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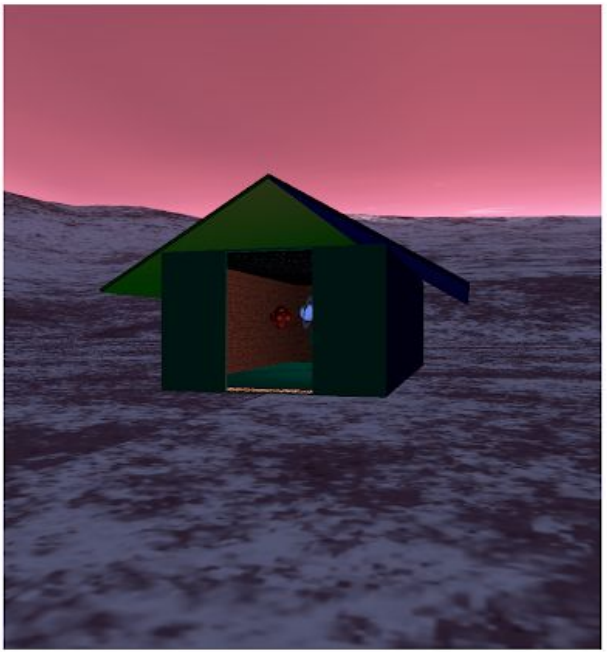
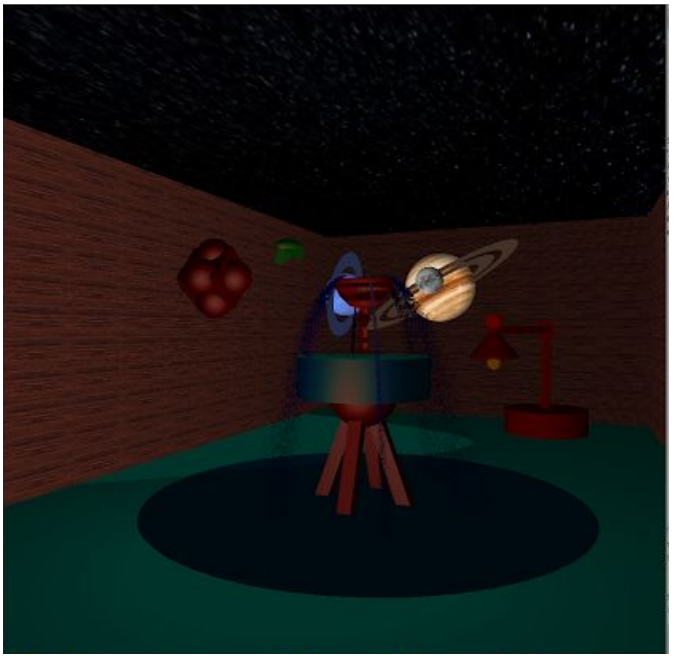
COSC363: Computer Graphics Assignment 1

A Brief Description

My scene contains a simple textured skybox, with a house containing several animated models on display. From the point of initial loading, we can use the “left”, “right”, “up”, “down” keys to manipulate the camera into moving around the scene in a tank-like fashion. The house has an open entrance that you can “walk” into and inspect each model. Each model is constructed by combining GLUT objects or using a surface of revolution method, and is animated in some fashion by manipulating translation and/or rotation values over time.
The scene is lit by 2 light sources, the first being a central overhead light at the centre of the house, and the second being a spotlight with its origin at the bulb of a lamp model in the scene.





Extra Features

1. A spotlight is used as an additional light source in the scene. Its point of origin is in the bulb in the lamp model. Its projection angle is continuously updated with the other components of the lamp model (0°- 45°), which results in a realistic light, dynamic light source.
2. A particle system is implemented with the goblet model. Each stream has an origin point on the top of the goblet. On initiation, single colored vertices (with points recorded) will be generated and have a gravity variable applied to them to control their falling rate. When each particle goes beyond the y-axis value the floor is at, it ceases to be active. The rand() function is made use of to create slight variations between droplet vertice values. Specifically, the rate of fall of each droplet is called by

the variable equation: GRAVITY * particle mass. These are 2 variables we have defined globally, so that they are applied evenly to each particle. There is a limited number of drops each stream can produce as a way to prevent a bogging down of the systems resources.
3. Gravity was a simple variable initialized so that when compared to the mass variable of an object, we can get a rate of fall which can be applied to an objects y- axis negatively.

Models

1. Stool/goblet: The stool was created using GLUT cubes, a sphere, a cylinder, and 2 discs. The goblet was made from a surface of revolution, taking initial vector form file "Goblet.off".
2. Bird: flying around above the goblet is a bird made with an elongated sphere for the body, and 2 discs for the wings. The wings are rotated around a variable vector point at the centre of the bird body of the x-axis. The entire set of objects is then rotated around a vector to produce a "flying" pattern.
3. Cube/Sphere mash: to the left of the scene a GLUT cube with 6 spheres is located with several rotation points applied to the x-axis and y-axis to produce a somewhat complex movement pattern.
4. Lamp: a lamp is modelled using GLUT objects (cubes, spheres, discs), with 1 section moving along the x-axis. A spotlight source is also attached to this object.
5. Planets: simple GLUT spheres with planet-like textures are on display on the back of the gallery, which have rotations around the y-axis to emulate planet day/night cycles. Disc objects are also surrounding the planets to produce planet-ring systems. In addition, a moon with its own "orbit" around the planets completes the features of this system.

Controls

Left/right: changes the motion towards left/right by a certain angle.
Up/down: moves the camera forward and backward respectively.

Resources

Some code was adapted from lab task files to suit my use. Textures were obtained from:

1. Lab-supplied textures.
2. https://jcpag2010.deviantart.com/art/Neptune-Texture-Map-686186465
3. http://www.jnoodle.com/makeit/q3_solarsystemsim.html
4. http://www.custommapmakers.org/skyboxes.php

Resources for water drop algorithms/pseudo-code:

https://www.3dgep.com/simulating-particle-effects-using-opengl/
http://www.opengl-tutorial.org/intermediate-tutorials/billboards-particles/particles-instancing/

https://daim.idi.ntnu.no/masteroppgaver/001/1176/masteroppgave.pdf
https://github.com/AnalyticalGraphicsInc/cesium/wiki/Particle-System-Details
http://www.cplusplus.com/reference/cstdlib/rand/

ALL textures are used with permission for educational purposes.