a3-launch-170050077_170050081

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Note: Most of the code snippets are taken from the tutorials. For example, shaders are from pixel-by-pixel shading in tutorial 5 and the texturing code from tutorial 6.

a3-model-0:

In this program, we model the earth along with a layer of clouds and outer space.

Spheres are created for the earth, clouds, and outer space and texture-mapped accordingly. Outerspace is nothing but a sphere with a very large radius compared to earth texture-mapped with an image containing stars. Earth and outer sphere use bitmap images for the texture-map and while the clouds are texture-mapped using a png image to a sphere whose radius is slightly larger than that of the earth. PNG image was used because of the availability of the alpha channel in this format. Each sphere is in a separate vao/vbo. Hence total 3 vao.vbos are used.

The "texture.cpp" file was lifted from tutorial 6 and added an extra function to texture-load png files to account for transparency.

Keyboard controls are also added to move/rotate the camera and to rotate the earth about its center. Earth, Outer space and view frustum sizes are chosen such that the camera movement can allow us to see the earth very close to surface and also from outer space.
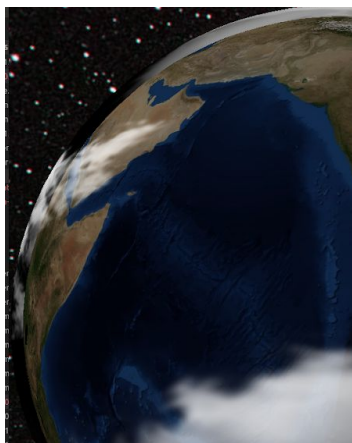

Default View

Views from far away and a bit closer.

View from one of the nearest points to the surface(**MAX ZOOM**)

The transparency and altitude of the clouds are clearly depicted in this view

a3-model-1:
In this program, we model the launch site and the launch pad on the surface of the earth, with lighting effects and a sky.

A very large sphere texture-mapped with a blue-sky image is used to represent the sky. And a flat plane texture-mapped with an image of the ground is used to represent the surface of the earth. Per-pixel shading is done using a fragment shader similar to that from tutorial 5. A single light source is used. Separate vao/vbos are used for (base+building+launchpad), tower, protrusions, ground, skymap. Hence a total of 5 vao/vbos are used in this program.

The launch site has a launchpad at the center, a building nearby and a tower that moves nearer and farther from the launchpad. The tower also contains a few protrusions that can move in and out of the tower.

Keyboard controls are also added that can change the position and orientation of the camera.
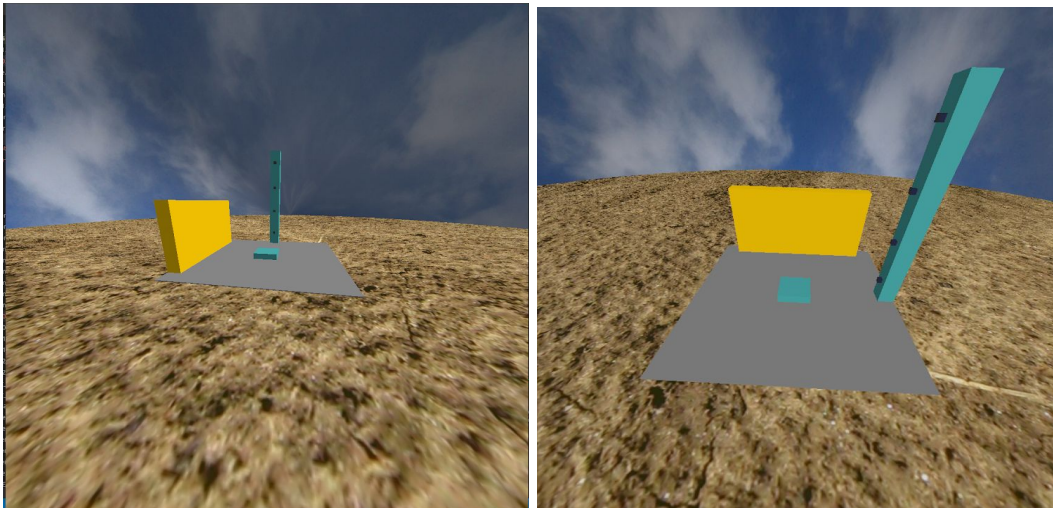
Different views of the default configuration of the launchpad along with lighting.
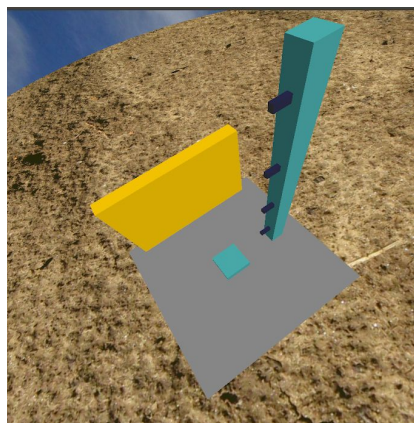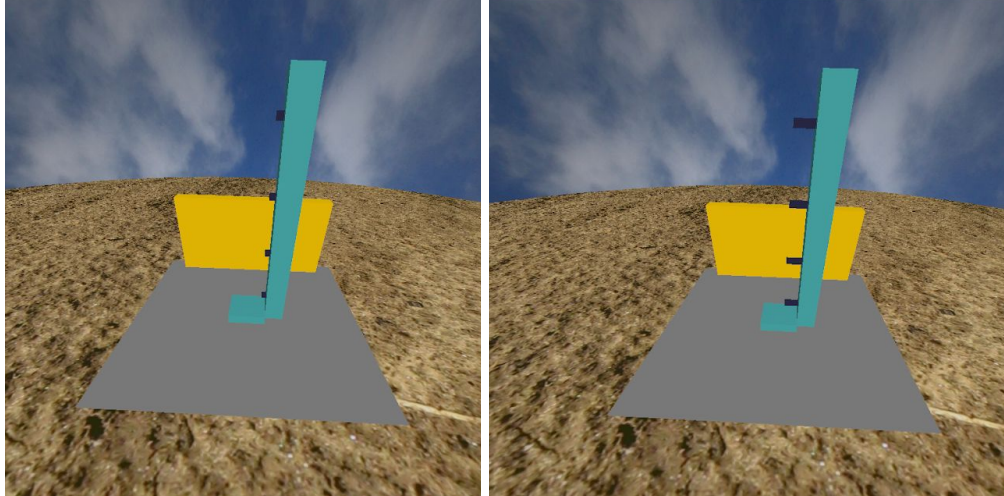
Pictures depicting the movable parts.

a3-model-2:

In this program, we model the payload and launch vehicle. Both of them are created in OpenGL itself. Per-pixel shading is done to show the lighting effects. Shaders are the same as that of "a3-model-1".

The payload has two movable solar panels that can be opened out and rotated along an axis. The hierarchical model for the payload is given below. Separate vao/vbo are used for both panels, payload body, rocket. Hence a total of 4 vao/vbos are used in this program.
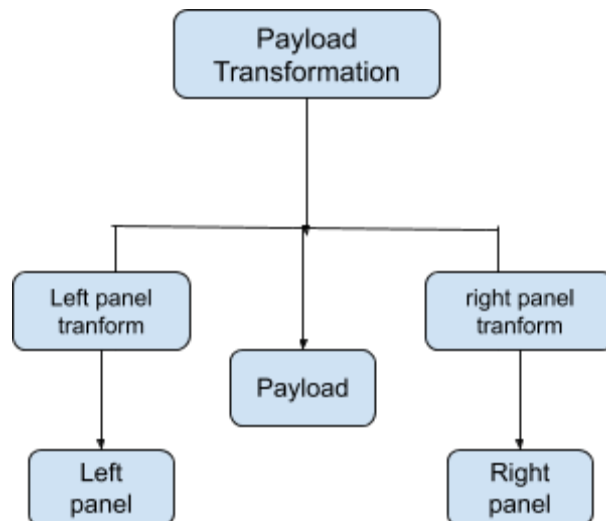
Keyboard controls are added to move the parts of the payload and to change the position and orientation of the camera.
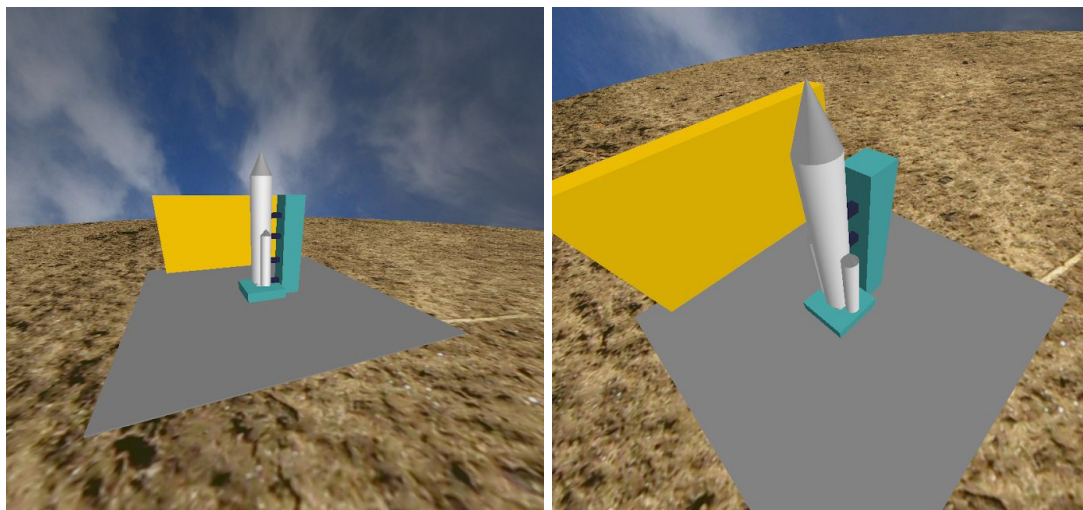
The launch vehicle is based on **Falcon Heavy** by **SpaceX**.
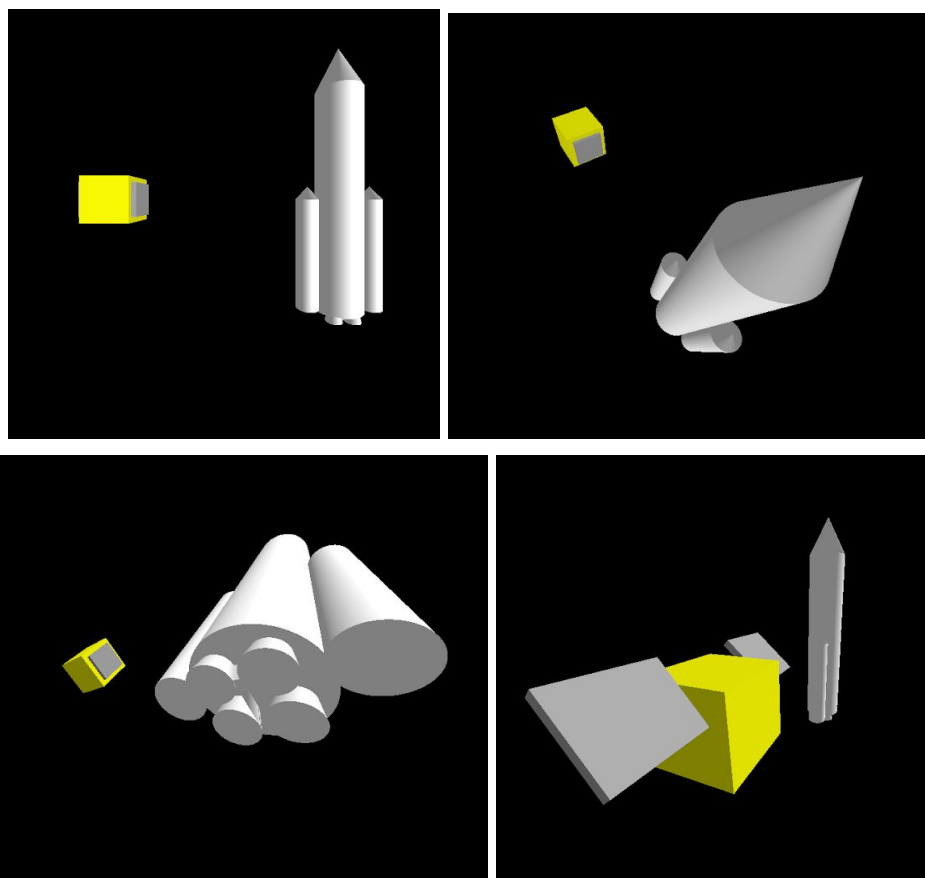
Different views of the payload and the launch vehicle

A3-scene:

In this program, we create a scene from the previously defined models. The shaders are the same as that of the previous part.

Launch Sequence:

Highlights and Details:

- Used high-resolution textures wherever possible to give more detail to the texture-mapped models.
- Made sure that the camera does not go inside the earth or outside the space mapped sphere.
- Added constraints for the panel rotation in the payload so that it does not rotate unless fully opened. This makes it more realistic.
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