Computer Science 805
Spring 2007
Project 4 – Procedural Modeling

Due: Thursday, 4/26/2007

Overview

For this project, you will implement a program to generate one of four possible procedural models: a fractal mountain terrain, an L-system tree or plant, a particle system waterfall or jello cube.

Description

fractal mountain terrain – write a program using fractional Brownian motion:

- manually create an object consisting of triangles or some other type of polygons which will serve as the fractal mountain base
- recursively subdivide the polygons to an appropriate level
- use OpenGL, your ray tracer, Maya, or any other renderer to shade objects in the scene; you may provide faceted (flat) or smooth shading of explicitly defined polygonal objects

Suggestions:

- You need only write the code for the polygonal subdivision. Use whatever renderer you like to get the best final effect.
- Your code need not be robust enough to handle a variety of cases – you can hard-code the scenes if you like.
- You may want to place a simple body of water or ice around your mountain range.

L-system tree or plant – write a program using L-system models:

- generate a plant or tree of a reasonable complexity (five or more levels)
- use parameterized L-systems to vary length and possible trunk/stem diameter
- use OpenGL, your ray tracer, Maya, or any other renderer to shade objects in the scene

Suggestions:

- You need only write the code for the L-system. Use whatever renderer you like to get the best final effect.
- Your code need not be robust enough to handle a variety of cases – you can hard-code the scenes if you like.

particle system waterfall or jello cube – write a program to implement either of the following:

- a waterfall, where the water is composed of particles constrained by global forces
- a jello cube, capable of bouncing and responding appropriately to global forces
- use OpenGL to run the simulation

Suggestions:

- use gravity in your program to act on the water or jello cube
- initialize the water simulation with an emitter at the top of the waterfall
- employ springs to model the forces between the vertices of the jello cube
- initialize the jello simulation by suspending the cube some distance above a surface; to start the simulation, let gravity act on the cube
- both programs require a modular particle-plane detection routine

Submission Requirements

You should create a web page with the following:

- your name, the date, and a title/description of this project
- one of the following:
    - two or three nice mountain images – provide an image of the range that shows the polygons you generated (flat-shaded) for each mountain range; try to produce an additional image with textures to show a more realistic terrain effect
    - two or three nice images of the plant or tree your code produces; try to produce an image that has realistic modeling, shading, and lighting
    - two or three frames from an animation showing your waterfall or jello cube simulation; also include a link to the animated movie
- instructions on how to compile and run your code
- any interesting problems you encountered and how you resolved them

You should e-mail the source code along with instructions for compiling and running it.

Additionally, you will give a short presentation in class showing some of the images you produced and discussing any interesting problems you uncovered and how you resolved them.

You will be graded on the source code you submit, the images/animation your code produces, the web page presenting your results, and your presentation.