The Application of BIM Technology and the Three-dimensional Architectural Design

Hao HUANG[1,a], Jian-She HUANG[2,b,*]

[1]Xiamen Branch, Fujian Architectural Design Institute, China

[2]College of Navigation, Jimei University, Xiamen, China

[a]hh109@126.com, [b]xmhjs@163.com

*Corresponding author

Keywords: BIM, 3D Architectural Design, Autodesk Revit.

Abstract: This article describes the characteristics of building information model technology, and analyzes the relative merits of Autodesk Revit with synergistic effect and relative merits of building model and the technical application prospect of Building Information Model, then show an application example of the software of Autodesk Revit.

Introduction

With the development of modern construction technology and social needs, modeling and function of the building is becoming more and more diversified the traditional 2D architectural design software has become increasingly unable to meet the requirements of the new architecture design. The traditional method of the building structure design are mostly limited to using a model analysis software, For example, PKPM, then use the 2D design software, such as CAD, for the deeper design and complete the construction drawings, to a large extent improve the efficiency than manual drawing, but it only through geometric figure, such as dot, line, plane, simply expression the architecture design, between each building component, there have not the mutual connection and restriction, it just draw a 2D graphics, and the using of the 2d graphic date is very limited, it cannot provide more help in terms of helping the engineer to complete the whole engineering design, When one element of one professional changes, there are so huge work on other professional related changes and information communication.

To sum up, there are many deficiencies above in traditional design methods, and they become bottlenecks of the current construction technology development, the technology bottlenecks to breakthrough bound its development have gone farther on the road to development, deepening transformation design thought, improvement of aided design tools and methods has become the inevitable choice and the way out. Emergence of building information modeling (BIM) technology forebode the architecture design step from 2D design into a new life cycle of 3D, brought the second revolution for the building design and construction field. For the whole building industry, this technical revolution caused by BIM changed people's teamwork concept, and changed the ways of teamwork between the project participants.

Building Information Model

Abstract of BIM

Building Information Model（BIM）is a new Concept appear in the 21st century, it is a new tool of architecture, engineering and civil engineering, It base on the three-dimensional digital technology and integrate all kinds of related information base data model of construction project, is the detailed digital expression of project related information, and building the model base on all kind of the related information of construction project, it use a specific software, Gives all building components, systems, to related parameter information, and design, modification, analysis visually in the form of 3D visualization, then building the reference documents which can be used in the full life cycle of project design, construction, operation management and so on. The implementation of BIM will solve the

problem of information islands in the stages of planning, design, construction and operation, realize the effective use and management of engineering information in the whole life circle, it is a important ways of seeking fundamental changes in the traditional design methods and eliminating information islands.

The Characteristics of BIM

Building Information Motel is no only a simple digital information integration, but also a kind of the application of digital information, and a digital method can be used in design, construction and management, this method support the construction project integrated management environment, can improve efficiency and reduce risk of the construction project in the whole process. In the whole life circle of the construction engineering, to make a perfect combination of information motel of building and management behavior model of construction project, Building Information Model can realize integrated management, so this model includes both of the information motels of building and management behavior model of construction project. BIM have the characteristic of visualization, harmony, simulation, majorization and drawings formation.

At present, the concept of Building Information Model have a consensus in the academia, architecture and software developers, ArchiCAD of Graphisoft company , TriForma of Bentley company and Revit of Autodesk company is leading trend of architectural design software system, the following main discuss the platfrom of Autodesk Revit.

The Platform of Autodesk Revit

Summary of Autodesk Revit

The platform of Revit is a Building Information Model solution specially developed by Autodesk. The platform of Revit contains some applications such as Revit Architecture, Revit Structure and Revit MEP and so on, it's a system of comprehensive building design and documentation for a specific field, can be use for support to total stage of design and building documentation. From the concept of research to the most detailed construction drawing and the detail, the application software based on Revit can easily implement.And the date can be mutual import between traditional common building design software such as Autocad, 3ds Max.In Revit Series software, Revit Architecture (architectural design) has a early start, the building design of Eureka tower of Melbourne, Australia and the freedom tower in New York, United States adopt the BIM concept, and designed by Revit Architecture. Currently, Revit Structure (structure design), Revit MEP (Mechanical, Electrical & Plumbing design) also gradually adopted by the design institutes, believe in the near future, it will be gained popularity.

The Building Information Modeling in Revit

BIM of Revit build the 3D building motel by using the relational database, using this motel, can create 2D graphics and manage masses of related and no graphic data of the construction project. The Building Information Motel of Revit is a huge collection of date, it contains different kinds of graphic element, such as graphic element of model, graphic element of view, graphic element of symbols, and there have relationships between different kinds of graphic elements. We can visit Revit files through the API provided by Revit, also can get the information of Revit entity, the Revit provides an interface of export the ODBC database, through this interface, we can get the information of Revit entity. In the model of Revit, all drawings contain the 2D view, the 3D view and a list that they are different manifestations of the same base Building Information Motel. When working in the drawing view or the list view, Revit will collect information on construction projects, and coordinate the information in all other forms of the project. The parameterization modification engine of Revit auto-coordinate the date in motel view, drawing, list, section or plane.

The Advantages of Revit Compared with the Traditional AutoCAD

As new 3D building design software, Revit has a big advantage in compared with the traditional design software AutoCAD:

(1)The traditional design software AutoCAD is not a professional building software, it just draw some 2D graphical data by dots, lines, filling graphics, and Revit is a software dedicated to architectural and related profession, It divides components into different categories we wonted such as beam, plate, column and base according to the habit of architectural, and every components has its own structural information such as size, material, position, and finally connect them to constitute the whole building, what is more accord with the habit of designers.

(2) Revit not only provides many parameterized graphic element can be used in the design directly, but also allows the user to design component, through custom family, user can freely define component's parameter attributes and 3D shape, in order to adapt to the designer's requirements neatly.

(3)It is easy to create and modify the architectural drawings and document. Due to the way of drawing the basic is three dimensional, associated modification can auto avoid making stupid mistake that producing inconsistencies between plane, elevation, section during the process of drawing design.

(4)Revit has capability of renewal. Revit depend on the model of creating by family, when modify one of the components, all same type of component will be renew on each view, it is save a lot of manpower and time.

(5)Revit has capability of visual 3D display and analyze. By using the capability of visual 3D display, monitoring and collision checking, user can find the problem in the process of designing during different professional teamwork quickly and intuitively.

(6)Architectural design is not only a simple model, but also a whole database. It can export three-dimensional size of every building component, and create statements, progress of works, preliminary budget and something else automatically, no only for the design stage of the building, but also for construction stage and later use are there much guidance.

Examples of Application

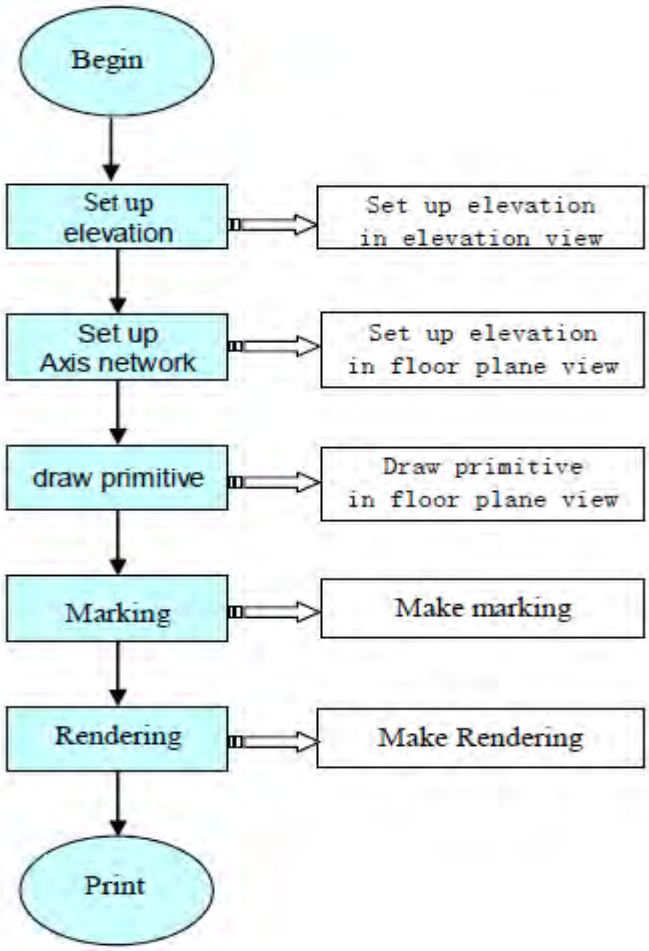

Fig. 1 The Flow Sheet of Building Model in Revit

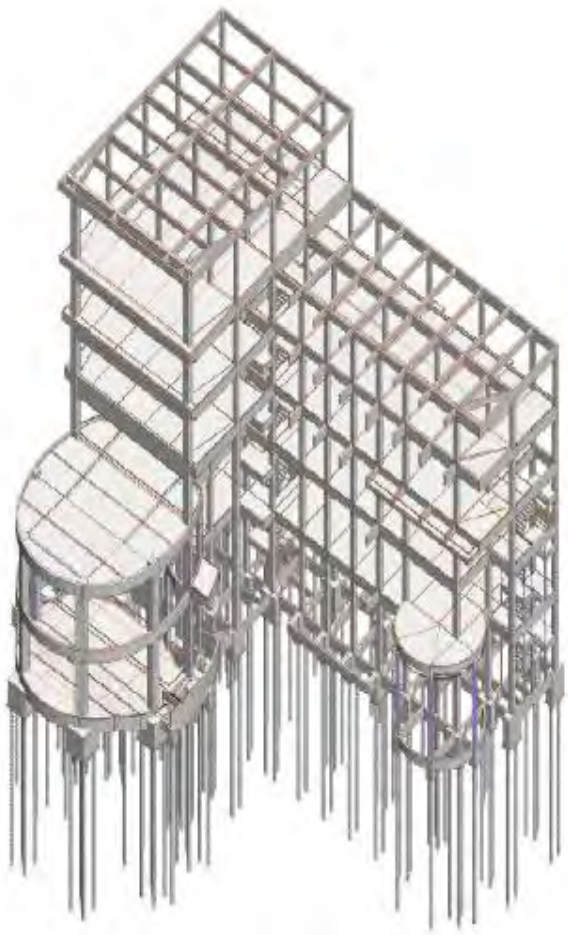

Fig. 2 The 3D Structure Model Created by Revit

References

[1]Yanni Li, Juanhua Liu. Discussion on architectural modeling technology based on Revit. Application of the technology of Computer Engineering, 2011(10).

[2]Zhifeng Shangguan. Research on building information model is realized with Revit. Mechanical and electrical information, 2009 (12).

[3]Xiaodong Huang. The design of efficient software achievement efficiency. Journal of Architecture, 2007 (3).

[4]Shanshan Yang,Qun Liu. Experience from Revit software to BIM 3D model of the early thinking. Shanxi Architecture, 2011 (6).