



# Research on the Technology of Constructing Scenic Spot Scene with Graphics and Images – Taking the Scene Modeling of Huiyan Peak Scenic Spot as an Example

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**Abstract.** By studying the development of graphics and image technology, analyzing the application status of computer three-dimensional modeling technology, combined with the current demand for scene modeling of scenic spots, this paper summarizes the relevant elements of computer-generated virtual scenic spot scene and carries out practical research, aiming to use computer graphics image technology provides digital empowerment for the development of the tourism industry in the “post-epidemic” era and activates new driving forces for the development of the tourism industry.

**Keywords:** Graphics and Image Technology · Scene Generation · 3D Modeling

## 1 Introduction

From the command line interface for command input operation to the graphical user interface for the general public, computer graphics technology has changed greatly from the vicissitudes of the 1980s to today’s universal application, from “the former Wang and Xie mansion into today’s ordinary people’s homes”. We stand on the “shoulders of predecessors” to study and explore the specific application of graphics and image technology in the scene construction of scenic spots, so as to provide a new transformation idea for tourism developers in the “post epidemic” era and develop a new experience mode against the current.

Computer 3D modeling technology is a computer-aided design technology and an important part of computer graphics and image technology. Through this technology, the general view of the scenic spot in the real world can be restored to a certain extent, the user’s experience in a particular aspect can be enhanced, and more choices can be given to tourism practitioners and even tourists. In this paper, the Huiyan Peak Scenic Spot in Hengyang City, Hunan Province, is used as the real scene prototype to model the three-dimensional scene and optimize the scene model of the whole scenic spot.

## 2 Research Status of Graphics and Image Technology at Home and Abroad

### 2.1 Foreign Research

Computer graphics and image technology was born in the United States in 1980. In 1980, Herbert Freeman presented a concise overview of the first two decades of the development of Computer-generated imagery (CGI) in his paper “IEEE Compiled Computer Graphics”. In 1981, sylvan Chasen published a paper similar to the evolution law of computer graphics and images. He first put forward the concept of computer synthetic images from nothing, and believed that from 1950 to 1963 was the “pregnancy” of computer graphics; From 1964 to 1970 for its development of “childhood”; “Adolescence” from 1970 to 1981; “Adulthood” after 1981 [6]. There are also many papers and materials recording the computer synthetic image technology and its rich development history in the application field.

### 2.2 Domestic Research

Compared with foreign countries, the research on the development of computer graphics and images in China started relatively late, but the research on technology application is very mature. The State Key Laboratory of CAD&CG of Zhejiang University (Yang 2015) has developed a set of desktop virtual building environment real-time roaming system; the “Potala Palace” produced by the National Optical Disc Engineering Research Center of Tsinghua University has realized the panoramic VR system by using Quick Time technology; the computer department of Harbin Institute of Technology has successfully synthesized face images, which belong to specific expressions in the advanced behavior of people, and successfully solves the technical problems of expression synthesis and lip movement synthesis [1]. It can be seen that graphics and image technology is developing rapidly in China and has broad prospects.

## 3 Application Status of Computer Modeling Technology

3D modeling technology is a branch of graphics and image technology and a specific application technology of graphics and image technology. There are three main ways of 3D modeling technology: (1) modeling technology based on 3D geometric rendering method; (2) image-based modeling technology; (3) Modeling technology based on hybrid geometry and image [2]. This paper adopts the modeling method of graphics and image mixing, which not only uses the geometric modeling method, but also generates realistic scene images through the image processing system.

In terms of its practical application, 3D modeling technology has been extended to various production and life fields. Its flexible application can be seen in reconnaissance, environmental design, social development, engineering, public health and other disciplines. At the same time, its application also provides ideas and help for the development of these fields, it has also promoted the development of these fields to a certain extent. For example, in the field of investigation, the application of three-dimensional modeling technology can simulate the criminal process by setting animation and adjusting

the physical parameters of motion, provide simulation exercises for solving cases, save reconnaissance expenses and solve cases more quickly and conveniently; In the medical field, through the three-dimensional modeling technology, we can simulate the operation process, capture the simulation data, deconstruct the risk of the operation according to the big data analysis, make preventive preparations in advance and improve the safety of the operation; In the field of film and television media, the application of three-dimensional modeling technology is also strengthened [5]. With film and television special effects, three-dimensional animation has also been widely recognized by the market. In the tertiary industry such as tourism services, 3D modeling technology can also enrich the content of scenic spots, innovate tourism experience, and show the scenery of scenic spots without regional restrictions.

## 4 Analysis of Relevant Elements for Virtual Scene Generation

3ds Max is a modeling software for medium and low precision models. Its models are widely used in architectural design, game animation, virtual reality and other applications. Its operation is simple, and it can also produce high-precision models on the premise that it is generally applicable to low precision models. Therefore, this paper mainly uses 3ds Max 2014 version, takes Huiyan Peak scenic spot as an example, carries out practical operation, and summarizes and analyzes.

### 4.1 Construction of Geometric Object Model

The Wild Geese Carving is the core building of the scenic spot, and the whole can be divided into three parts: pillar, flying wild geese and carvings.

Firstly, the fabrication of the pedestal column can be achieved by setting out a circular figure and a straight path, and then by adjusting the axis point in the modifier, as shown in Fig. 1.

The second is the addition of the column pattern. First, convert the column into an editable polygon, use the quick slicing tool to add an edge, select the face at the bottom of the column, and use the face extrusion modifier to extrude the texture. To make a building logo, you only need to select the corresponding face. Other texture engravings are also obtained by selecting faces in the same way and adding face extrusion modifier, as shown in Fig. 2.

The last is the production of flying geese. There are four flying geese with different postures, so they need to be completed one by one. Make the first flying geese, get the

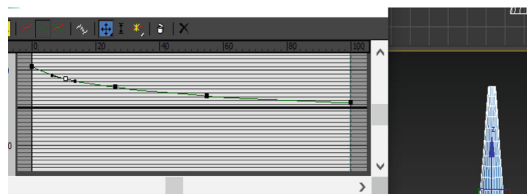
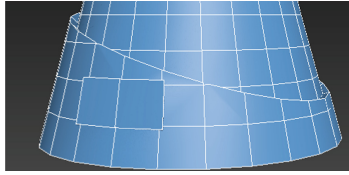
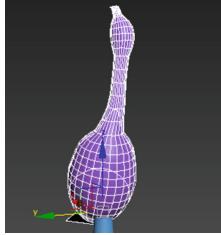


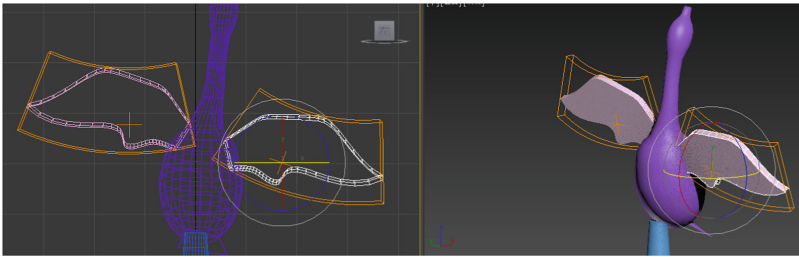
Fig. 1. Pillars carved with wild geese.



**Fig. 2.** Bottom of wild geese carving column.



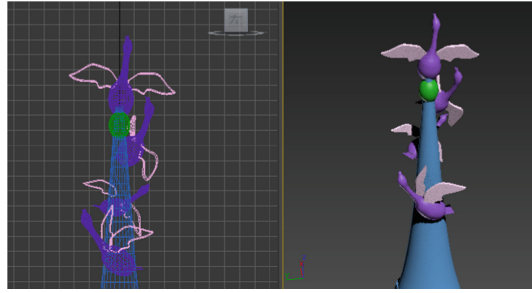
**Fig. 3.** Torso of flying geese.



**Fig. 4.** Goose wings.

cylinder through circular and linear lofting, and then adjust it to the body shape of the flying geese through scaling in deformation, convert the object into editable polygon, quickly slice and add two edges, use the chamfer to make the tail of the wild geese, add a bending modifier to the whole object, bend it  $50^\circ$  along the X axis, and adjust the state of the flying geese [5]. Finally, turn the whole object into an editable polygon and use soft selection to adjust the state of the flying geese's head. The final effect is shown in Fig. 3.

Then there are the wings of flying geese. Use the spline to draw a rough outline in the left view. Then at the modifier level, select the vertices and modify the corners to Bezier corners. Adjust each point to get the section shape. After adding the extrusion modifier to the shape to get the three-dimensional shape, convert it into editable polygon and slice it quickly, add a spline parallel to the section in the top view, pull the spline, add wing instances along the Z axis by mirroring, and you can get the other half of the wing of the goose and adjust its position. As shown in Fig. 4.



**Fig. 5.** Wild geese carving.

Other flying geese first get the shape of each flying goose through the same method. After placing the flying geese in different positions, adjust their posture through perspective view and three views, and combine the bending modifier to zoom, rotate and other operations on each flying goose. After continuous adjustment, the geometric model of geese carving is completed, as shown in Fig. 5.

The shape of the object is determined by the polygons, triangles and vertices of the object, and the appearance of the object is determined by the surface texture, color, illumination coefficient and so on. Therefore, after the basic model is built through geometric objects, the surface texture of the model needs to be processed for simulation.

## 4.2 Material Mapping

In the process of modeling, in order to achieve the real effect, it is inevitable to use material mapping and render. In many cases, the final rendering effect also determines the rendering effect. Therefore, it can be said that mapping rendering is a key link of 3D modeling.

The first is the collection of mapping materials. In order to achieve the real effect, a digital camera needs to be prepared during the preliminary design investigation. During the investigation, the model of the real environment is photographed and the material samples are taken [3]. Some model materials can directly use the real photos as the texture map of the model, the other part of the picture may need some other post-processing to get it. For example, through the plane image processing software Photoshop, setting the size of the material texture picture needs to set the corresponding value. Some material mapping contents that cannot be photographed from the on-site environment, such as buildings, rockeries, trees, etc., can also be obtained by making graphic materials. The processed picture material is shown in Fig. 6.

## 4.3 Light Rendering

After the material map is assigned to the model, the modeling of the model is adjusted through the viewport. First, add a camera according to the needs of the model, adjust the viewport to the camera viewport, then move the camera to aim at the model scene, and select the appropriate scene from the long-range, panoramic, medium range, close-up

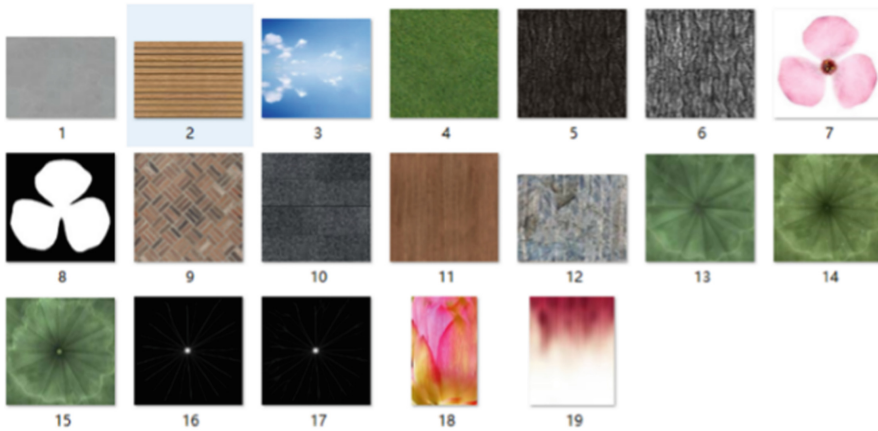


Fig. 6. Texture mapping.

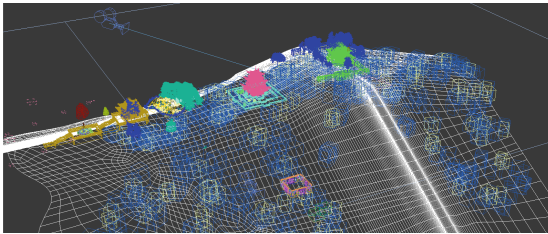


Fig. 7. Lighting and camera.

and close-up as the display content of the output effect. First, add a sky material to the scene of the scenic spot. When rendering, the whole scene seems to be under the sky, which is more realistic. Then add lights to the scene, including sky light, natural light, focusing light and many other options. In this scene, you can first choose to add a skylight, adjust the position of the skylight and relevant data parameters, so that the overall model has the feeling of being illuminated, which is similar to the sun in real life, and generate a shadow for the model. Then, after rendering the content of the picture through the camera, set up other lights, which can be the close-up lens of the focus light or the natural light to supplement the light of the whole picture. In addition, there are many other styles of lights that can be added to the model environment after adjusting their brightness, color and other relevant values as needed [4]. Similarly, you can also set up several cameras and select multiple angles to display the model scene. The effect is shown in Fig. 7.

## 4.4 Model Optimization

### 4.4.1 Texture Mapping

In addition to enhancing the realistic effect of material mapping, its texture mapping can also reduce the drawing of model surface, and give the model a certain texture by

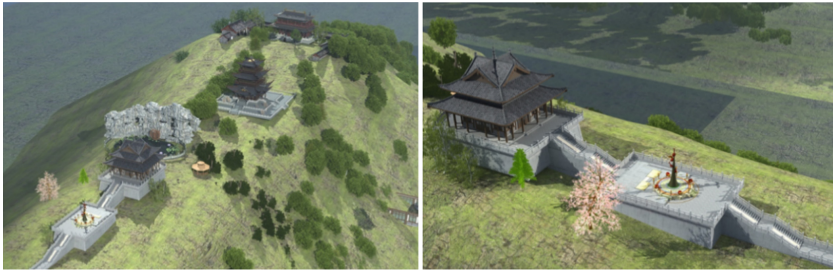


Fig. 8. Panorama of the scenic spot and wild geese carving.

increasing the roughness value. In addition, the size of image texture will directly affect the storage size of the whole project file and the speed of rendering the project file. Therefore, when dealing with mapped material pictures, you should set the material pictures to the minimum value, but the limit is based on whether it will affect the overall effect. In special cases, you can make certain modifications through 3ds max.

#### 4.4.2 Delete Redundant Faces

Firstly, in the modeling process, the model usually has redundant triangular surfaces, such as overlapping surfaces and invisible surfaces. Deleting redundant surfaces can reduce the number of triangular surfaces of the model, improve the three-dimensional rendering speed of the model, save computer memory overhead, and better apply and promote the utilization rate of scenic spot scene model.

Secondly, the model can be processed by using the prooptimizer editor of 3ds max, which basically does not lose the fineness of the model for 3D models with a large number of faces, and reduces the number of triangular faces of the model. The operation of surface reduction is relatively convenient, and most details can be well saved. Prooptimizer's algorithm focuses on maintaining the contour, which will slightly affect the topology of the surface. Therefore, for the model in the scene, the editor can be used to reasonably simplify the number of model surfaces [1].

## 5 Design Practice of Effect and Application

### 5.1 Effect Display Diagram

The scenes of Huiyan Peak scenic spot take the wild geese carving, Yanyu pond, Huiyan Pavilion and Yanfeng temple as the main scenic spots. Therefore, these four buildings are mainly used as reference objects to make models. On the whole, the overview of the four scenic spots of Huiyan Peak is roughly restored, some details are modified, and the model is adjusted and improved. The rendering effect is shown in Fig. 8.

### 5.2 Construction of Scenic Spot Scene with Graphics and Images

The construction of scenic scenes with graphics and image technology also provides more ideas for the tourism industry in the "post-epidemic" era: build virtual scenic spots

through graphics and image technology to provide more travel choices for tourists; Integrate the scene model of the scenic spot, make cultural and creative products of scenic spot sign buildings, and open up the market for tourism; Use the scenic scene model to create film and television works to improve the popularity of the scenic spot; in addition, it can also be combined with scenic spot scene models, develop a three-dimensional scene map of the scenic spot, provide more perfect services and enhance the market competitiveness of the scenic spot.

## 6 Conclusion

After more than 40 years of rapid development, graphics and image technology has been fully used in all walks of life. Similarly, in the tourism service industry, it can also endow the entire industry with new vitality and strength through its own advantages. Through computer graphics and image technology, geometric modeling of scenic scenes, adding material maps, lighting rendering and optimizing output, make reasonable application in the tourism industry, expand the industry market, and promote the transformation of the tourism industry in the “post epidemic” era with science and technology, which is not only the mature application of graphics and image technology, but also a choice for the tourism industry to “ride the wind and waves”.

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