Experiments 2: 3-D OpenGL

CS 420

Objectives:

- Understand the purpose of the z-buffer (depth-buffer).

- Understand the distinction between orthographic projection and perspective projection.

- Observe how a curved surface (a hemisphere) is constructed from triangles.

- Start to think about transformations such as translation and rotation.

Experiments

- Experiment 2.21 and Exercise 2.23.

  1. Make sure you can explain the "why" behind the differences/non-differences.

- Experiments 2.22 and 2.23 and Exercise 2.28.

  1. Explain the differences between orthographic and perspective projection.
  2. Consider two identical objects that are at different distances from the synthetic camera. With orthographic projection, will the two objects appear to be the same size? If not, which object will be smaller? Repeat for perspective projection.
  3. In perspective projection, where is the center of projection located?

- Experiment 2.24.

  1. In the source code, observe the "special" callback for the "special" keyboard keys.
  2. If you hold a key down, the program will "animate." This is our first "animation." If you study the source code, you'll see that double-buffering is used. More on that later, but its use ensures smooth animation.

- Experiments 2.26 and 2.27.

  1. Not that we'll be doing much of this ourselves, but observe how a "curved" surface is broken down into a mesh of triangles.
  2. Experiment with various combinations of the rotations. Start the program, then have it rotate the hemisphere about the X-axis. Then, terminate the program. Repeat this "start, rotate, terminate" sequence with the Y- and Z-axes, observing the rotations.

     Next, start the program and perform several rotations about the hemisphere's axes. After the first rotation, the remaining rotations won't appear to be about the original axes. Can you think of a reason for this?