

# VR Development and the Study and Establishment of Virtual Campus

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**Abstract.** As the development of computer and the popularization of networking, VT has already drawn attention of educational institution as well as the relevant departments in China. This thesis introduced the application of VT on the aspect of education--the features and current situation of virtual campus. This thesis came up with some problems of virtual campus and looked forward the future of it.

## 1. VR

VR is short for virtual reality. The technology is from America and has made world wide achievement on the realization of informatization management in the life and educational fields. However, VR technology in China is still at an initial stage, so, on many aspects, we should reference the experience of other countries.

in China, more and more leaders of universities and colleges pay more attention on the digitization and informatization management of campus life, as the bellwether and experimenter of scientific research, universities and colleges started to develop this technology. Therefore, virtual campus, the manifestation mode that is more intuitive and deeper than traditional campus sprouted in the soil of universities and colleges. This thesis mainly introduced the virtual campus in Zhejiang Oriental vocational technical institute that is built on the relevant theories of the combination of virtual environment issuing function and virtual situation geometric modeling technology that is offered by Google Earth platform.

We cannot say that the development of universities and colleges must rely on the establishment and perfection of virtual campus, but virtual campus must be a trend. Furthermore, the virtual technology will brilliantly shine in more fields in the near future.

### 1.1 Virtual Campus

Virtual campus is modeled with the three-dimensional tools such as 3D Rhino, Google Sketch-Up. It is a system that is manifested in Google Earth. In this system, we can not only roam

to any position to check any building from all the directions but also completely know the history and function of the buildings through landmarks as well as management function.

## **1.2 The Development Platform and Design of Virtue Campus**

### **1.2.1 The Introduction of 3D Rhino Modeling**

3D Rhino is the short for Rhinoceros. It is called Xiniu in Chinese. 3D Rhino is a 3D modeling software that is easy to be learned. The establishment of 3D modeling to the system of virtual digital campus is the same as the foundation to a mansion. Aimed to the issue platform of Google earth map that is used in virtual digital campus system, we chose 3D Rhino as the modeling tool mainly because its interface is concise, its order is convenient and handy, and its working efficiency is also high, and what we treasure the most is that it has extremely strong modeling ability and it tremendously reduced the faults of users.

### **1.2.2 Google Sketch-up**

Google Sketch-up is issued by Google company in 2006. The same as 3D Rhino, the uppermost function of SU is 3D modeling, and it can set easy chartlet and material for its models. Further more, it can also perform some more detailed functions. Because of its 3D scene roam function, our ground-floor plane can be firstly built in SU. Its convenient data format conversion is also an important reason for us to choose it.

### **1.2.3 The introduction of Google Earth Platform**

Google Earth, issued by Google Company in 2005, is a free software for satellite poly-chrome scanning. GE is short for Google Earth. The promotion of Google Earth platform drove the three-dimensional of digital earth, provided new platform for the establishment of virtual reality scene and provided new mode for the application of virtual reality technology in education. It can perform simulation 3D demonstration with all kinds of objects. Its import mode and the function of export all kinds of format is the communication bridge between GE and other software. Google Earth has rich layer resource and remote sensing image data. Its backup force is the modern main-current technology in the fields of computer technology and spatial information technology. Therefore, it has strong functions and it is easy to be operated. This makes it the best choice of the establishment of virtual campus platform.

### **1.2.4 The Model of Virtual Campus Landscape**

According to cognitive theories, the geographical category that should be manifested by virtual campus landscape can be divided into five basic space phenomena: land form, building facility, road facility, communal facilities and vegetation. In the modeling, we should not only establish the basic form of these space phenomena well, but also further describe something distinctive to strengthen the sense of reality.

### 1.2.5 The Data Acquisition of Virtual Campus

This thesis divided the data source of 3D modeling into the following three types: The existing relevant resource. Except for building data, map and 2D GIS data base, this resource also includes some literal statement on history, usage, and meaning. Its refresh rate is relatively slow. Photogrammetry. Photogrammetry provides rich geometry and texture data for modeling. At the same time, it can provide high three-dimensional reconstruction for the buildings with obvious outline. Satellite image. As the establishment of American 0.6 meter business satellite system, satellite remote sensing entered its high resolution and high precision age, so, satellite image will be the most promising 3D modeling data source.

Integrating and compressing after data collection can conduct mass data effectively and rapidly. In practical application, the data is always square structural raster data.

## 2. The Brief Introduction of Model Technology

This thesis introduced two 3D modeling software in the previous paragraphs, we will introduce you the establishment of virtual scene model. According to the scene, the model can not be too complicated that its practical operation will be influenced. It also cannot be too simple that the reality of virtue environment will be influenced. There are three main modeling methods.

### 2.1 Modeling technology based on geometry model;

Geometry modeling is to summarize real scene with geometry polygon and then perform the operations such as paste material and texture mapping. It controls the information such as position, illumination, and blanking of observers through the software and finally outputs the scene built. The flow chart of geometry modeling is showed as follow:

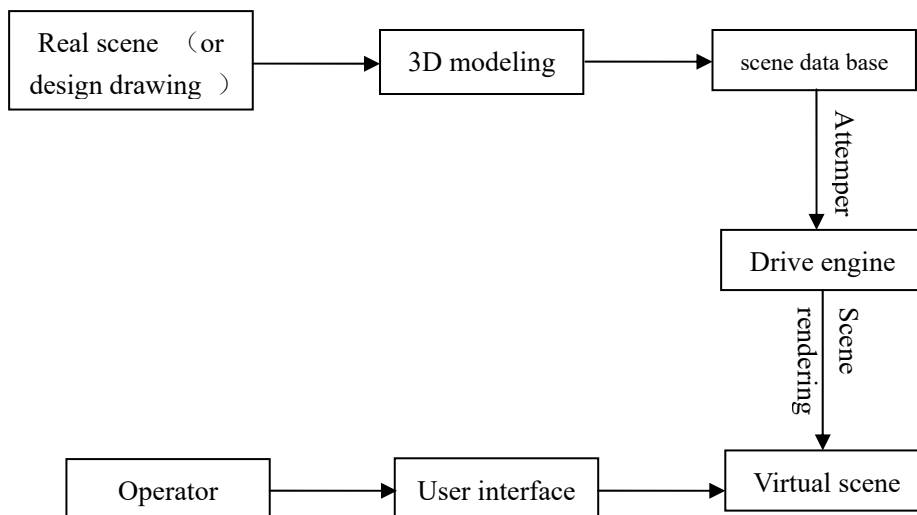


Figure 1 Geometric Modeling

## 2.2 The modeling technology based on image rendering

The modeling technology based on image rendering is based on the real image of the building. It uses computer vision technology to label the environment, compounds the new perspective view, and then completes the roam of environment. It drew a lot of researchers' interest because its modeling process is convenient. Although its development is still not mature because of its technology limitation, virtual reality modeling technology based on image has wild application prospect. It is especially suitable for the natural environment whose 3D modeling cannot be built easily with CAD method and the applications whose original style and features of environment should be reappeared. Figure 2 shows the flow chart of packaging scene modeling method.

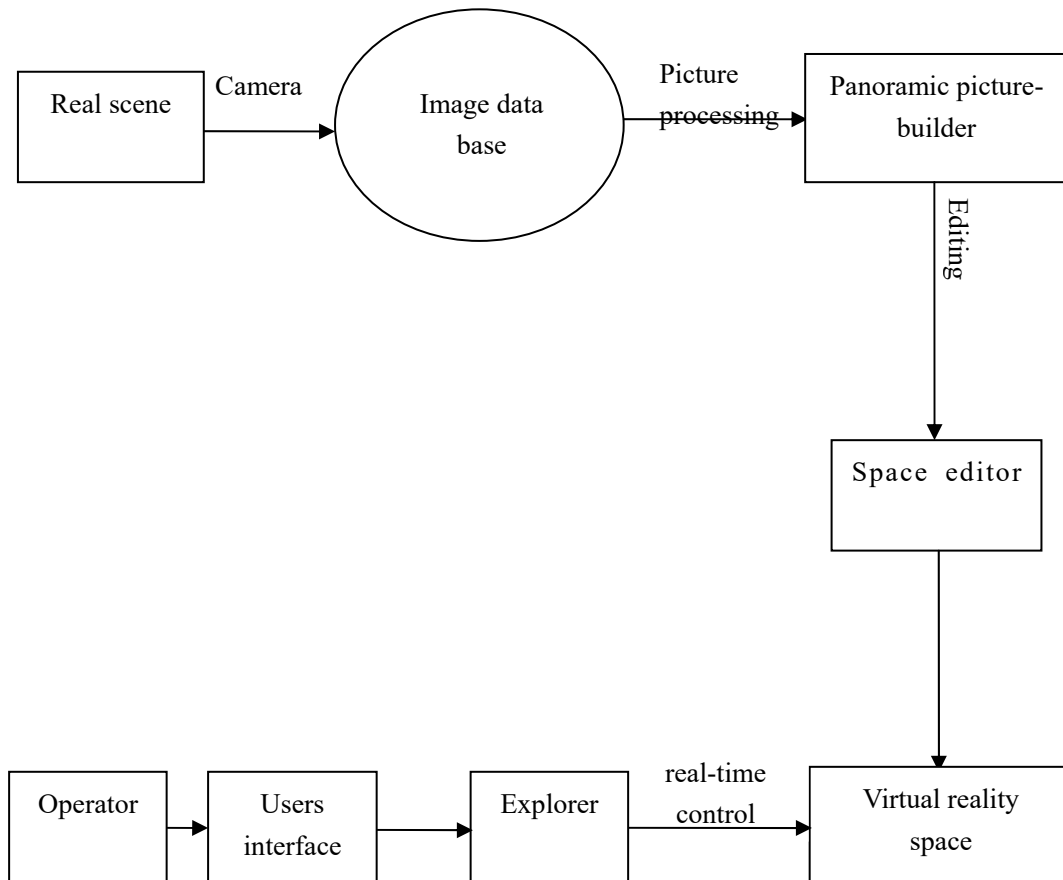


Figure 2 The Flow Chart of Packaging Scene Modeling

## 2.3 The mix modeling technology based on geometry model and image

The mix modeling technology based on geometry model and image combines the advantages of both the modeling technology based on geometry model and the modeling technology based on image. It can perform model to building with sparse-distributed images. Compared with the modeling technology based on geometry model, this method is more convenient. Compared with the modeling technology based on image, it can get accurate modeling result with only a few images.

### 3. The Realization of Virtual Campus

Based on geography information technology, virtual reality technology and computer network technology, the process of the realization of virtual system is: 1. Planing land form and collect the texture of buildings. 2. Making base-ground plane in SU, predicting the length and scale of each ground part of buildings for the preparation of the flowing process. 3. Modeling in 3D Rhino. 4. Importing the complete modeling made in SU and finally refining. Finally,the modeling can be issued on GE platform. There are three methods for issuing: 1. Direct import. 2. Later period import. 3. Inputting modeling document with RML language writing. This thesis used the first method to issued the 3D modeling. The following figure shows the campus scene with a basketball court.

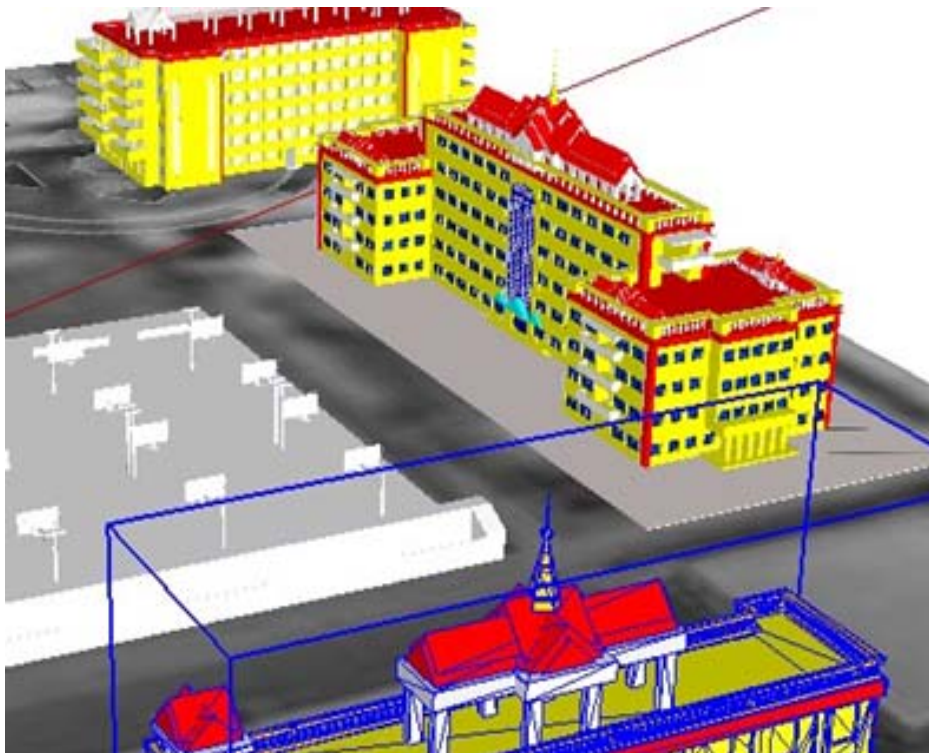


Figure 3 Campus Scene

### 4. The Bottle-neck of Virtual Campus

We have already briefly introduced the situation of the development of virtual campus. Although virtual technology is competitive in some fields, as the base of virtual campus, soft ware is still in a weak stage. Because of the limitation of software functions, the virtual campus idea of Longwan Campus of Zhejiang Oriental Technical Carrier Institution cannot be full played.

On the aspect of chart let, although GE has rich resource, neither its chart let function for the surface of 3D objects nor the material function of 3D Rhino is good enough for modeling chart let.

The hardware configuration of computer influenced the modeling a lot because the process of both modeling and rendering need large storage space and quick running speed.

Influenced by the limitation of software, when the modeling is being imported into GE platform, the reality of scene can not be presented because some angels of view cannot be transformed perfectly.

The modeling efficiency is influenced because there are always some unknown-errors in the process of importing the modeling form SU and Rhino.

## 5. Outlook

The establishment of virtual campus is a complicated project. It covers a wide range. It requests high on the aspects of 3D modeling, resource collection, detail optimizing and the importing and exporting of modeling. This thesis only studied and discussed some simple aspects, for real development of virtual campus technology and system, we still have a long way to go.

To realized integrative roam, virtual campus model needs not only the model of the external buildings, but also the description of internal buildings.

To strengthen the development of software. The optimization of platform software such as GE, 3D Rhino, SU will strengthen the functions of virtual system.

Nowadays, technologies are developing with a high speed. As the development of network and computer technology, virtual campus technology have great development space in China. At the same time, the development of virtual campus will drive the development of 3D modeling software and explorer issue website. Therefore, virtual technology still has great development space, lets wait and see what will happen!

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