Application Research of Computer Aided Architectural Design Based on BIM Technology

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Abstract. This paper summarizes the development and application experience of computer aided design software for control system. Discusses how to arrange interaction with users with extensive experience. This includes question and answer dialog boxes using macro tools and different types of menu driven systems. A set of software packages for modeling, identification, analysis, simulation and design are described. The problems related to architecture, portability, and maintainability and extensible are discussed. Experience in developing and using software packages in teaching and industrial environments.

Keywords: BIM, Computer Aided Design, Architectural Technology

1. Introduction
With the continuous improvement of information technology, computer BIM Technology has become indispensable in our life. BIM Technology takes information as the medium between the components. The operation mode of the system will change from the traditional manual drawing to the form of integrating data information. In this information-based design mode, any design behavior is aimed at information rather than a simple element, This enables the various fields related to architecture to share a platform that everyone can identify and exchange information platform.

Due to the continuous improvement of computer technology, many experts have studied the computer BIM Technology. For example, some national teams, [1]. Some experts have studied how BIM Technology can better realize the intelligent design and construction management of buildings, and better play the auxiliary function of computers in the construction industry. This paper summarizes the application status of computer-aided architectural design in the current construction industry, as well as the impact on the construction industry. This paper analyzes the problems existing in the computer-aided architectural design, and concludes that the building information model (BIM) is gradually created, transmitted and applied in each stage of the whole life cycle of the building [2]. Some experts have discussed the application of BIM Technology in computer-aided building energy-saving design, analyzed the current development and application status of computer energy analysis software at home and abroad, and then put forward the way to solve the problem BIM Technology according to the existing problems. Through a large number of examples, the application of BIM Technology is discussed from the aspects of scheme stage, late design stage and fluid analysis. It is concluded that BIM Technology has fundamentally changed the way and process of building
information creation [3]. An expert also introduced the relevant concepts and technologies of BIM into
the energy-saving transformation of existing office buildings, analyzed the universality and specificity
of existing office buildings, and sorted out the relevant theoretical system of energy-saving
transformation of existing buildings. This paper summarizes the targeted transformation strategy
system of existing office buildings, and concludes that the energy-saving transformation of office
buildings is universal and regional in qualitative strategy system, and has adaptability and specificity
in quantitative design of energy-saving transformation strategy. Only by accurately grasping the
relationship between the two and taking information as the basic criterion, can BIM play a great role
and potential, The office building after energy-saving transformation can better serve the office users
[4]. Although the research on computer technology is abundant, there are still some deficiencies in the
research of computer BIM Technology.

In this paper, in order to study the auxiliary role of computer BIM Technology in architectural
design, the application of computer BIM Technology in response surface method experiment is
studied, and the green building design of computer BIM Technology is found. The results show that
computer BIM Technology can assist architectural design.

2. Method

2.1 Application of Computer BIM Technology in Response Surface Method Experiment

BIM Technology has been widely recognized by international academic circles and software
developers. In the field of architecture, there are some new, previously unknown professional fields. In
more and more cases, the redevelopment and modernization of existing buildings are carried out
according to BIM standards, which is why it is necessary to convert existing 2D documents into
virtual 3D models of buildings. The increasing complexity of construction, engineering and
construction (AEC) projects has helped to promote the development of methods and practices used, as
well as the development of information technology to support its implementation. At present, this
sector is still characterized by low efficiency, which affects its competitiveness and technical
requirements. According to the design experience of each Architectural Specialty and the
understanding of the aided design software, this paper studies the three-dimensional collaborative
design system for different architectural specialties in order to solve the coordination and
communication problems in the design of construction projects. In the process of project development,
it is very important to generate accurate and reliable information based on the high level of
involvement between systems, and it is also necessary to establish good communication between the
personnel responsible for the development of the project. As a new supporting technology in the
engineering construction industry, BIM is not only based on one or a kind of software, but also
includes different applications of different specialties, different application parties and different
project stages. Therefore, the application of BIM has derived a series of related technology software
platforms. Among them, the information core modeling software is the key core. This paper reviews
the application of response surface methodology and visual communication technology in absorptive
modeling and optimization. The theoretical background and application program of the method
discussed are described. The most commonly used experimental designs, their limitations and typical
applications are introduced. How to determine the accuracy and significance of model fitting is also
introduced. In addition, the references for modeling and optimizing absorptive using RSM and ANN
methods in recent years are also introduced [5]. Special attention should be paid to the selection of
factors and responses, as well as the statistical analysis of modeling results. The application of visual
communication technology in response surface methodology (RSM) optimization experiment design
can theoretically guide experimental optimization and provide optimization design for exploring new
technology in actual production. This method can be used in medical chemistry, life science, film
culture and other fields. It provides a new research idea and method for experimental optimization
design. For example, suppose an experimenter wants to find out the levels of temperature (x1) and
pressure \( (x_2) \) to maximize the yield \( (y) \) of the process. The yield is a function of temperature and pressure levels, for example

\[
y = f(x_1, x_2) + \epsilon \quad (1)
\]

Where \( \epsilon \) represents the observation error or noise of response \( y \), including uncontrollable adverse factors and model fitting errors. If the expected response is \( e(y) = f(x_1, x_2) = \eta \), then

\[
\eta = f(x_1 + x_2) \quad (2)
\]

2.2 Computer BIM Technology Green Building Design

Under the background of environmental deterioration and energy depletion, the development of green buildings is an inevitable trend, which can not only improve the energy utilization rate, but also improve the quality of ecological environment, and create a healthy and comfortable living environment. This paper mainly analyzes the application of BIM Technology in computer aided architectural design in green building design, and points out that BIM Technology will greatly accelerate the process of green building design. Drawing is an important ability of BIM. All kinds of plane, section, elevation drawing and statistical report can be obtained from BIM model. Therefore, in the green building design based on BIM, the construction drawing is the easiest task design compared with the previous design stage. In BIM Technology, what you see is what you get means if you want to draw a plan [6]. The purpose is to automatically generate energy-saving performance analysis report of design scheme in the process of architectural design. The study focused on developing an automatic generation application for the report using BIM concepts. The proposed technology is a design support system, which can minimize the time and manpower required for energy analysis, and generate optimized design schemes by automatically generating analysis reports. Facility management (FM) is a discipline that includes various operations, activities and maintenance services to support the main functions of buildings or facilities in use. In the context of project documents, BIM can greatly reduce design errors. Through the elaboration of BIM Technology, this paper puts forward the actual situation of BIM Technology in architectural design, and the generated model can be reused in the construction phase, such as planning and cost calculation, and used in asset management during handover [7]. Although the drawing is still an important method to record and guide the whole process of building construction, in the future, the drawing will probably stop to be the way to express the design information, so the design record shall be based on the model. If the current legal restrictions on the format of drawings are lifted, it is believed that the development process of BIM will be further accelerated, which will also provide the possibility to further improve the efficiency of design and construction.

3. Experience

3.1 Extraction of Experimental Objects

Computer BIM Technology extraction is mainly to extract its features. Traditional feature extraction methods mainly include texture structure extraction, color difference selection, self structure feature extraction and orientation feature extraction [8]. The method/device provides a 3D geometric modeling object, including at least one 3D geometric element, providing a logical modeling object containing at least one logical component, and associating a set of at least one 3D geometric element with a respective set of at least one logical component. The method/device displays a representation of a set of at least one logical component in a 3D scene, which is partially superimposed on the corresponding associated set of at least one 3D geometric element. In this chapter, aiming at the complex factors such as the diversity of computer BIM Technology objectives, the uncertainty of information and data, the computer implementation method and device of object combination are designed in the computer aided design system. In order to solve the problem of interactive design based on BIM, this paper proposes a method based on computer interaction compensation, which is
based on computer interaction design. It has carried out thorough research with the selection, the model construction and so on related question [9].

3.2 Experimental Design
The CNN model structure extracted by feature method can be divided into three steps: the first step is interactive design pre-processing, including edge preserving relaxation filtering and pixel block extraction; the second step is feature extraction of visual communication technology; the third step is feature fusion classification. Because ape can mine the effective information in the original spectrum and lacks spatial information, if it does not Denise in advance, it is necessary to implement the feature fusion and classification. On the other hand, it can make up for the lack of spatial information of each pixel, or extract the spatial features of each pixel better than the single feature in the space. In order to verify the validity of the model, two public data sets, namely, kindness and gregariousness, were selected for comparative experiments. Then, the noise interference features are denotative to improve the classification accuracy. If the noise is not preprocessed, the noise is too large, resulting in the neural network unable to learn the features we want, so the classification accuracy is very low. Finally, a comparative study is carried out [10].

3.3 Statistical Analysis of Data
Mathematical statistics: use Excel data processing software to analyze and statistically process the relevant data, and present them in the form of charts. The formula is as follows:

$$SUMIF(\$, A2 : $G2, H2, A3 : G3)$$

4. Discussion
4.1 Data statistics of Computer BIM Technology in Auxiliary Building Design
With the development of information and communication technology and the continuous development of big data application environment, the demand for building information utilization in domestic construction field is also increasing. This phenomenon seems to be the necessity to ensure technological competitiveness by using building information to provide new technical services and create new business models. BIM Technology speeds up the process of architectural visualization, eliminates the need for designers to spend time on reconstruction, and improves the accuracy of visualization. However, due to the influence of the separation order contract, there is a structural problem in the domestic construction environment, which cannot guarantee the consistency and continuity of construction information in the design, construction and maintenance stages. BIM (building information modeling) is a new design technology to solve these structural problems. According to the data of computer BIM Technology in the auxiliary architectural design, we found that with the improvement of social productivity and the continuous development of computer technology, we use more and more computer BIM Technology in architectural design. As shown in Table 1.

Table 1. Statistical table of computer BIM Technology in auxiliary building design

| Particular year | 2006  | 2007  | 2008  | 2009  | 2010  |
|----------------|-------|-------|-------|-------|-------|
| Usage probability | 15.07% | 16.09% | 19.08% | 21.03% | 28.73% |
According to the statistics of using computer BIM calculation in different areas of China, we found that due to the needs of the development of new first tier cities, the probability of using computer BIM Technology in architectural engineering design accounts for 27.06%. As shown in Table 2.

**Table 2. BIM technical data used by different cities**

| City type          | First-tier cities | New first tier cities | Second-tier cities | The third-class cities |
|--------------------|-------------------|-----------------------|--------------------|------------------------|
| Usage probability  | 27.06%            | 38.09%                | 21.56%             | 13.29%                 |

**Figure 1. Statistical table of computer BIM Technology in auxiliary building design**

**Figure 2. BIM technical data used by different cities**
5. Conclusion
The development of BIM Technology is one of the needs of construction technology. In the process of engineering design, BIM Technology can play a great role, including improving the quality of architectural design and improving the effect of building energy saving. In this study, we propose a prototype of design support device for architectural design evaluation using building information modeling (BIM) data. The system is composed of transparent display, solid model and digital building model, and adopts a new frame form. In order to use transparent display in interactive applications, a method of removing background and correcting observation points in captured video is proposed. Review BIM data formats for use in interactive applications. Through the proposed hardware and software combination, the system can be extended from two user systems to multi-user cooperative systems. The results of this study will be applied to solid model and digital architecture model to evaluate the design effectively and economically in the field of architectural design.

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