VIZA 659/CPSC 649 – Physically Based Modeling

Homework Assignment 2: Particle Systems

Due: Thursday, October 5

The goal of this assignment is to expand on the previous bouncing ball simulation to handle a much larger-scale particle system simulation. You are to create a particle simulator.

At a minimum, your project should have:

- A particle generator
- At least one polygonal face that particles bounce off of. Your simulation should demonstrate that the face is indeed a polygon (with an edge), and not just an infinite plane. The polygon and at least one of its edges should *not* be aligned to one of the major coordinate axes – that is, you should show that you are handling a general polygon, and not just a simple x/y/z value check.
- Particles with initial attributes including position, velocity, lifespan, and color (you may modify or eliminate these in order to achieve particular effects, but your simulator should be able to handle a particle system with that level of complexity).
- Initial attributes drawn from a probability distribution (probably different for each attribute).
- Some level of particle behavior control/choreography, beyond simply generating particles and letting them fall under air resistance and/or gravity. This may include a clever generator, additional forces such as wind, a potential field, etc.
- Large numbers of particles, at least in the thousands.

As a reminder, to receive "A" level of credit for the assignment, you will need to enhance the simulation from the basic requirements. Some examples (this is not exhaustive) of this might include:

- Better rendering techniques. You might want to import your particle simulation results into another rendering system (e.g. by writing out particle positions per frame), and generate a video of your results for the demonstration. However, you should be able to demonstrate that your code produced the original simulation on which the rendering is based.
- Particularly interesting forces. For example, these could be vortices or more complex potential field forces that create particular particle effects.
- Using more complex polygonal objects (e.g. reading in .obj files).
- Allowing for interesting user interaction with the simulation. In the past, students have used everything from musical instruments to video processing to do this.
- Optimizing computation to simulate extremely large numbers of particles

You should exercise your creativity to come up with a simulation that is interesting.

You should be prepared to demonstrate your program in class on the day it is due, and turn in your code on ecampus.