



## Virtual terrain generation

Researchers at UCT have developed the realistic Terrain Synthesis System (RTS), which is an improved method for creating a realistic-looking virtual 3D terrain on a computer. It synthesises new terrains in real time, subject to the constraints sketched/selected by the designer, utilising real terrain examples drawn from a database of Digital Elevation Maps.

The designer starts with a working terrain with target dimensions and an associated height, chooses a template terrain (such as bare terrain, a canyon, a mountain, vegetation, a river, or rolling hills, etc.) with an associated height dimension, and then modifies the working terrain by 'height matching' it to the template terrain. The designer can apply user-defined constraints to further modify the working terrain and produce a final landscape with the desired features. The computer algorithms achieve seamless integration of the various terrains for a more realistic image.

### Benefits

Existing terrain generation software tends to produce unrealistic terrain, or uses computationally complex simulation processes to create realistic-looking terrain. These processes, being slow, do not support quick iterative design cycles, and are expensive. The RTS system fills a niche since there are no current terrain generation software systems, which combine its speed, ease of use and user control.

### Market

Development and publishing houses that use 3D computer artists and animators tasked with creating digital terrains.

### Technical description

In contrast to current approaches, we adapt parallel texture synthesis to produce terrains. Texture synthesis is a software technique that, given one or more input colour images or photographs, is able to generate larger images in the same style by cutting and re-stitching the inputs. Our innovation is an adaptation of existing texture synthesis to the specific case of digital terrains, along with extensions to allow user-driven constraints that provide artists and animators with control over height and surrounding slope by means of constraint points and curves; a paint-by-numbers interface for specifying the local character of terrain; and copy-paste functionality to directly transplant terrain regions. Furthermore, our technique allows both larger input terrains in the synthesis database, thus providing greater variety, and larger output terrains. While there has been some previous research into using texture synthesis for terrains, our system employs per-pixel parallelisation on the GPU and is thus orders of magnitude faster, as well as offering much greater user control over the shape of the terrain.

#### Keywords:

MRI, patient tracking, MRI orientation, image correction

#### Intellectual Property Rights:

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#### Technology Readiness Level:

5 - Alpha release

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