

Due: Saturday September 22 at 6:00am

Assignment 3—Hello 3-D world

In a nutshell

Implement an interactive 3-D computer graphics application.

Details

1. Planar pinhole camera class
 - Constructor
 - Rotations (pan, tilt, roll)
 - Translations (left-right, up-down, front-back)
 - Zooming (in and out, a.k.a. changing the focal length)
 - Interpolation: given a second camera and a fractional number compute an intermediate camera by linear interpolation between the two cameras;
 - Save to text file, load from text file;
 - Visualization: draw the camera, given another camera and a framebuffer.
2. Triangle mesh class
 - Stores an array of triangle vertices, an array of vertex colors, and an array of triangle connectivity data;
 - Constructor: loading from file;
 - Constructor: axis aligned box;
 - Center: computes center of mass;
 - Position: translates the mesh to a new center of mass;
 - Scale: scales the mesh about its center of mass;
 - Rotate: rotates mesh about arbitrary axis theta degrees;
 - Render: given a camera and a framebuffer, draw the triangle mesh with z-buffering and vertex color interpolation
 - RenderWireFrame: same as above, except that triangles are rendered in wireframe, with z-buffering and vertex color interpolation.
3. Example
 - Make a 3-D scene with the triangle meshes given; make sure that the application starts up with a meaningful view of the scene;
 - Allow the user to navigate the camera through the GUI;
 - Create a camera path that shows the scene you built; save the path to a text file; the path should have 3 or more key frames and 300 frames total; allow the user to render the path by pressing a Play button;

- Path should show all aspects of planar pinhole camera control (i.e. 3 translations, 3 rotations, and zooming)
 - Save the frames rendered by your path as consecutively numbered tiff files; make a 10 second 30 frames per second movie from the stills; use compression; the movie file should be 10MB or less.
 - You can use any program you wish. Some free applications that might help, VirtualDub, Windows Expression Encode, Windows Movie Maker, or Imagemagick
 - To generate an mpeg movie using Imagemagick, the command is “convert image*.tif movie.mpeg”
4. Extra credit
- Non-linear camera interpolation (3%)
 - Morph triangle mesh to sphere (2%)
 - A cylinder constructor of the TriangleMesh class (2%)
 - A sphere constructor of the TriangleMesh class (2%)
 - Nice scene, i.e. complex geometry, animation (x%)

Turn in

- Submit your code
- A README.txt description of your GUI
- The path text file
- Movie file
- An image of your planar pinhole camera visualization