

## Assignment 4

CMSC 427, Fall 2001

**Due: 11:00am Tuesday, November 27, 2001**

(a) Implement collision detection of the missiles with the plane. The plane should disappear on collision and a new plane should appear shortly after that. Generalize the 2D collision detection code from Assignment 2 to the three dimensions for this. For the purpose of this part of the assignment you may approximate the missile by a point at its center (but still draw it as a sphere). (5)

(b) Place a sphere of radius 3 units at the world coordinates  $(-40, 30, -50)$  (you may use `gluSphere()` here). Implement lighting and shading for the terrain, the plane, and the Moon. Assume that the Sun can be represented as a directional light source at  $(-0.5, 1, 0.0, 0.0)$ . Play around and use appropriate light and material colors for ambient, diffuse, and specular illumination. Compute the normals for at least the airplane's polygons. (5)

(c) In this part of the assignment you are asked to texture map the terrain with a  $512 \times 256$  texture image that has been given as a binary data file `texture.dt`. You can use the function `LoadDtFile()` provided in the file `loadfile.c`. The function `LoadDtFile()` has the following specification:

```
GLubyte* LoadDtFile(char* sName, int* pWidth, int* pHeight);
```

Alternatively, if you will like to write your own function to read the files, a BMP format file named `texture.bmp` is also available at the assignment web page.

Use OpenGL's texture mapping calls to map the texture image to the entire ground. (5)

(d) Implement the shadow of the airplane as it flies over the ground. Since the ground is composed of a number of triangles, you can simplify the whole ground as a plane parallel to XZ plane with the equation  $Y + 19 = 0$ . Just make sure that the shadow is slightly above the terrain triangles so that the shadow doesn't get occluded by the terrain's triangles. (5)

(e) **Extra Credit:** Implement one of the following effects: (5)

- Have airplane drop bombs on the ground. Implement explosions.
- Implement troops being air-dropped with parachutes.
- Implement the plane leaving a trail of exhaust behind it that slowly dissipates away.
- For anything else that you will like to implement for this come talk with me to see if it will be too hard or too easy to qualify for extra credit.