A Sketching Interface for Terrain Modeling

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1 Introduction

Three-dimensional terrain models are widely used in entertainment applications such as movies and video games. These terrain models are mainly used as background and it is not necessary to carefully design every detail. A popular interface for designing terrain models is standard polygonal mesh editing that explicitly manipulates 3D positions of vertices. Another popular approach is to paint 2D heightfield, from which the system generates a corresponding mesh [Terragen]. These interfaces are suitable for careful design by experts, but not necessarily easy or intuitive for casual users. The Harold system [Cohen et al. 2000] included an interface where the user can directly sketch the ridgeline to design hills and mountains, but the resulting terrain looks awkward when viewed from other viewpoints.

This poster introduces a system where the user can design variety of terrain models using a sketching interface. The user edits a 3D geographical model by drawing 2D strokes that represents the desired ridgeline. Whenever a stroke is drawn, this system generates a terrain model whose ridgeline matches to the stroke on the screen.

2 Modeling Process

Figure 1 shows an overview of the modeling process using our system. The user first draws a stroke by dragging the cursor with a pen or mouse (b). When the button is released (or the pen is released), a mountain is generated (c). The stroke is interpreted as the ridgeline of the mountain. A round stroke generates a round mountain, and a sharp stroke generates a sharp mountain. The user can repeat drawing to obtain scene with various mountains (d)-(e). Optionally, the user can add noise to make the terrain look natural (f). Noise of various strength can be added to the original terrain. The user can also add colors to the terrain according to the height (g), and draw rivers on the terrain(h).

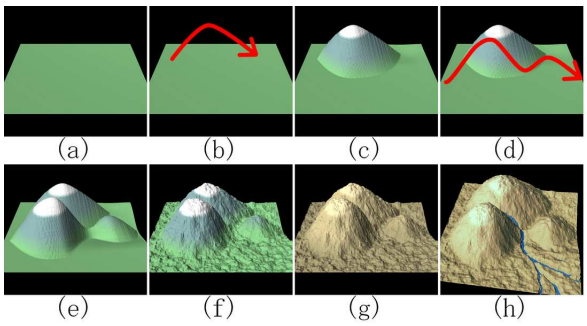

Figure 1: Modeling process

3 Implementation

A terrain model is represented as a grid-based DEM (Digital Elevation Model) that consists of a raster grid of regularly spaced elevation values. The current grid size is 250 × 250.

In Harold [Cohen et al. 2000], the depth (the extent of the mountains perpendicular to the screen) is constant, and the cross-section is parabolic (Figure 2 top). Mountains, therefore, look unnatural when viewed from other viewpoints. Our system adjusts the depth and cross-section shape according to the shape of the input stroke, resulting in a more natural-looking geometry (Figure 2 bottom). Briefly, we segment the input stroke at local maximums and minimums, and compute the depth and the cross-section shape for each segment (our current implementation is designed for specifying overall geometry and cannot handle wiggling strokes that represents a ridgeline with small details).

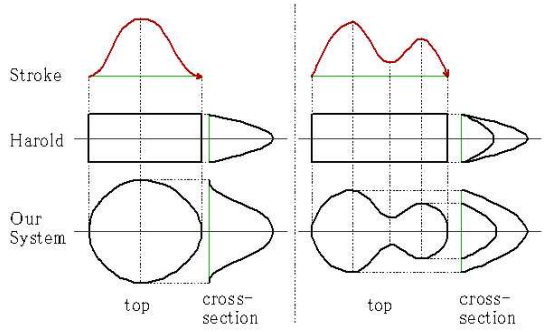

Figure 2: Comparison between the mountains in Harold and our system.

4 Results

Our prototype system is implemented on Java ™ version 1.4.2. The author and test users generated various terrain models using our system. Figure 3 shows those designed by the author and Figure 4 shows those designed by the test users. It is possible to model these terrain models in approximately 10 minutes using our system.

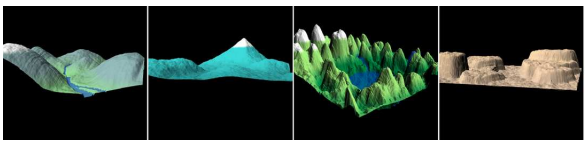

Figure 3: Terrain models designed by the author

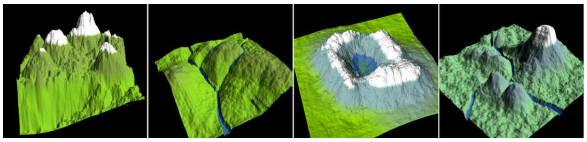

Figure 4: Terrain models designed by test users

References

COHEN, J. M., HUGHES, J. F., AND ZELEZNIK, R. C. 2000. Harold: A world made of drawings. In *ACM NPAR 2000*, ACM NPAR.

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