the site can be carried out, and real-time friendship and 3D simulation animation can be produced in real time. Display in all directions and multiple angles.

3.1. Topographical design

Terrain is one of the four major elements that constitute a garden entity. It is the skeleton of the entire garden landscape. In modern garden design, the original terrain is reshaped, which can enhance the landscape effect of local areas and increase the scale of greening. Improve the garden microclimate and increase Large surface area, control the sight of visitors, etc. In terrain design, the establishment of terrain, terrain analysis and terrain transformation are the basic steps to complete terrain design [5].

The use of "Garland" software can quickly and effectively solve various problems encountered in terrain design. The terrain design module in the Garland landscape design software of "Jiayuan" includes the steps of guiding current data, establishing terrain, terrain analysis, terrain transformation and earthwork calculation. Firstly, the original terrain and landforms are simulated by three-dimensional data, and the terrain grid is generated, as shown in Figure 1. Then, according to the design requirements of the scheme, the rationality of the terrain's orientation, slope, and current height is analyzed, as shown in Figure 2. Finally, according to the analysis results, the terrain modification plan and the plant configuration plan are designed, and the earthwork calculation is carried out at the same time, as shown in Figure 3 [6].

![Figure 1. Three-dimensional terrain](image-url)
3.2. planning and design of landscape

Landscape planning and design refers to the overall consideration and design of surrounding environmental elements in the process of architectural design or planning and design, including natural elements and artificial elements, making the building and the natural environment have a corresponding relationship, making it more convenient and comfortable to use. Improve its overall artistic value. The content of landscape design varies greatly depending on the starting point. Large-scale river basin management. Most of the overall urban planning is from the geographical and ecological point of view, medium-scale theme park design. Street landscape design often starts from the perspective of planning and gardens, and the area of relatively small city squares and community green spaces. Even Residential courtyards are based on detailed planning and architecture, but there is no doubt that these projects involve landscape factors.

4. Specific application of BIM technology in landscape architecture design

The following will be related to the actual situation to introduce the specific use of BIM technology in landscape design work. There are many landscape architecture design software, and the use of the design software includes the following parts:

(1) From the beginning, it is to carry out operability analysis. The main purpose is to collect and organize data. For example, in the process of constructing garden waterscape, it is necessary to clarify what kind of waterscape to choose, so it is necessary to fully grasp the geographical situation and soil conditions of this area, You can choose the method of sampling analysis, and then the relevant staff need to record the obtained information into the computer system [7]. Use the computer virtual system to
complete the data sorting work, and finally use the BIM technology to upload the relevant information to the simulation system, use the computer to simulate, and finally make relevant judgments.

(2) For the design of topography, it is necessary to fully grasp the geographic information in the early stage, and then choose the most suitable topography for landscape garden construction to carry out the design work. Since the topography is more important for the garden construction, it will directly affect the overall garden construction. It is necessary to attach great importance to this work in garden design. In the landscape design topography, the design includes the collection of topographic survey data, the setting of 3D topographic maps, and the calculation of earthwork. When using the design software, it is necessary to record the relevant terrain data, establish a three-dimensional model, and then conduct research and improvement according to the relevant design requirements, and finally carry out the earthwork calculation.

(3) Conceptual design and overall planning and design. Conceptual design is to link the known survey results with the topographical framework, and then improve the overall garden design work. By using BIM technology, the design manuscript can be fully displayed and can be found in time. Existing problems, and propose countermeasures to solve the problem [8]. The second point is to be able to complete the visual reality, and enhance the creative inspiration, complete the modification and creation. As for the content of the overall planning, BIM technology needs to be used to generate buildings, roads or rest places, and finally a more reasonable planning and design from all angles.

5. Application of BIM technology in garden planning and design

5.1. Case overview

Take a project as an example. Within the red line of the central green space, there are three levels of urban infrastructure underground, and the ground is a park. This project not only needs to meet the basic functional requirements, but also needs to start from the level of public space and green infrastructure, and adhere to the principles of openness and publicity. Because of the complex spatial form, it is difficult to meet the accuracy requirements using traditional garden planning and design methods. Based on this, it is proposed to use BIM technology, build a BIM model, and formulate planning and design work methods. Now combine engineering practice to analyze the specific application of BIM technology.

5.2. Digital Technology Environment

In the planning and design of this project, Rhino and REVIT are combined. In the specific operation process, use Rhino to construct complex curve and surface models; use REVIT to virtualize, verify and transmit information related to landscape construction to ensure the accuracy of complex shapes.

5.3. Build a collaborative platform

Based on the garden planning and design of BIM technology, the collaborative platform constructed mainly includes software environment, file system and geometric control system, etc., to realize information sharing and real-time transmission between various professions and personnel, and to improve information transmission and exchange efficiency. The core of this platform is the geometric control system. In the design, by defining the architectural grid + coordinate system as the basic control line of the garden landscape, using the architectural grid to accurately define the relationship between
the landscape and the architectural plane. Using the landscape model, it can be assembled accurately according to the grid and building model. In addition, the corresponding relationship between geodetic coordinates and relative coordinates was constructed, and the coordinate system was used to define the direction of the square and the road. Vertically, realize control according to elevation and relative elevation. The use of geometric control system definitions can comprehensively describe the control framework of landscape elements, so that such data information can be accurately defined in the three-dimensional landscape by means of vectorization [9].

5.4. Optimized design

Based on BIM technology, the planning and design of gardens can optimize the design plan. The garden planning part of this project relies on BIM technology for waterscape optimization. In this project, the waterscape is set on the east side of the site, showing a state of being large and small. It falls into the underground waterscape dark pool from east to west, and two sets of drop troughs are arranged on the falling slope, which is step-shaped. On the north and south sides of the waterscape, steps are set up to guide the flow of people into the underground space [10]. The L-shaped curbstone pool collects the curbstones and slides down the waterscape smoothly. Using BIM technology, the design steps are as follows:

1. Optimize the falling water surface to make it a smooth curve, and then make it a monorail scanning surface.

2. Use single-size granite to fit the falling surface. By repeatedly adjusting its size, it can ensure the landscape effect after fitting and avoid the folding surface on its surface.

3. The designed L edging stone, which buckles the water collection ditch and pipeline underneath, can locate the position of the edging stone according to the optimized falling surface of the waterscape.

4. The north-south steps and the L-shaped curbs are vertical curbs. Based on the actual positions of the curbs, the specific layout positions of the steps are deduced and a step model is constructed.

5. Optimize the edging stone so that it becomes a three-dimensional straight line segment, and the remaining part becomes a smooth curve. Construct a solid three-dimensional model for simulated cutting.

6. Import all models into the REVIT software, send them to the factory for processing, and use them for on-site installation guidance.

6. Conclusion

How to apply BIM technology to garden construction more proficiently and reasonably is still a problem, this problem needs to be strengthened continuously. In this information age, if you want continuous development, you must learn to use computer technology first. Only in this way can we make mutual progress with society. I believe that our country's garden industry can use computer technology proficiently in the future, the development prospects are broader and the development is faster.

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