

Landscape based on three-dimensional SketchUp modelling to get visualization applications

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Abstract

Landscape designing CAD software are now mostly in two-dimensional draft stage in domestic, and three-dimensional visualization of designed landscape models and applications are still in the initial stage. The essay based on precise three dimensional solid modelling SketchUp software, introduces SketchUp software functions and features, and focuses on three aspects of garden design, hand-painted TIN terrain design, planting design and planning and design of garden objects. Through engineering examples to import the landscape of two-dimension vector data into SketchUp software, use SketchUp techniques flexibly to solve different details and avoid redundant and diverse work. After rendering and post processing, establishing a realistic visualization of three-dimensional entity model.

Keywords: SketchUp software, landscape, three dimensional solid model, engineering examples

1 Introduction

With the development of science and technology, concerning for geographic information are increased, the requirement for access to information is getting higher and higher. Due to the three dimensional environment closer to people's vision habitat, more geographical information can be shown, it can express more complex spatial structures. Establishment of three-dimensional geologic models in two ways: use a geographical model of three dimensional to display topography; use three-dimensional model animation techniques [1] to display formation and process of the development of models.

Development of three-dimensional modelling technology, three dimensional landscape modelling technique bases on SketchUp software has gotten more and more attention by Garden Lovers [2]. SketchUp is a collection of design tools that Google introduced in 2006 for design-oriented process, operator interface is simple and powerful this gives many landscape designers and enthusiasts even more ideas of experience, breaking the shackles of traditional two-dimensional landscape design ideas, and create different styles of three dimensional model programmes. Establishment of three-dimension model in SketchUp software is as simple as a pencil on paper drawing, the software will automatically identify the composition of line and capture, you can quickly import or export to dwg, dxf, jpg and other formats files [3]. Due to landscape, design has a lot of detail in textures, you could find texture mapping function in the SketchUp software, use material of the software itself, or you can import your own production material, to create the landscape model more realistic.

Landscape designing is the process of combining aesthetics and technology, science and the environment. Designing works not only need to have visual aesthetic, and get more interaction with the surrounding environment. Modern landscape designing including urban greening, plaza designing, road conditions, and river attractions planning, landscaping, etc. [4]. It emphasizes both the landscape and life, geography, cultural integration, but also the vegetation development, conservation and the using of natural resources [5]. However, designing and application of computer-aided landscape was introduced relatively late, many landscape design in secondary developed of Auto CAD. This tool has been unable to meet current requirements and ideas of the designers. So a variety of model building software in 3D have been appeared much, and are applied to all works of life. This article focuses on modelling methods of the SketchUp software, and shows the embodiment of engineering to display the results.

2 SketchUp software overview

SketchUp has a unique nature sketches and interaction designing thinking, making designers have more inspiration in the designing process, powerful function bring designers illuminating harvest [6].

2.1 INTRODUCTION OF SKETCHUP FUNCTION

According to the current mainstream trend of multimedia, three dimensional images and text content is favoured by learners. Three dimensional multimedia can present plane content more specific and detailed for learners to

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understand an object more intuitively in different perspectives and aspects. Three-dimensional character presented by media factors break through previous content presentation form. Learners can have different mental feeling when they receive the content presented by multimedia courseware.

TABLE 1 SketchUp function introduction

Function modules introduction	Tools in module
Essential tools modules	Selection tool, eraser tool, painting tool
Comment module	Measuring tool, text tool, dimension tool
Drawing module	Circle tool, line tool, polygon tool, free drawing tool
Camera module	View, track, zoom tool
Correction module	Mobile tool, follow tool, scale tool
Sandbox modules	TIN is used to simulate terrain
Model management module	Materials browser, parameter settings and parameter selection
Google module	Share tools on Google Earth
Navigation module	Touring tool, walking tool, camera setting tool
Import/export module	Supports various data formats for import and export

2.2 SKETCHUP SOFTWARE CHARACTERISTICS

- 1) Feature of SketchUp software is his interface is simple, powerful, and easy to learn and use.
- 2) SketchUp provides new methods for computer-aided architectural designing, meet the requirements of each stage of the building designing, show better details, and get three dimensional works more realistic.
- 3) SketchUp provides a powerful rendering tool and several models displaying mode, you can set the daylight effects rendering and shadow analysis at different times.

- 4) SketchUp software has a unique geometry creation and editing techniques, and full of randomness.
- 5) SketchUp through creating groups and components to achieve three-dimensional modelling, using it widely and flexibly will not only improve efficiency, also can display optionally implement an object hidden.
- 6) SketchUp software entities that defines rich parameter settings can be made, each entity has a intelligent autonomous relationship with each other.
- 7) SketchUp software has more real actions, shadow analysis, special effects presentation can be done more quickly and efficiently.
- 8) SketchUp software provides the secondary development interface, with extended capabilities [7, 8].

3 Modelling of three dimensional designing

Three-dimensional SketchUp landscape designing, take landscape design as a subject, terrain design, planning design, planting design for the main content, integrate elements such as buildings, roads, culture, whole architecture is shown in Figure 1.

3.1 DUAL CHANNELS ASSUMPTION

Terrain designing of three dimensional landscape designing software SketchUp modules including topography, terrain analysis and geomorphology transform these basic steps. First use graphic data to simulate the original topography to get terrain mesh. Analyse according to software modules such as terrain, water, and slope.

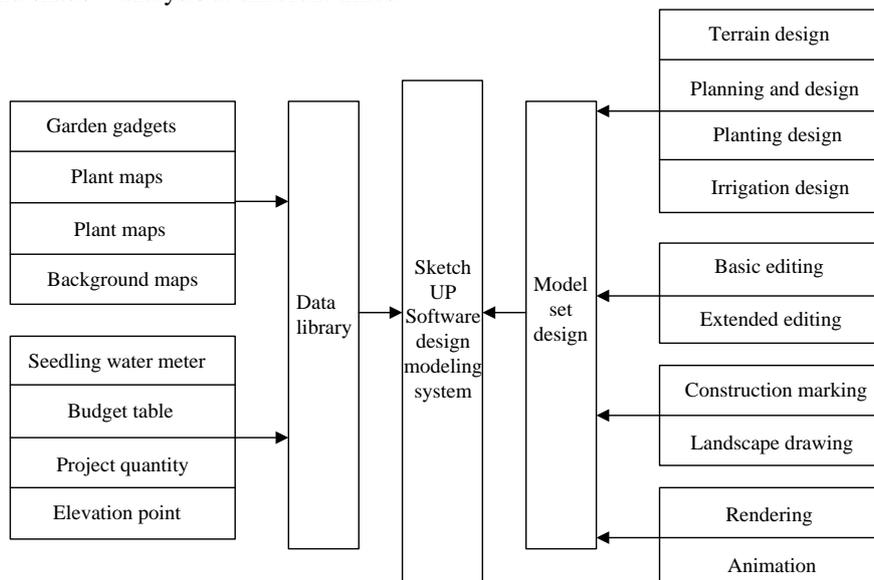


FIGURE 1 Design modelling system architecture

In the sandbox modules, we use TIN to make terrain models. TIN is the triangular plane which linking to each other, after smoothing, it looks like a continuous smooth surface. The orientation of the triangle in TIN can be different, some triangles are level headed, and some

triangles are orientated vertically, the orientation of the triangle is known as triangulation. Triangulation [9] is very important, because with some tools of the Sandbox, you can change the orientation of the triangle, so as to make the TIN more smooth as shown in Figure 2.

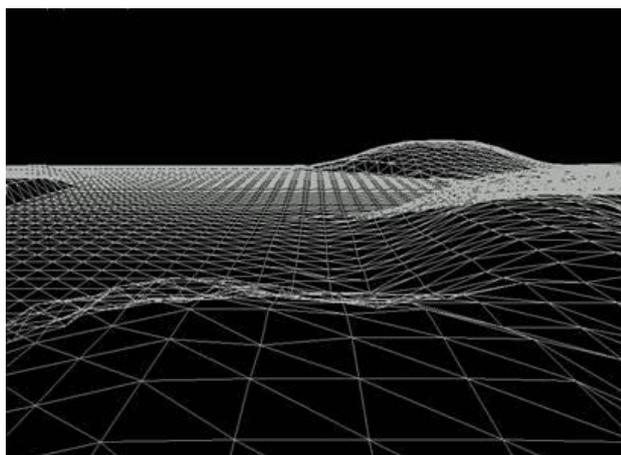


FIGURE 2 TIN making terrain model

3.2 PLANTING DESIGNING

In landscape construction process, usage of the plant is usually very large. There are various planting patterns in the landscape model, include solitary planting, stroll planting, turf planting, unitizing and intermingle. In SketchUp software, you can edit the result of planting, planting plants in any terrain.

Flowers, plants, shrubs, trees and other plants in landscape are described by point features. Many three dimensional modelling software have problems in details, with free hand drawing in SketchUp, trees are more realistic, details are more sophisticated, as shown in Figure 3.



FIGURE 3 SketchUp Hand-painted plants

3.3 PLANNING AND DESIGNING

Road landscape planning and designing is included in SketchUp software, handle road intersection automatically and set round corners at road crossings, modify road width and update the road borders and rounded corners at intersections automatically; get the block Specific, custom site name; setting garden gadgets models parametrically, the system can adequately sum up the curb, flower beds, pools, steps, Pergola, fence walls, landscape architecture feature information, as shown in Table 2.

TABLE 2 Biologically treated effluents (mg/l)^a

Category	Element, Ebenename	Space Type	Data Type
Vegetation	Single-tree	Punctiform	Ponit Feature
	Path	Threadiness	Line Feature
	Green-lawn	Facet	Polygon Feature
Sidewalk	Sidewalk	Facet	Polygon Feature
	Centre-road	Threadiness	Line Feature
	River	Facet	Polygon Feature
Main-Building	Main-building	Facet	Polygon Feature
	Surroundings	Punctiform	Ponit Feature
Infrastructure	Benches	Threadiness	Line Feature
	Stree-lights	Punctiform	Ponit Feature

Some parameters of landscaping or gardening gadgets can also be generated by selecting the input or parameter, as shown in Figure 4 for landscaping small objects.

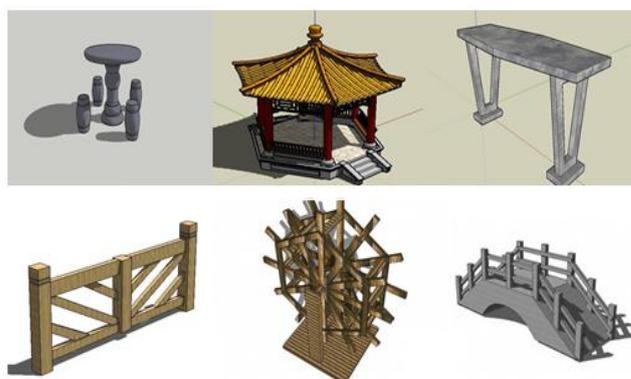


FIGURE 4 Garden gadgets maps

4 Engineering examples

Getting ready for a modelling job that needs to be modelled into components of architecture, landscape architecture, and any component can be saved as a single file, modifying or assembling a deviation can be modified at a later time.

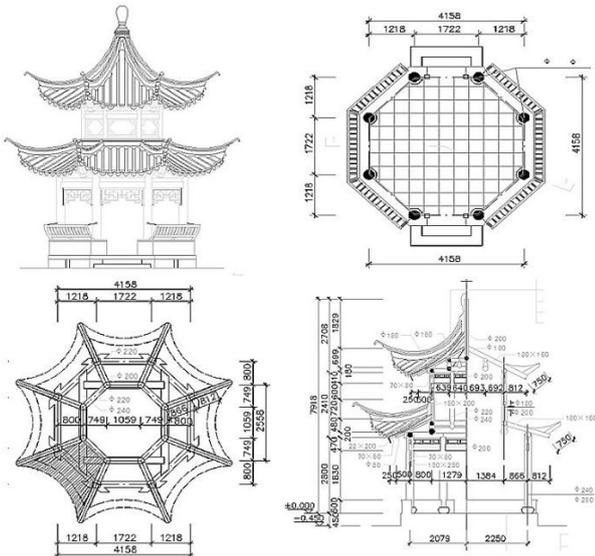


FIGURE 5 Required to establish a model of CAD files

As shown in Figure 5 Select the modelling of architectural CAD files, import into SketchUp software, and through simple depiction of each line to generate it, then make in a three dimensional model of each side. This stage demands very high quality of the CAD drawing. Representation of contours in two-dimensional are in very mess. We need to import SketchUp by CAD drawing software as a base map, change details, as shown in Figure 6. Some overlapping lines of unnecessary details in CAD, this is unnecessary in SketchUp, so make the whole graphic into component avoids complexity of works. Pull the base, without the exploded diagram above, based on maps that are not exploded. On this basis, select the staggered lines for the base model; Import ARC paths to follow and create the geometry model; Use method of creating groups to copy multiple objects of the same; Selection exploded after the merge component, removing unwanted clutter line (as shown in Figure 7).

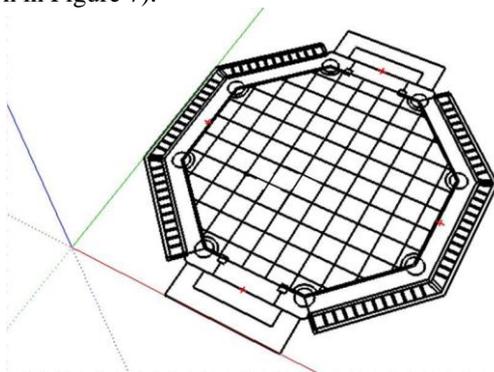


FIGURE 6 Base maps modified

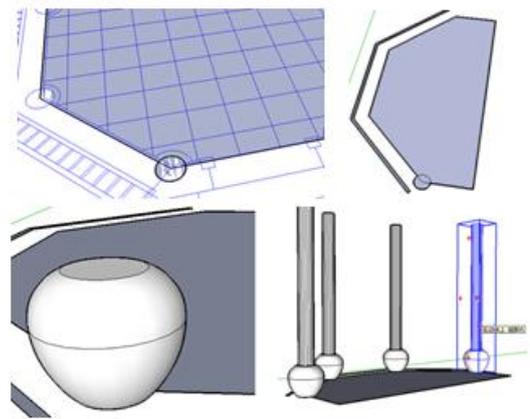


FIGURE 7 Base model

We used a group quickly copying approach in the modelling process. Intercropping in the base map guides, by rotating a certain degree, to achieve the positioning that you want to copy. Finally, drawing plane or make combination to implement a three-dimensional view of the component, as shown in Figure 8. When model's appearance substantially completed, we can get post processing. In the SketchUp get appropriate materials, click on the pattern and then attach the material model to be rendered on the needed part.

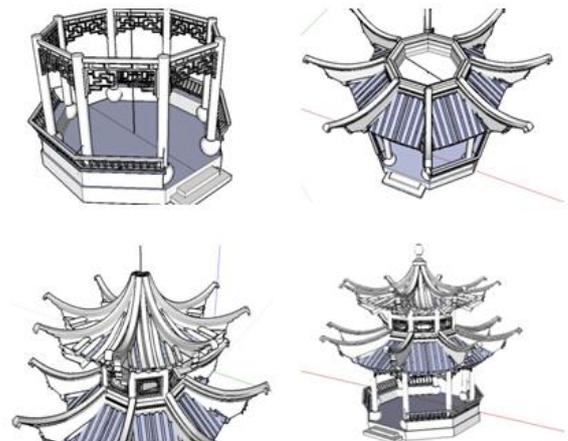


FIGURE 8 Three dimensional model stretch mix

5 Conclusion

This paper introduced variety of function modules and various tools in SketchUp software, make an overview of SketchUp software is simple to understand, powerful, compatible with good features. From three-dimension modelling aspect outlines three main designing including landscape design, planting design, planning and designing. From TIN terrain designing, hand-painted designing of landscape plants, parametric or texturing the landscape planning of the image of the object to show SketchUp modelling tool's variety and convenience. Finally, through a detailed analysis of engineering examples, from the base map locating, to the combination of individual components, to show

SketchUp software's flexibility and application. Two-dimensional image after imported into SketchUp, many lines do not work because SketchUp intelligent, various issues could appear through models from two-

dimensional graphics into a three-dimensional. Through flexible use of SketchUp software, you can easily avoid unnecessary work, this reflecting its strong functionality.

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