Computer Graphics
Assignment 5

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Problem Statement

Enable an application to:

- Render an animated scene using scenegraph
- Control the motion of the interactive object

Solution Approach

The scene has been modelled with four moving objects - a rotating sun at the centre, a rotating earth that revolved about the sun, a rotating moon that revolves around the earth and a spaceship that takes the object's size, texture, motion and spin. Animation uses a Scenegraph implementation that has been coded from scratch. The headlight is simply defined at the camera position and moves along with it. Camera rotation is handled using Fast Trackball.

Texture was mapped using a spherical mapping and the SOIL library. The texture coordinates (u, v) were calculated as

$$u = \frac{\tan^{-1} \frac{z}{x}}{2\pi}$$

$$v = \frac{\tan^{-1} \frac{z}{\sin(2\pi u)}}{2\pi}$$

Object picking uses the RGB values of texture as in Assignment 4. When a new destination is selected the spaceship is popped from the node list of the current object it is attached to. The time of travel is taken to be

a fixed 20 seconds. Using this time and the known speed of movement of the picked object its final position is calculated. The spaceship then travels a patabolic path from its initial position to this final calculated position. The parabolic path is defined as

$$x = x_{start} + / - \ \ abs(x_{stop} - x_{start})/20 \times t$$

$$y = y_{start} + v_y \times y + \frac{1}{2} \times g \times t^2$$

where v_y and g are calculated by plugging y_{stop} into the equation for y. When the spaceship reaches the final position it is pushed into the node list of the picked object.

Conclusion

Scenegraph makes controlling the transformations of *connected* objects much easier than individually controlling the transformations of every object.