



Research Article

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## Three-dimensional modeling of simulation scene in campus navigation system

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### ABSTRACT

Virtual reality technology has many applications in the field of digital city, virtual assembly and virtual building. Campus navigation system is one issue of virtual reality technology. Virtual campus navigation system could play an important role in decision-making, predicting the future of the whole campus development plan and school management. Campus navigation system is the basis of digital campus and platform. Three-dimensional models in scene affect the sense of immersion for campus navigation system. This paper discusses the modeling technology of simulation scene in campus navigation system, which includes data preparation and layered structure determination and so on. At last, we give the scene model roaming in Lynx environment.

**Keywords:** Three-dimensional Modeling; Campus navigation; Simulation scene; Texture

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### INTRODUCTION

Virtual reality, multi-media and network are said three of the best prospects for computer technology. Virtual reality technology has emerged as a high-tech in recent years. Virtual reality technology has been one research hot spots in computer science. Virtual reality technology plays an irreplaceable role in the aerospace, military, medical, education and many industries since birth. Its application includes simulation modeling, computer-aided design and manufacture, visualization, simulated driving training, remote machines control, data and model visualization, entertainment and the arts, urban design and planning, and long-distance operation, and so on[1-5]. In China, there has been an increasing number of research institutes and enterprises to do research and product development for virtual reality technology. Virtual reality is a kind of advanced computer interfaces technology in essence. According to applications of virtual reality technology to different objects, its role can be expressed as different forms, such as a concept or idea of visual design and operation, the remote site-to-life effect to any complex environment of cheap simulation training purposes, and so on. It provides users real-time interactive means to maximize user-friendly operation by vision, hearing, touch and other natural and intuitive sense.

Digital campus is a well-known concept. It refers to digital information of the campus, including access to information, processing and application. The real campus will be reproduced by integrating computer data and practical model. Virtual campus roaming system is the basis of digital campus and platform. Campus navigation system is one application aspect of virtual reality technology. Designing 3D virtual campus roaming system adapts to the trend of development of the information society. Campus navigation system adapts to the trend of development of digital campus. Campus navigation system is the basis of digital campus and platform[6-9]. Virtual campus navigation system including the contents of the digital campus facilities, campus roaming intelligence, visualization, and other aspects. Campus navigation system has great practical significance. It could play an important role in school management, predicting the future of the whole campus development plan, real decision-making. In China, many universities have started research and development of virtual campus roaming system.

This paper is organized as follows: Section II introduces campus roaming system. In section III, Three-dimensional modeling of campus scene is introduced. The first part discusses data preparation for navigation system. The second part introduces determining layered structure. Section IV presents the technology of building scene models. Section V is the conclusion.

### Campus Roaming System

Contents of virtual campus roaming system include the digital campus facilities, campus roaming intelligence, visualization, and other aspects. In China, many universities have started research and development of virtual campus roaming system. For example, we can see Suzhou University of Science and Technology has designed campus navigation system from reference [6]. From reference [7], we can see Beijing Institute of Petro-chemical Technologhas done much research on virtual roam system. Campus roaming system includes mainly two aspects, which are three-dimensional modeling of campus and scene roaming. Figure 1 is design plan for campus roaming system.

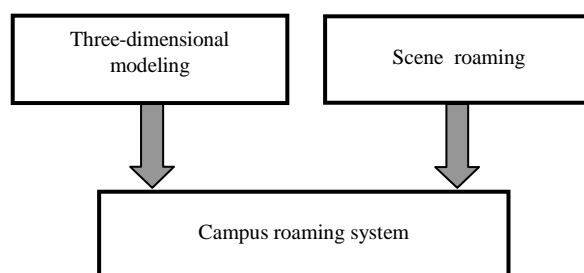


Figure 1. Design plan of campus roaming system

### Three-dimensional Modeling of Campus Scene

Virtual navigation system is essentially a human-computer system. It must have the flexibility, portability and real-time interactive features. The realistic of virtual campus roaming system depends primarily on whether its visual generation system is good or bad. It is an important factor to affect the sense of immersion for virtual reality system. This paper discusses the three-dimensional modeling technology of virtual simulation scene in campus navigation system.

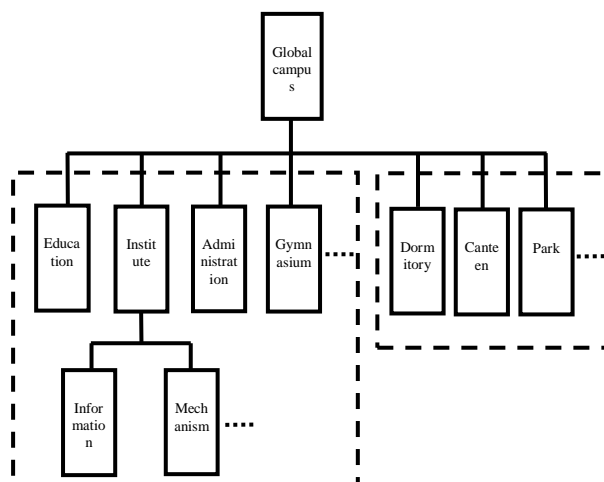


Figure 2. Layered structure of campus navigation system

#### A. Data Preparation

Data for three-dimensional model includes digital map data, three-dimensional model of data size, texture data. We can get all the digital map data through the campus of the floor plan, architectural drawings. Texture data is from the field of taking pictures with high quality and texture database. Texture can increase the realistic of virtual world.

#### B. Determining Layered Structure

Building scenes database through a three-dimensional modeling way is the primary work of roaming system. 3D virtual campus system construction is a heavy workload and it is also the most important part of system. According to different objects, modeling process should be treated differently.

Figure 2 is layered structure of campus. Shenyang ligong university is used as an example. The global campus includes education building, institute buildings, administration building, gymnasium building, dormitory, canteen, park and etc. Institute buildings include information institute, mechanism institute and etc. As show in figure 1, left part in line is education zero. Right part in line is student living zero. Figure 2 is global structure of campus. In software Multigen Creator, each part will be expressed as group. In each group, there exist many objects and faces to compose building.

### Building Scene Models

Successful three-dimensional virtual scene is extremely complicated. Immersion is an important criterion to evaluate a system. The software development environment is a higher demand. The software we use for modeling is Multigen Creator. Multigen Creator is one leading three-dimensional modeling software in visual simulation[10]. Multigen Creator is a real-time modeling and graphics database generation tool that MultiGen and Paradigm Corporation has developed. Multigen Creator uses tree-level database structure to organize and manage model in the construction of the scene. It can carry out organization and management for solid model easily. The advantage for this software is easy and convenient.

The method we use in software Multigen Creator is combination method. Copy, cut, edit functions are included in this software. By using these functions, model can be constructed on the basis of practiced use software Multigen Creator. Figure 3 is model on constructing in Multigen Creator.

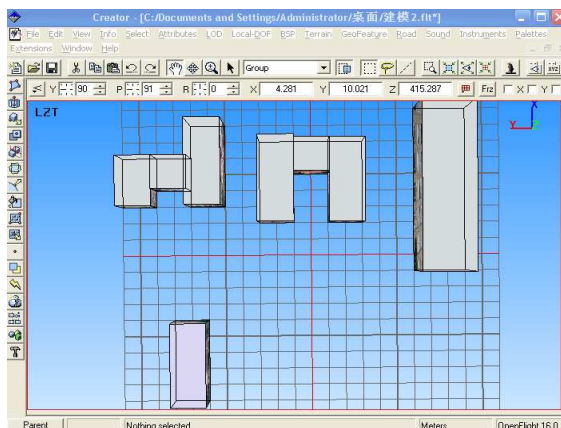


Figure 3. Model on constructing



Figure 4. Texture processing in software Photoshop

Quality of texture processing is important. Texture acquisition is from taking photos for building. In the process of it, we should consider the effect of weather and illumination. To increase the realistic of texture, the textures can be processed in software Photoshop.

Texture file type is a problem that should be paid much attention to in the process of construction. The file format that Vega can run properly is RGB. Thus, texture file should be converted into this file format. At the same time, the size of texture should be integer power of number two. Figure 4 is texture processing in software environment Photoshop.

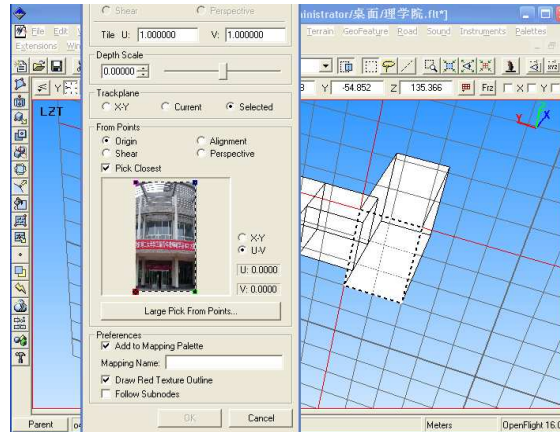


Figure 5. Pasting texture in Multigen Creator

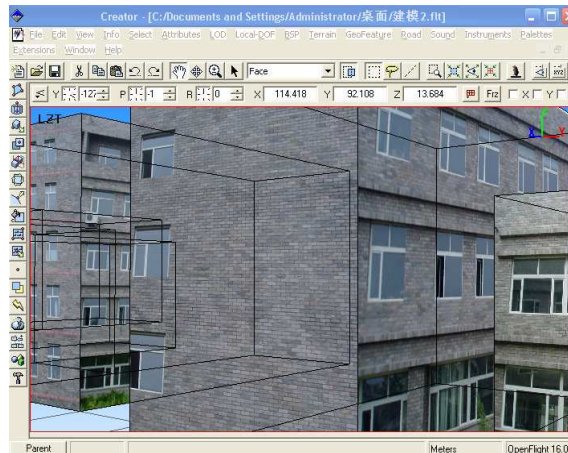


Figure 6. Scene model after texture pasting

There exist many methods in software Multigen Creator to paste texture. In the process of it, two adjoining texture should not be overlapped. Otherwise, there will exist flitting phenomenon. Figure 5 is the process of texture pasting in Multigen Creator using method of four points. Figure 6 is partial scene models of campus based on Multigen Creator software after texture pasting. When we finish the three-dimensional model of simulation scene for campus navigation system. We roam this scene model in Lynx. Lynx is roaming software for three-dimensional model. Figure 7 is campus model roaming in Lynx environment.

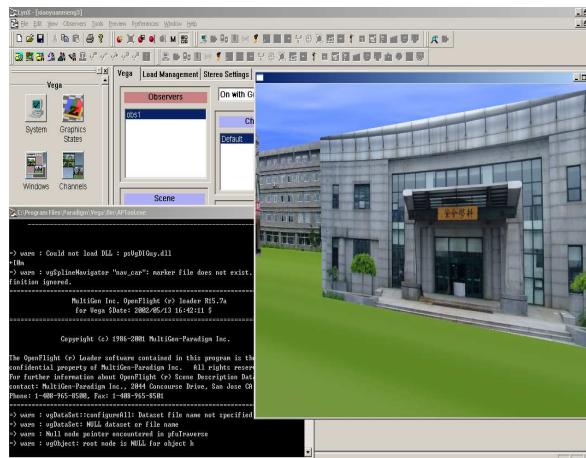


Figure 7. Campus model roaming in Lynx

## CONCLUSION

Virtual reality technology is research hot spot in computer science at present. Campus roaming system is one application aspect of virtual reality technology. It adapts to the trend of development of digital campus. At the same time, it provides a new means for digital campus. It could play an important role in school management, predicting the future of the whole campus development plan, real decision-making. At present, many universities have started research and development of virtual campus roaming system in China. The realistic of campus roaming system depends primarily on whether its visual generation system is good or bad. It is an important factor to affect the sense of system immersion. In this paper, three-dimensional modeling technology of virtual scene in campus navigation system has been discussed.

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