Reconstruction of Historic Landscapes

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1. BACKGROUND

When the eccentric and reclusive connoisseur William Beckford (1760-1844), having exhausted the largest inherited fortune in England, finally abandoned his doomed architectural extravaganza at Fonthill Abbey, he retired to Bath. His enthusiasm for tower-building soon revived, and with the help of his trusted gardener Vincent and an able young architect Henry Goodrich he set about making a linear landscape garden stretching from his home in Lansdown Crescent to the hilltop 100m above. Though the Crescent house he lived in, and the tower he built on the hill, survive with little change, everything in between is now lost beneath more recent development.
Our project has been to recover the design and planting of "Beckford's Ride" from written accounts, contemporary drawings, and a few vestiges on the ground. This evidence we use to make an interactive computer reconstruction using the latest video-game technology (from Crytek in Germany). It has recently become a permanent installation at the Beckford's Tower museum.

2. METHODS

A game engine such as CryEngine has a surprising range of subsystems (Sousa 2011). The most important for us are concerned with: terrain and its textures, water, vegetation, sky (including sun, moon, stars, fog and clouds), static objects like buildings, particles (for smoke, fire, fountains), movable objects, triggers that make things happen, physics (collisions, falling objects, vehicles) and sounds (collisions again, footfalls, ambience, music). We also make use of scripted sequences of events, called cinematics.

Though the architectural modelling could be done conventionally (using SketchUp and Rhino) other aspects required some bespoke software. The landscape visible from the top of the tower extends about 80km, but the game engine was not able to handle more than 8km. The solution was to use an image-warping technique to apply hyperbolic compression to a digital terrain model, and associated aerial photography. This kept the central 2km radius true to scale, but applied a kind of perspective shrinking of the remainder to fit within a bowl of 4km radius. The view from the centre of the projection looks exactly the same.

The landscape rendering required a large number of trees, of recognisable English and exotic species. We developed a parametric generator in Processing to manufacture several versions of each species, each with several levels of detail obtained by using Catmull-Clark subdivision. Coupled with stereo photography of bark and foliage, we were able to place some tens of thousands of realistic trees in the landscape.

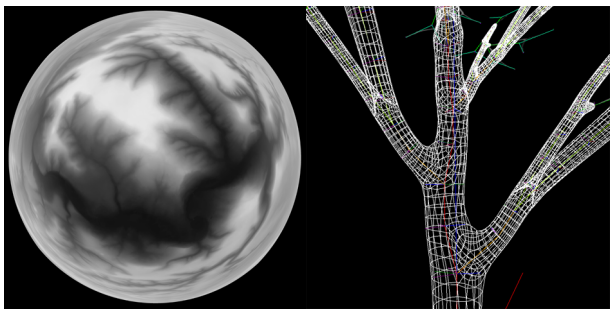

Figure 2: *Terrain model after hyperbolic compression*

Figure 3: *Tree modelled as a subdivision surface*

2. RESULTS

The completed game can be presented in several different formats. The simplest is to play it on a desktop computer, with keyboard and mouse. A darkened room and a pair of earphones improve the quality.
We have shown it quite often in a lecture-room setting, using a large-screen projection. This can be quite impressive, but viewers do not have the

chance to interact and explore on their own. Most of them will not be seated in the ideal viewing position, and the presenter has to drive with caution, otherwise the audience may suffer mild giddiness.

Our preferred presentation is to project from overhead onto a large screen, reaching from floor level to 3 metres above, in a dark space. A lectern is placed at the exact centre of perspective, with a tethered game-controller and some basic instructions. Audio is channelled through a 5+1 surround system. Placing the player at the exact centre of the visual and audio simulation gives a substantial boost to the feeling of immersion.

Displayed in this way, we achieve our primary aim, which was to generate interpretive exhibition material for public consumption, to convey in a fully rounded and immersive form what a lost landscape would have been like to enter and walk around, and to relate this visual impression to the intentions and taste of the creator, and also to the surviving scene of everyday experience.

Figure 1: *Beckford's Tower in a reconstructed landscape*

2. acknowledgements

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