Statistical Geometry Processing
Winter Term 2011/2012

Assignment Sheet #3: Representations of Geometry

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Handed out: Nov 29th 2011
Due: Dec 14th 2011

Assignment 3.1: Bunny Mesh (score: 20%)

Create a new GeoX experiment and implement functionality to load meshes from file. Import the "Stanford Bunny" model and display it as a triangle mesh. Please note that you need to set normals if you use the lighting function of the GeoX viewer. What is a good way to set the normals?

Hint:

- A copy of the bunny model can be downloaded from Michael Garland's mesh simplification research page.
  http://mgarland.org/research/quadrics.html
- The file format is extremely simple (it's called SMF – simple mesh format). Lines starting with "#" are comments, lines starting with "`v`" list the three vertex coordinates separated by whitespace, and lines starting with "`f`" list triangle faces, indexed according to the vertices listed before.

Assignment 3.2: Bunny Point Cloud (score: 30%)

(a) Convert the bunny mesh into a point cloud with points distributed uniformly and randomly across the surface. Make sure to store interpolated normals along with the points (this will help in part 3.2).

(b) Distributing points randomly, independently of each other on the surface area does not yield a very uniform sampling. How can this be improved (be creative)? Develop, implement and test a technique that samples the bunny more uniformly.

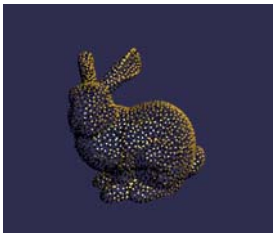
Assignment 3.2: Implicit Bunny (score: 50%)

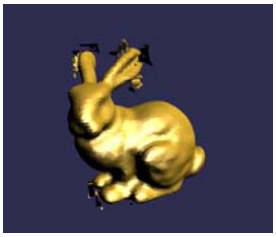
(a) Just for a quick test – describe a sphere by a signed implicit function (for example, as shown in the lecture). Then, use the marching cubes functionality provided by GeoX in order to create and display a triangle mesh of the sphere. What artifacts do you observe and why?

(b) Start with the point-cloud bunny from Assignment 3.2 and convert it into a signed implicit function representation. Use again the marching cubes method to visualize the result. What artifacts do you observe, and why?


bunny mesh


bunny point cloud


nice point cloud


implicit reconstruction