CS 475

Assignment 3

Submitted by:

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The model created is based on the Chandrayaan-2 mission by ISRO. Chandrayaan-2 was launched from the second launch pad at the Satish Dhawan Space Centre on 22 July 2019 at 2.43 PM IST (09:13 UTC) by a Geosynchronous Satellite Launch Vehicle Mark III (GSLV Mk III). Here are a few pictures of the models created.

Figure 1: Earth and space

Figure 2: Payload Model(left) and an actual image of the payload(right)

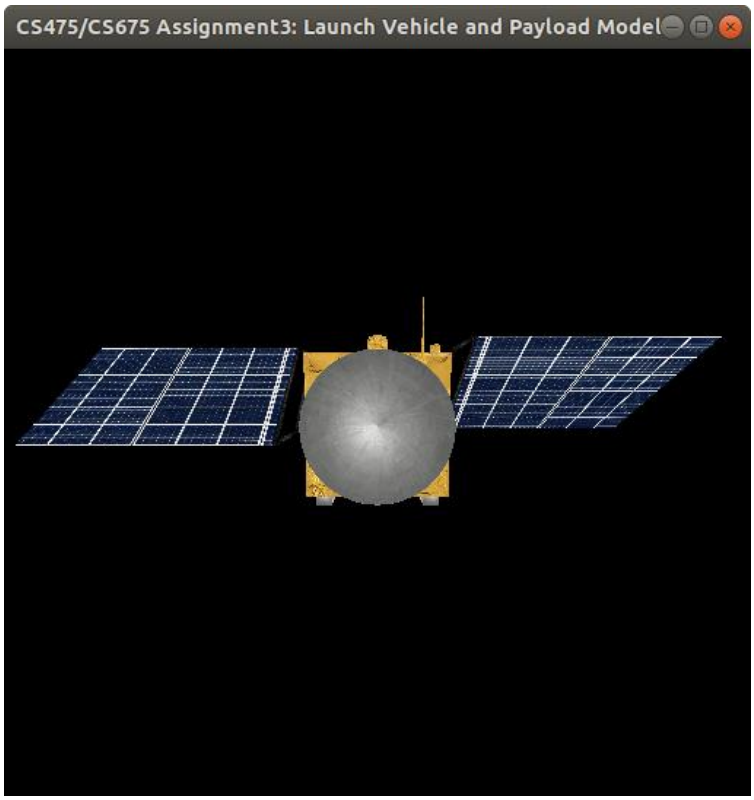

Figure 3: The solar panels of the payload model can be moved individually

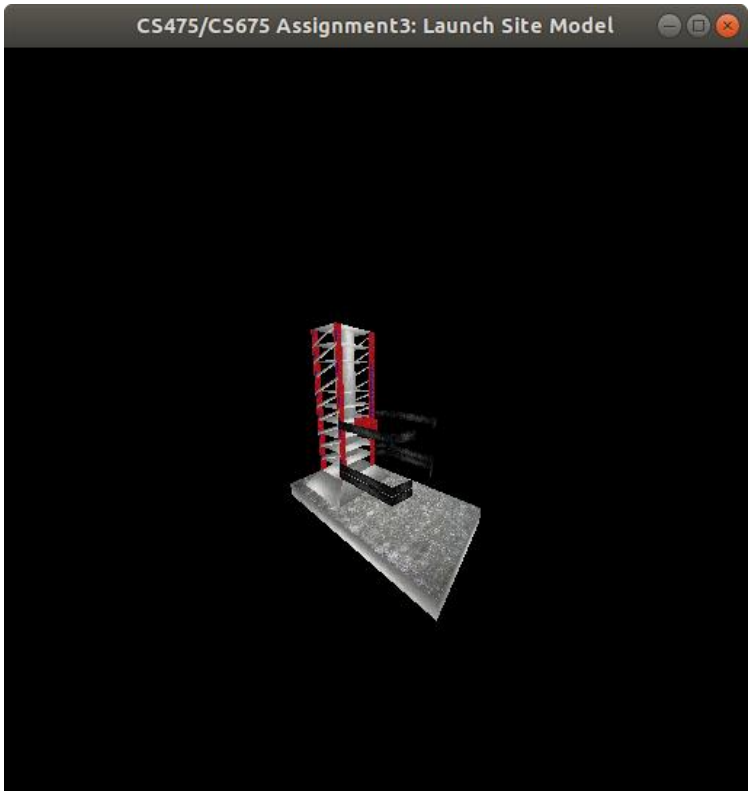

Figure 4: Launch Site Model

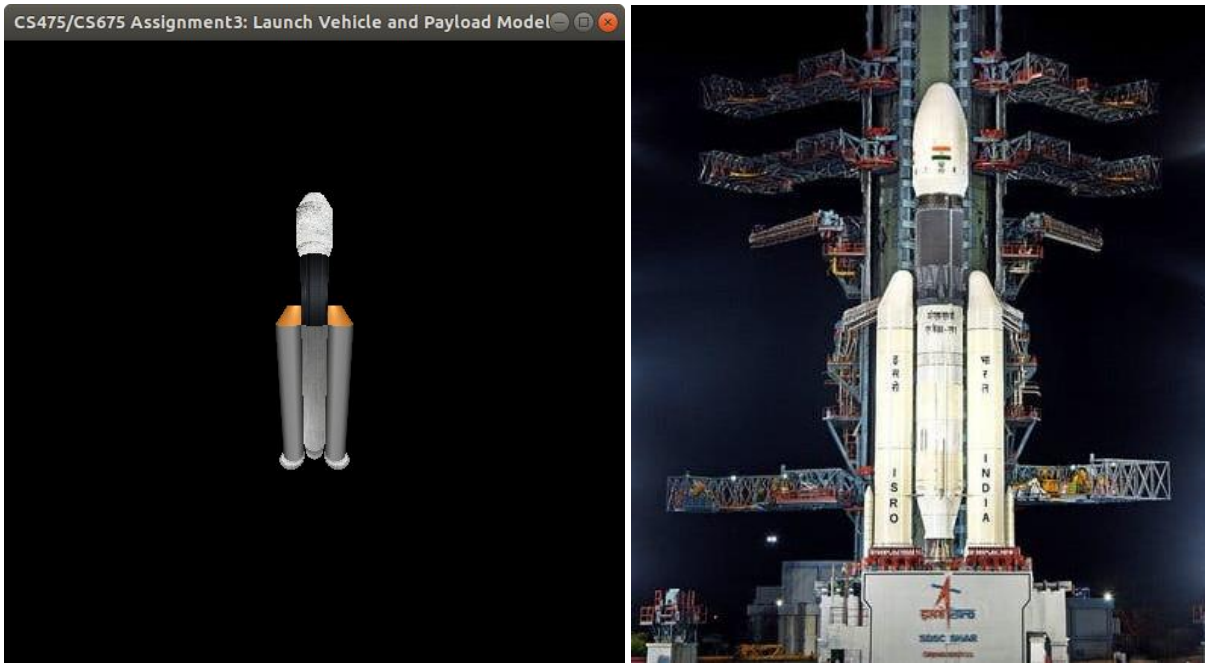

Figure 5: Launch Vehicle Model(left) and an actual image of the launch vehicle in Chadrayaan 2 mission(right)

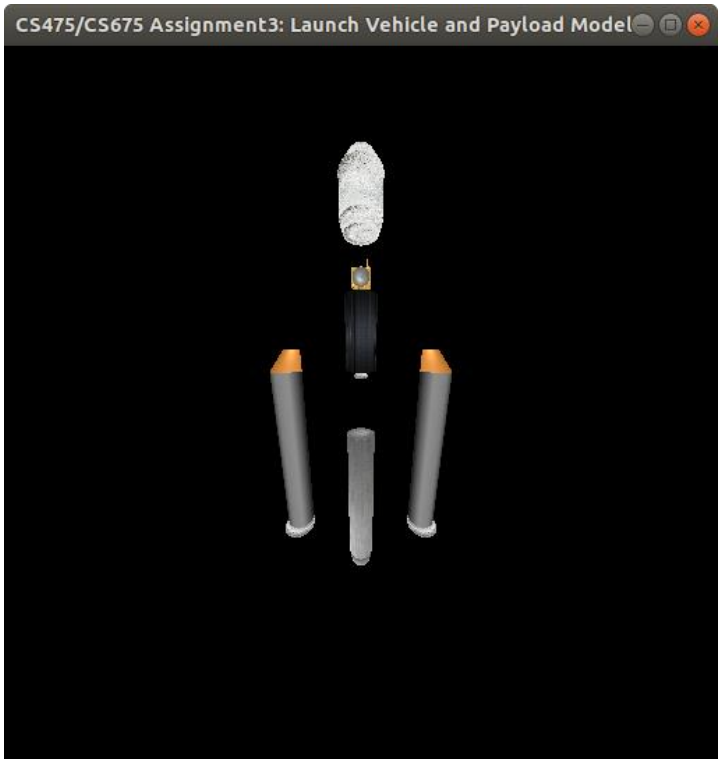

Figure 5: The separated parts of the launch vehicle model

Texture images:

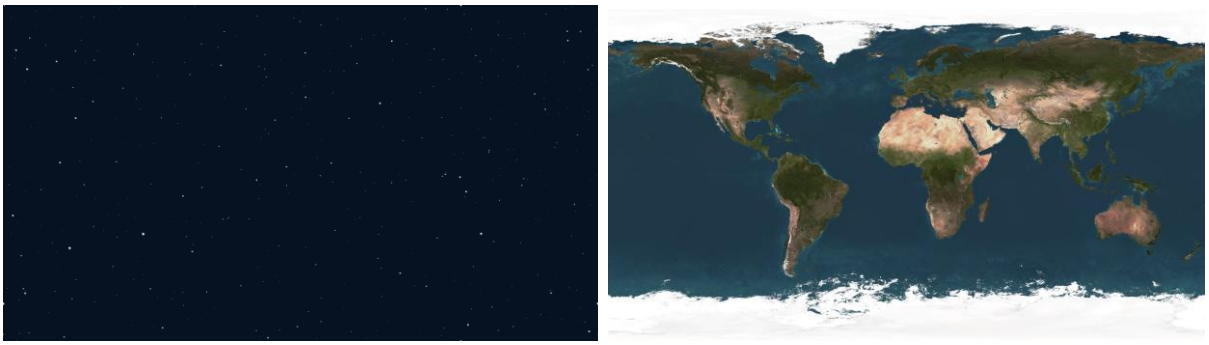

Figure 6: Textures for Space(left) and Earth(right)

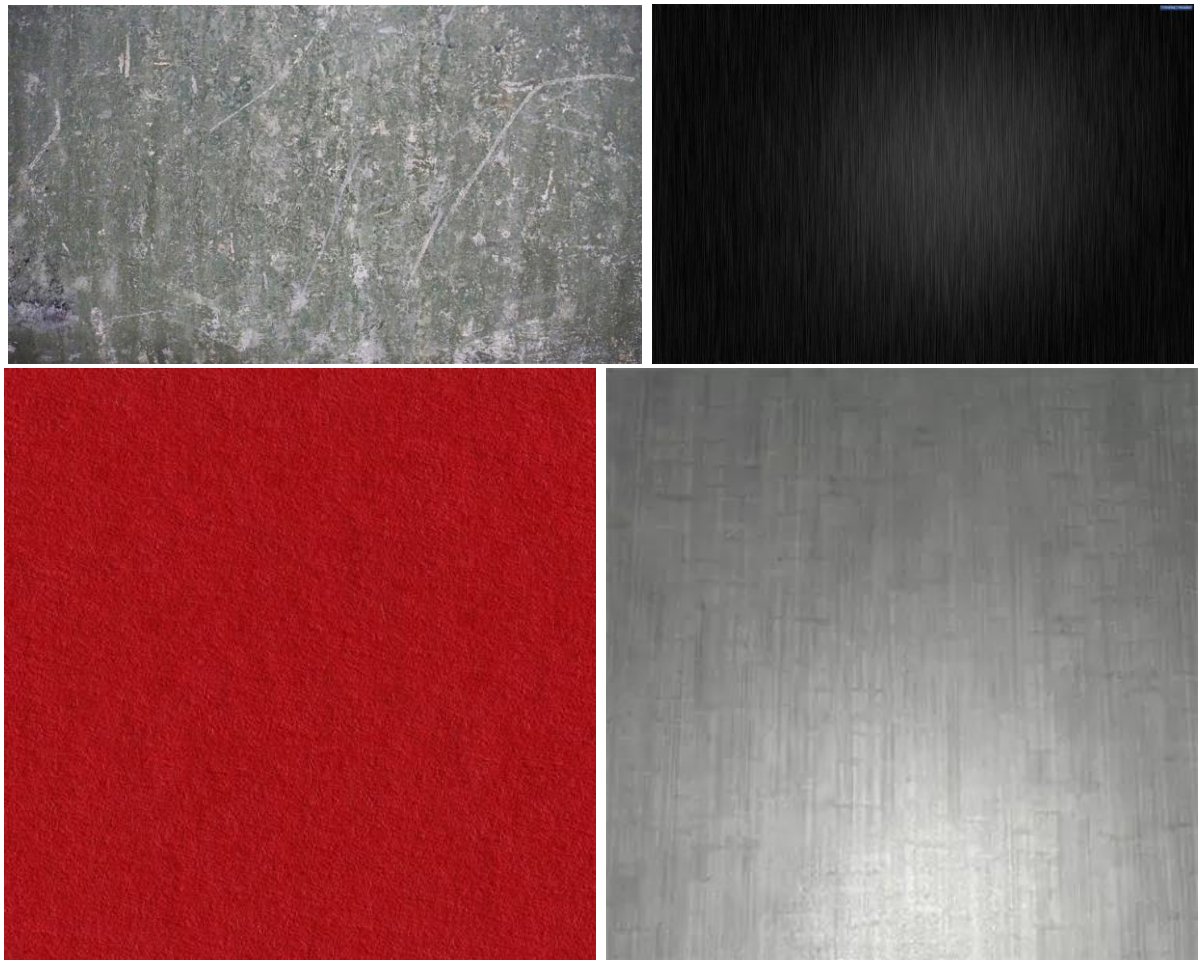

Figure 7: Textures for Launch Site

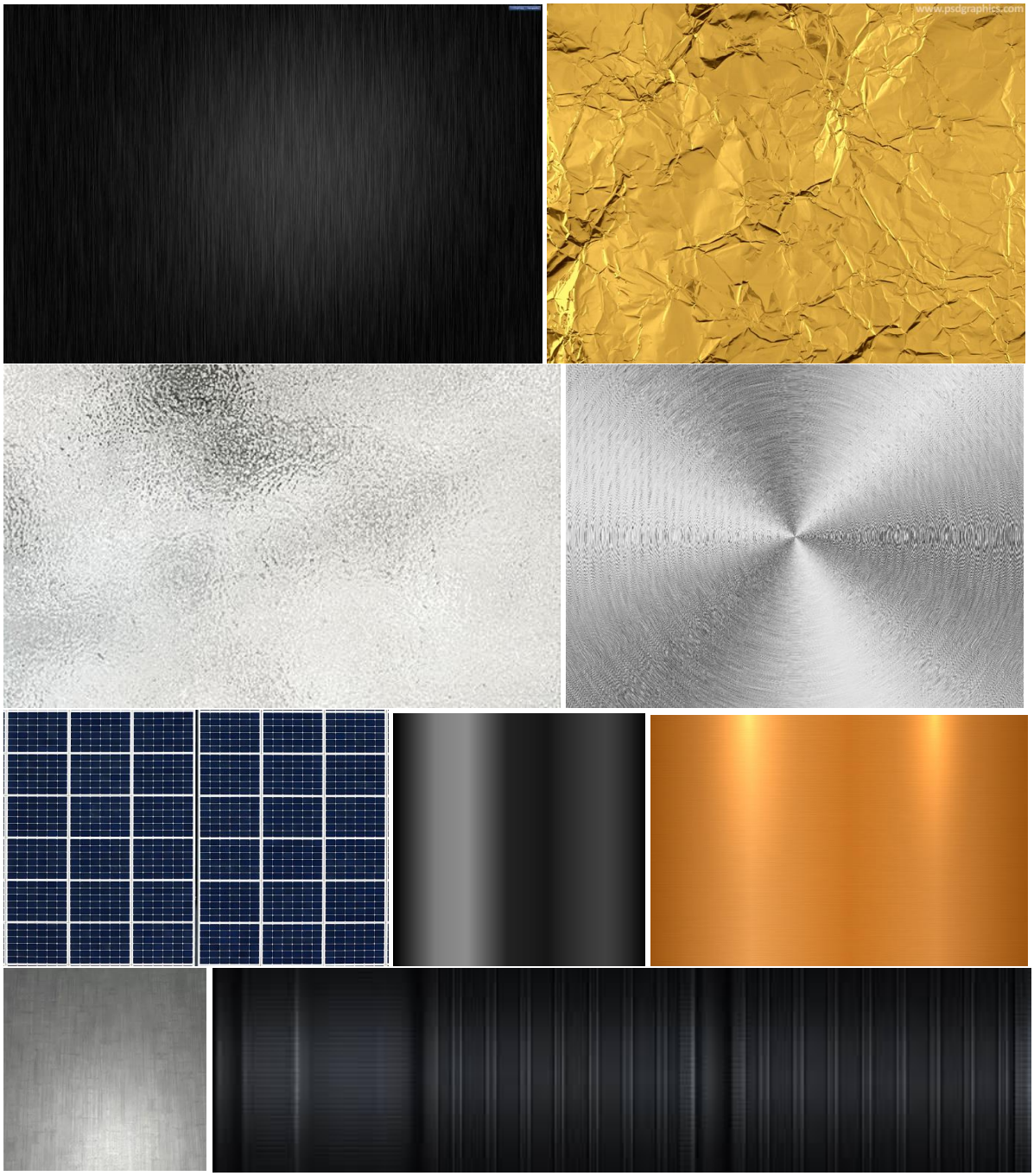

Figure 8:Textures for Launch Vehicle and payload

Description of the models:

In a3-scene:

We can change the camera view by pressing 1,2,3.

1 is for the camera whose look-at vector is always pointing towards the centre of the earth. It can be translated using the arrow keys, '[' and ']' and rotated via keys A, D.

2 is for the camera whose look-at vector points towards the payload of the rocket. It can also be translated using the arrow keys, '[' and ']'.

3 is for the camera which remains close to the launch vehicle and moves along with it. It cannot be controlled by keys.

Earth and space:

The space is a large cube and the earth is a sphere inside the space-cube. The camera is inside the space-cube

Payload:

This is a hierarchical model. The base is a cube and has cylinders on top and cubes on bottom. On either side, there are two triangles acting as pivot, joining the solar panels to the central cube. The panels are rectangles. There are four thin rectangles acting as support between the pivot and the panels. The panels can be rotated about the pivot, independently.

Launch Vehicle:

Hood of the launch vehicle is made up of two frustums and one cylinder. The cylinder is centred between the frustums. The central part of the launch vehicle is a cylinder having a frustum on the base as a blaster. The top of the central part contains the payload. So when we remove the hood the payload is visible. The two boosters are comprised of a skewed frustum, then a cylinder, again a frustum for the blaster. The base of the body is also a cylinder, with a frustum for the blaster. All the parts mentioned have different textures so that they are easily distinguishable. First the two boosters are detached. Then the base, and then the central part. The parts getting detached keep moving with constant velocity. The

payload receives constant velocity sometime after the central part gets detached.

Launch Site:

The base is a cuboid. Above it is a trapezoid. On it there are five cylinders (one central, and four other on four corners). There are 6 holders holding the launch vehicle, each made up of 3 rectangles. The different floors on the launch pad are represented by rectangles. There are thin rectangles representing stairs joining the floors. There is a red tunnel which joins the launch pad with the launch vehicle

Description of the Shaders:

earth_vshader.glsl:

Updates the texture coordinate (tex) for each point (gl_Position).

earth_fshader.glsl:

Used Rayleigh and Mie scattering. Most of the part of the code has been taken from the internet, with a few modifications to fit the 3D model. The inputs in the shader are the position of the camera, the normal_matrix, view_matrix, the radius of the earth(earthRadius).

planet_vshader.glsl:

Updates the texture coordinate (tex) for each point (gl_Position) of the space.

planet_fshader.glsl:

Updates the frag_colour using the texture.

All the other shaders are similar to planet_fshader.glsl and planet_vshader.glsl.