The Study of Architectural Animation Based on Computer Aided Design

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ABSTRACT: With the development of information technology, computer aided design has changed modern architectural significantly. The animation and image generation functionality of this technology changed working style of architectural designs and the techniques of expression of architectural images. Based on the characteristics of computer aided design, we explore the relationship between architectural animation and computer aided design, then discuss the characteristics, methods, steps of animation and image generation when we use computer aided design.

1 INTRODUCTION

Currently, computer aided design (CAD) has played the important role of intelligent design in the area of living environment, housing structures, lighting analysis. By utilizing various types of design software can reach 3D simulation animation and image letting viewers watch image of residential buildings more directly and visually. Meanwhile, using visual simulation of CAD to show the dynamic environments of residential buildings is an advantage compared with manual designs which could not and would never be realized this effect. The observation of manual design of architectural model can only obtain a static experience which could not be associated with dynamic design objects. CAD can simulate human’s perspective with animate software’s camera window to revolve and move at the horizon and form a series of point trajectory. Such way can not only make the design objects feel a surreal sense of reality, but also show the designers’ minds more fully.

2 ARCHITECTURAL ANIMATION

technology of CAD—take 3DS MAX FOR EXAMPLE

CAD has been used as convenient and efficient tools in the architectural design, because CAD can accurately simulate a building model and its internal structural framework. CAD can present all kinds of materials, light sources, environmental factors (such as smoke, fog, etc) with 3D software to show the effect of entity. CAD also can decrease designers’ working intensity more effectively, shorten the design cycle and save consumptions. Proofreading designs in the computer has lots of advantages such as good visibility, easy modification, no need to destroy the original programmers. The representative software of animation design and image generation of contemporary residential building is 3D STUDIO and its updating software 3DS MAX. Using computer, image input and output devices and graphics image processing software can deal with dynamic image. This way has strong ability of modeling and rendering. Designers can simulate residential space of 3D static effect with 2D rendering virtual picture and dynamic visual landscape of movement in building space.

Firstly, 3DS MAX has a production environmental integration which has all kinds of tools (such as modeling, rendering, making animation, etc) making out very delicate scene. These function modules have adopted new non-modules of programming technology and it’s convenient and efficient to create animation works just like pressing a button or modify a system parameter.

Secondly, the picture and excellent rendering function of 3DS MAX can turn any or all views on the screen into delicate color pictures and form a working environment in simulated real-world. In such kind of environment, building design became more intuitive and various ideas can be tried.

Thirdly, material editor of 3DS MAX has rich function, it can achieve the effect that refracted light change frame-by-frame in animation to receive abundant performance effects namely achieve animation changes effect of any object. For example,
adjusting time sliding block of animation can achieve animation changes effect of any object, even through changing the distance between object and camera can achieve animation process containing different details. Built-in inverse dynamics, this characteristic makes CAD have modeling and animation integration degrees, which other 3D animation software’s don’t have, and it can also create animation material with special effects.

Finally, 3DS MAX provides a view along the time axis, you can use it to manage all aspects of the animation process, even if the animation synchronized with the sound as well. You can use free styles or animation curves styles to create and edit animation when observing animation effects. More importantly, these technologies are combined with multimedia technology and networking technology which greatly enriches the analysis, decision-making, implementation, management tools and methods on residential building design.

Assistant technology based on the computer application has been widely used in architectural planning and design in developed countries. Traditional building and residential design display through the drawing, a common approach is to build a building model or a careful display plan, namely reduce the scale to simulated 3D environment. However, this approach can only access static image, it is difficult to simulate the real world how people see. The development of computer aided techniques can effectively address this problem. By virtue of high speed of information transmission capacity and efficient analysis ability and the simulation architecture built by visual tools of computer, housing planning design becomes more dynamic and vivid and computer improves the efficiency and scientific of planning. G. Broadbent points out that “All the work that designers do for customers and the environment will be revolutionized. However, if timid people continue to fear or neglect computer while enthusiastic people continue to be confused by the complexity of the computer, and even they see rubbish as the Bible, all of the above will not be able to achieve. ”

3 IMPACT OF CAD ON ARCHITECTURAL ANIMATIONENHANCE

3.1 Multidimensional displaying 3D architectural design

Designers utilize CAD to achieve a virtual representation of the real thing, this reproduction process, which itself is a process of human thought process, is a kind of 3D digital modeling tools. For example, it’s necessary for designers to have ability to grasp 3D design as a whole and take details into consideration when they establish 3D modeling in the architectural space. They need to observe and grasp accurately the exterior characteristics of objects in virtual reality, and then think rationally, find objects’ features, finally produce enough details need to show. Stereo rendering architecture has its own basic rules, which is subject to conditions and transmission constraints, and which decides its highly generalized and simplified features of architectural forms. The process needs designers to show their design concepts and requirements of the building in stereoscopic form and the process itself is a highly technical process of art.

Using existing technology and experience, architectural animation can be showed more information and shock the visual effect based on the designer's own intention. Because architectural animation all elements are created in the virtual reality software, in which each element are quite flexible controllability, compared to law-abiding reality works architectural animation can produce a lot of flexible scene changes according to design needs. Such as building in reality is not moving, and architectural animation can through technical means, let a seat buildings have sprung up, building consisting of slabs, steel, glass and other building materials quickly fly into the screen, in a moment to complete the process of building construction. Moreover, designers can add some interesting elements to adorn the entire film, such as birds fly over real estate which is difficult to shoot in reality.

3.2 Realizing interaction with customers

"Interaction" refers to the mutual influence, mutual communication and joint participation, which is also a mutual motivation and drive. From the user perspective, the interaction is an effective way to help users to experience product usage and make users pleased. CAD has changed traditional one-way communication between people and information, which makes contact and communication between people and information more natural and engaging. In building dynamic images with CAD, designers can create realistic visual effects and add multiple interactive demonstration actions into it. Users can not only use keyboard and mouse to rotate the view freely, but also click on the different buttons to demonstrate building function virtually. The whole process is full of interest because of interaction.

Early architectural animation did not introduce the interaction between computer aided design and user to express the architectural features and design concept, which makes a lot of problems for designers who will interpreter the theme of architectural space. In recent years, with the return of architectural animation to the direction of film and television, introducing the role of user in architectural animation can significantly enhance its performance, which should become a direction of the development of architectural animation. The
concept of people oriented is one of the main design theories of modern architecture. In the producing process of the animation, the proper addition of the characters or the interaction between human or animals and buildings, can better display the architectural design concept. In some courage to try the architectural animation works, we can already see some architectural animation in which added to the role of information, from early to add the single voice over narration roles to later add leading role throughout the whole architectural animation, and to move from the perspective of the leading role as a clue, and highlight the project environment elegant through the interaction between leading role and whole architectural project, to better integrate the audio-visual language into the existing building animation creation.

3.3 Enforcing the expression form of artistic

As always, making architectural animation with CAD is considered as an engineering technology. People are customer to depict the surface of buildings by means of hi-tech restricted to program technology and various algorithm of research. They only concentrate on the work including computer hardware equipment, programming, running environment, seldom consider building animation design of culture and aesthetic carefully from form to content, from part to entire, from phenomenon to nature. They make a mistake that building animation essentially is an art subject, containing components of beauty and culture connotation. Actually in the actual design phase, many steps such as modeling, architectural lighting, material handling, environment detail carving, all kinds of multimedia elements (text, tables, graphics, sound, etc) comprehensive editing and adding animation and objects dynamic behavior, this can’t do without artistry. The architectural culture and aesthetics are combined into building animation production process, and this way can not only constitute a bridge between the real and virtual buildings, enhance artistic quality and visibility, but also can review the authenticity of designs.

Designers can grasp performance results with greater certainty and predictability when use the computer aided design technology to express ideas, and as long as the designer has enough patience, presentation drawing can be almost same with the as-built drawing. At the same time, the designers can be free from the pen, ink, paint, paper problems, so as to focus more on artistic expression and test idea. Computer aided architectural representation requires a large number of software application skills, and it is based on the skilled manual. If skilled mastered the concept of sketch, color concept, the concept of scale and perspective relation in manual presentation drawing, designers can use computer more easily drawn architectural designer. At this time, designers and users will feel the power and charm of the combination of computer aided design and art.

4 ARCHITECTURAL ANIMATION PRODUCTION PROCESS WITH CAD

Architectural animation is animation film produced by construction and construction related activities. Architectural animation shots depicted by CAD can present the future building images realistically. We can find the reason that 3D animation upgrades the design model from traditional sandbox to “what you see is what you get”—an advanced real scene way and also improve the quality and efficiency of design and planning greatly.

Building animation design principle is through various modeling software to construct virtual environment in geometry entity and review virtual reality technology conditions of movement, maps, rendering processing. For example, using mainstream modeling software’s such as 3DS MAX, and MAYA can establish scene and building modeling, mapping, rendering, and then import software to achieve interactive operation, finally integrate multimedia information and output. In the whole production of architectural animation process, 3D model is the base, adjusting lighting and texture mapping is the soul of architectural animation. Only by rendering to see the effect, adjust lighting and texture mapping, can we make realistic architectural animation scene.

4.1 Building a 3D model

The foundation of animation and the most important step is to create a model of building. For example, there are many 3DS Max modeling methods, the three most important are grid modeling, surface modeling and NUBRS modeling. Grid modeling method is widely used in modeling of buildings and designers can use it in square-shaped structure of the walls, windows and doors. The characteristic of residential construction is all soft and hard furnishings need compatibility, how to reflect systemic supporting facilities in the architectural design process is the key. The main modeling methods include the Lathe Modeling, which is to make a profile in the two-dimensional space, and then produce objects with rotation of the axis. Similar to the cylinder and other objects can be used in this way to produce. The Extrude Modeling, which is very useful for modeling techniques in 2D space to make a profile, and then extend the normal direction to generate the object. The loft modeling, which is mainly to stretch out the 3D object from the 2D profile, and to describe the profile of different height in 2D, and then extend it to different heights as the terrace. The Boolean Operations, which contains three kinds of operation that are
union/addition, difference/subtraction and intersection. Boolean operation is suitable for the physical model, which will take surface model as physical model to compute, after add automatically new surface at necessary location to close up the object.

4.2 Making architectural animation

After building the model, set the lighting and adjust. Objects show the shape through light, so lighting settings determines the effect of the whole scene. When setting and adjusting lights, through continuous rendering to find problems, until we get satisfactory results. Finally we can go on adjustments of materials and textures, smooth surface like glass and walls are main factors to influence picture effects in architectural animation. So, focus on adjust textures of these parts when we adjust the whole effect picture.

One of the key techniques in making architectural animation is mapping. The specific methods of mapping include the Basic Reflection Mapping, which is a simulation of the false reflection effect, the pattern directly affixed to the surface of the object, resulting in a reflection of illusion, can make objects similar to the texture of glass or metal. From the mapping effect, the light is reflected from the surface of the object like. The Self-illumination Mapping which can affect the intensity of self luminous effect. White produces the most intense luminous effect. Black does not produce any effect. The Opacity Mapping, which is based on the brightness of the pattern to change the opacity of the surface of the object. Black in the design is completely transparent, pure white is opaque, intermediate transition color is translucent. The Diffuse Mapping, which will replace the diffuse color component, using this method of mapping on an object is like drawing a picture on the surface of an object.

4.3 Postproduction

Nowadays, CAD has a lot of integrated software to make a wonderful multimedia animation. For example, Track view (track editor), Key Info (the key regulator), the Ruction Curve (adjust function curve) in 3DS Max software can achieve this effect. Making synthetic process can mix music and also create the entire animation scene at the same time. In this way, the effect of dynamic activities of the intelligent residence can be well reflected. However, environmental design can only be created by single frame images in a static landscape.

Interactive design is the focus of making architecture animation, and it is the most attractive point. It mainly includes the virtual scene of the object movement, rotation, scaling, etc., but also includes event design, behavior design, human-computer interaction design, such as mouse and other triggers, animation design, etc. This is a process of giving life to the virtual scene of architecture animation, giving it the ability to communicate with others, how to make the communication more natural and true, which depends on the subjective consciousness of the designer. Designers will be stored as the corresponding format into Cult3D, VRMI, Converse3D and other software after the completion of the virtual scene, through the scene editing adding event response, to conduct a series of interactive design. Designers grasp the behavior of the virtual world standards, interactive events and interactive time and even the specific subtle interaction, which requires the designer's subjective settings. So the designer must take full consideration of the user's behavior intention, behavior mode, interest and other factors. The purpose of interaction is to serve users, to meet the user's exchange of purpose and desire is the design of the original intention.

5 APPLICATION OF CAD IN ARCHITECTURAL ANIMATION

Compared with the traditional cartoon movie and art of animation, architectural animation not only has common characteristics of visual language and film knowledge, but also has unique artistic characteristics of architectural animation, in which the most important is to make use of CAD method to realize the creative ideas and better express the creation intention of designer intentions. For example, Shenzhen Nanshan Purple Park uses CAD
to create a much more leading domestic digital real estate presentation, presenting a refined decoration of the house site to potential customers with interactive multimedia system. Only a short finger touch, you can stay in the refined decoration luxury house. Customers can overall browse select the villa style according to their interests. At the same time, Purple Park digital model of the housing supports virtual simulation system. Viewers can roam the virtual model room each corner, making the garage simulation demonstration freely, so that they can understand the park intelligent security system better.

Using the virtual reality technology of CAD to make the architectural animation image is helpful to reflect the complex and changeable of physical form. Moreover, the software such as 3DS MAX can design animation according to the time sequence and add music and melody, to make the screen shots showing a beautiful sense of rhythm, which products a series of excellent works of architecture, film and modern art. For example, the film named "Night of the World Expo" produced by the Shanghai Crystal Education Institute created a set of colorful architectural dynamic image and a beautiful picture of a great rhythm through the light changes and with the beat musical notes. This artistic work make every viewer can deeply appreciate the theme of World Expo of Shanghai in 2010, so that the concept about "Science and Technology Expo" and "Humanities Expo" has been interpreted perfectly.

6 CONCLUSION

Improving the living environment and enhancing the service quality of work space are the problems many designers have always been concerned about. But the public always holds skeptical attitudes towards the modern architectural design. A main reason is that people are unable to understand the effect of the building's use before purchasing. In order to promote the design idea of modern architecture, it’s better to convey architectural design principles to the public in a more popular and easier way. This paper presents that the computer aided design can be combined with the architectural design. Through making the architectural animation, the design results can be showed in a dynamic image display, making the public understand the advantages and disadvantages of the modern architectural design, improving the understanding of the internal and external environment of the building. This paper hopes to offer the experience and enlightenment of the development to China's construction industry.

REFERENCES