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Research and Application of Digital Technology in the Protection of Historic Buildings in Wuhan—The Application and Research of Red Campus Culture in College Design

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ABSTRACT

With the rapid development of Chinese cities, many buildings with distinctive local cultural characteristics have been gradually destroyed. China is rich in architectural heritage, so it is urgent to protect and restore historic buildings. However, the traditional protection methods of historic buildings gradually fail, and may even cause further damage to historic buildings. With the continuous development of the construction industry, the traditional architectural design methods can no longer meet the needs of contemporary architects for information. BIM technology as a new generation of information technology, its application in the construction industry through the study of modern building characteristics, history and present situation, for historical buildings damaged by routine cannot repair, lack of protection consciousness lead to protection work is not in place, social economy and protection of historical buildings conflict protection problems, combined with domestic and foreign research on the protection of modern historical buildings, put forward BIM technology applied to the protection of modern historical buildings.

KEYWORDS

BIM technology; building protection; historic buildings.

INTRODUCTION

Modern historical buildings refer to all the new, expanded, rebuilt and rebuilt buildings, including historical buildings (including historical blocks), ancient sites, etc. Among them, historical buildings refer to the buildings (structures) that reflect the historical and cultural characteristics and regional characteristics of a certain city and have certain protection value. As a valuable cultural heritage, modern historical buildings

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have high value, not only have a strong use function, but also has high artistic value and aesthetic significance. However, due to the particularity of modern historical buildings, their protection work is faced with very severe challenges. Therefore, there are also many problems to be solved for the protection of such special types of cultural relics measures. This paper will take modern historical buildings as an example, based on the internal structure and external environment of BIM technology, and propose improvement measures for the current situation of the technology combined with actual cases.

APPLICATION OF BIM TECHNOLOGY IN THE PROTECTION AND RESTORATION OF HISTORIC BUILDINGS

Application Advantages

With the acceleration of the urbanization process, the protection and restoration of the urban historical buildings have attracted more and more attention. In China's current historical building restoration projects, the proportion of traditional restoration technology used is much higher than that in other countries and regions. Due to the low degree of construction industrialization in China, most of the traditional restoration techniques are completed by manual operations. The use of traditional construction technology has some problems, such as high cost, long construction period, high safety risk and difficult quality control. Therefore, using BIM technology to repair and protect historical buildings is a very good choice. BIM (Building Information Models) technology is a combination of digital model and structure modeling language, realize the digital expression in the process of building construction technology integration system, by creating and maintaining building information model (Building Information Model), realize the three-dimensional information, material properties and other engineering data (such as size, component size, etc.) simulation analysis and visual expression, so as to assist the engineering design and other work. At present, BIM technology has been applied in many historical building protection and restoration projects in China. Both ends of the support or adhesive paste to do less damage to the wall are fixed, if necessary, can be removed at any time and restore the original appearance [1]. With the accelerated development of China's urbanization process and the improvement of urban building industrialization level, various modern industrial enterprises are constantly appearing in the historical city, and the protection and restoration of historical buildings have also attracted more and more attention from many industries. From the perspective of national policy, the support for such projects is also increasing, but due to the lack of standards and construction procedures of historical building repair technology problems have not been fundamentally solved, so a large number of protection and restoration projects cannot get financial support. In addition, from the perspective of urban planning, there are no relevant requirements and standards for the approval of new residential areas in historical areas, which is not conducive to the overall protection of urban features. At the same time, in the process of repair of

historical buildings, it is often necessary to reanalyze and study the original building structure and establish a new structure model to protect and repair, while the traditional measurement technology is difficult to complete the construction of complex structure model. In addition, there are many problems to be solved and dealt with for cultural relics and intangible cultural heritage, and intangible cultural heritage, and many disadvantages of traditional measurement technology. According to the results of the simulation analysis, the optimization measures of historical buildings are put forward to achieve the improvement of the environmental quality of historical buildings [2].

APPLICATION OF KEY DIGITIZATION TECHNOLOGY IN HISTORICAL BUILDING PROTECTION

Application Significance of Key Digital Technologies

In the protection work of historical buildings, the traditional means are manual surveying and mapping, field measurement and data statistical analysis, so as to realize the consistency and authenticity of the status quo of the protected objects and the historical features. However, these traditional methods have been unable to meet the current complex protection object information processing and related research work. The interior environment of this historical building is mainly studied from the perspectives of wind environment, light environment and thermal environment [3]. With the development of digital technology and professional surveying and mapping technology, digital models have become an objective, visual and operable protection means. In the process of digitizing historical buildings, BIM model technology can be used to assist the analysis and evaluation of historical architectural heritage. On the basis of analyzing the value of historical architectural heritage, and the protection and renovation of historical buildings and their surrounding environment can be combined with traditional methods. Before BIM modeling, it is very important to conduct family planning. The basic unit of the Revit model is the family of models, in which the base family library and boilerplate files can be downloaded through the network and created by a new family yourself[4]. The widely used digital modeling methods mainly include three ways: entity modeling, scene modeling and visual modeling. Where the entity modeling approach is based on the entity model, Divide the house-related materials into different units in three dimensions, Through the combination of virtual space and three-dimensional model to form a complete and accurate one-dimensional and two-dimensional stereo structure; The scene modeling method is based on the physical location relationship between buildings and the surrounding environment in a one-dimensional virtual space, One-dimensional information is obtained through the digital model construction and display of the internal space of the building; Visual modeling is to make a digital work that can visually display the building information, the surrounding environment and the overall layout relationship in the virtual space through a certain visualization algorithm. The three-dimensional model established by the above method can not only accurately describe the internal structure of a single building, but also accurately express the

relationship between the internal structure of all the rooms contained in the house and the external environment, providing data support for the subsequent related research work. In recent years, with the gradual popularization and wide application of BIM technology in the real estate industry, the integration of BIM technology and physical model has become an inevitable trend.

Application Ideas of Digital Technology

Historical buildings are the epitome of the development of urban civilization and an important carrier of the inheritance of traditional culture. However, at present, China's relevant laws and regulations and policies on the protection of historical buildings are not perfect, and the degree of protection work is not balanced. In China's famous historical and cultural cities, towns, villages and many other protection units, the vast majority of them have immovable cultural relics value, but there are still many historical buildings were damaged due to insufficient investment in protection funds, unreasonable planning and design, and improper daily management and maintenance, which have both subjective reasons and objective factors. The objective reasons are as follows: first, due to the combination of traditional technology and modern information technology, the theoretical research and application practice of the protection of historical buildings are not sufficient; second, the formulation of relevant laws, regulations, standards and norms lags behind, so it is difficult to form a scientific mechanism guiding the protection of historical buildings. In order to better carry out the top design and implementation of the protection of historical buildings in China, this paper will start from the following aspects: First, promote the establishment of diversified financing mechanism with the main participation of financial input, build the core technical support system of digital design, mapping and management platform, accelerate the digital construction of historical buildings and the construction of related technical standard system in the protection of historical buildings. Digital design, surveying and mapping and management platform as the core support system. Through the investigation, it is found that the protection of historical buildings in China has been carried out well and some achievements have been made, but there are still many urgent breakthroughs in the digital application. For example, the knowledge structure and talent team building of professional and technical personnel have not yet been formed; the relevant regulations and policies are imperfect; and the existing capital investment is insufficient. At the same time, there are also some urgent problems: first, the relevant policies and regulations lag behind; second, the lack of unified industry standards; third, the implementation effect of some projects is not good. These problems have become the prominent contradictions and challenges faced by the protection of historical buildings in China. Therefore, in the process of promoting the safety protection of historical building heritage, it is urgent to strengthen the standard formulation and policy formulation of relevant laws, regulations, regulations and their implementation rules. The planting of trees outside the building is too close to the main body of the building, which also reduces the indoor light [5].

MAJOR PROBLEMS IN THE USE OF BIM IN THE PROTECTION OF HISTORIC BUILDINGS

Insufficient Development and Application of BIM Software

Although the BIM software is various, but according to the Canadian BIM, learn in April 2011 statistics, the global BIM, product 79 software mostly focused on the design stage, about 62, only 25 for construction, it is obvious that BIM application is still concentrated design stage, product cannot form complete life application system, thus cannot provide guidance for the project late operation and maintenance. From the actual situation of China, the domestic independently developed BIM core modeling software is still basically in a blank state, and most of the existing BIM software has also introduced foreign technology, and due to the differences in the background and environment of the domestic construction industry, the software localization work is very difficult.

Lack of BIM Talents

China's BIM application software talent is still very in short supply. From the perspective of "quantity", the national construction industry who can use BIM for engineering design and practice is too far behind, compared with the number of traditional CAD design talents. In terms of "quality", it is easy to equate BIM with 3D visualization, and then 3D mode is only the most basic part of BIM application mode. After further application, how to define the BIM data specification, how to establish the collaborative communication mechanism, and how to define the delivery standard of the BIM model, etc., also need to be realized by talent support. Therefore, the enterprise-level BIM application mode cannot be simply composed of one or several software, and the talent training mode also needs to start with software training, in-depth.

Conservative Ideas

If you compare BIM with the currently widely used CAD technology, you will find that CAD is basically a software thing, just a different tool, a different medium, more of the user's personal ability. BIM is far from this. BIM is not just a software matter. The maximization of its value needs the maximum integration and sharing of building information, which requires users to have a strong concept of collaboration and an open attitude to data sharing. However, the conservative concept of "independence" retained by the traditional CAD mode is not conducive to the realization of BIM value.

Poor Assessment of Benefits

Any new technology or new method can be widely adopted by the industry, so the BIM application benefit is one of the main issues of concern to the BIM users. However, at present, there is a phenomenon of one-sided quantitative benefits, focusing on the reduction of short-term costs, which eliminates the intangible social benefits brought by

the implementation of BIM and the huge commercial value of rework rate, engineering error and optimal resource allocation, resulting in the phenomenon of virtual low BIM input-output ratio.

COUNTERMEASURES AND SUGGESTIONS FOR BIM PROMOTION IN THE PROTECTION OF HISTORIC BUILDINGS

Improve the Software Functions

Considering the advantages of the original software and the habits of the users. In the process of the long-term use of the original domestic secondary development software, China's historical building protection workers have formed the operation habit to adapt to the convenient modules in the software, When contacting 3 D BIM software with old operating habits, Will compare the original habits with the new software section operation, When the old operation habits are incompatible with the operation habits of the new software, it brings the additional workload to the users of the novice software, In addition, the restoration work of historical buildings has complex and meticulous characteristics, It is very easy to produce a kind of resistance, Is not conducive to the promotion of the software. Therefore, in order to reduce the resistance brought by the resistance to the promotion of the software, the software developers should take the advantages and habits of the original software as one of the considerations in the function of the design of the new software, and set up more localized plug-in in the software, so that the new software is more acceptable.

Refine the Software "Family" Applications

The success of BIM application requires a suitable standard and a mature set of information platform, that is, a complete family library. The information platform established under the appropriate standard is convenient for management, but also easy to call and view information, more convenient for application. For the BIM protection of historical buildings, the construction of historical building component information platform is to standardize the complexity and the diversity of historical buildings make the application of BIM very difficult, such as the mouth of the roof ridge, the glass beast hanging on the eaves of four ridges; made of wooden supports between the beams, square grids. Such details of ancient architecture make the application of BIM software in the "family" changeable, so how to improve BIM to make it more suitable for the construction of complex historical buildings is the key to the promotion of BIM in the field of historical building protection. Compared with general buildings, historical buildings have its particularity. The information model of historical buildings does not simply apply BIM to historical buildings, but should face the particularity of historical buildings and improve their adaptability.

Campus Training

The protection of historical buildings has the nature of interdisciplinary integration and has high requirements for professionals. Professionals should not only have the foundation of architecture major, but also have a certain knowledge of literature and history. With the gradual promotion of BIM in the field of historical building protection, BIM technology has also become a skill requirement for professionals. BIM only began to be paid attention to and studied by various universities in China in 2006, and its education has not yet been popularized, so it still needs to be made from many aspects. First of all, more colleges and universities should add preliminary software courses related to BIM, because according to the latest statistics in 2013, only some universities (such as Tsinghua University, Tongji University, etc.

Tianjin University, etc.) offer BIM software courses in undergraduate field; secondly, universities should set BIM.

More BIM technical exchanges should be held to promote the development of BIM technology in China. Finally, all universities should actively participate in the National College Building Information Model Competition.

Enterprise Training

Unlike the core science and technology that only needs to be mastered by individual experts, BIM, as a relatively complex application technology involving multiple disciplines, relies on the basic mastery of BIM technology by all the whole staff involved in the project. Therefore, it is necessary to carry out the systematic training for the primary users who have not been in contact with the BIM software. Considering the software update, the corresponding retraining should also be carried out for the old users of the BIM software. For the current China, enterprises should make BIM training plans from two aspects: first, the training method is targeted. In general, BIM software is "easy to learn but difficult to refine". The centralized initial training and retraining cannot allow historical building protectors to fully master and skillfully use the software in actual projects. Therefore, it is very necessary to provide guidance for specific historical building protection projects, which is also the focus of BIM training institutions at present. During targeted training, in order to prevent possible disputes, attention should be paid to define the scope of their work before the project guidance; in order to improve efficiency, the assessment method should be agreed in advance. Secondly, there should be a training frequency suitable for the program. For the BIM training of the project, we seek the appropriate development conclusion, taking the project start, team building, cooperation and output as the four key nodes of the project. The targeted training of the node is the most critical and necessary link of the project. At the same time, we should pay attention to the daily universal education of BIM, because BIM is also a part of the daily normal work.

SUMMARY

To sum up, the significance of the historical building protection work has been widely accepted by the masses. Therefore, as a technical personnel, it is necessary to actively learn the historical building protection technology represented by the digital technology, and deeply study the related technologies. With the continuous development of cross-border thinking, more attention will be done in encouraging the future development of building protection technology

With laser, ultrasonic, uav technology, so technical personnel also need to think deeply about digital technology, historical building protection theory and other theoretical fusion method, by further optimizing the existing technology, improve the feasibility, accuracy and stability of related technology, so as to improve the role of relevant information comprehensiveness, accuracy. Relevant units also need to conduct in-depth research on relevant technologies, actively introduce advanced equipment and advanced technologies, encourage technical personnel to learn and master relevant theories, and understand the application mode and development trend of technology through practice, so as to lay a good foundation for the subsequent protection of historical buildings.

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