

CS475-Assignment 3 Report

170050044 - Suraj

170050073-Debabrata Mandal

We have used Tutorials **5,6** and **7** as base codes.

About the mission :-

Our assignment is about the Mars Orbiter Mission([wiki](#)). It was launched on 5 November 2013 by the [Indian Space Research Organisation](#) (ISRO). It is [India](#)'s first interplanetary mission and it made it the fourth [space agency](#) to reach Mars, after [Roscosmos](#), [NASA](#), and the [European Space Agency](#). It made India the first Asian nation to reach Martian orbit and the first nation in the world to do so on its maiden attempt.

Now we describe our approximation of the original orbiter, launch-pad and rocket as incorporated in the models we have designed.

(We have **not** used Blender to create any of the models or animation)

Description of Models:

1. a3-model-0 : Earth

This model renders earth with space. The earth and the space are rendered using texture maps on different spheres.

Keys **LEFT**, **RIGHT**, **UP**, **DOWN** , '[' and ']' can be used to change the camera direction.

Keys '**A**', '**a**', '**D**' and '**d**' can be used to rotate the earth.



Earth and the space

2. a3-model-1 : Launch Site

This model renders the launch site used to launch the rocket in the mission.

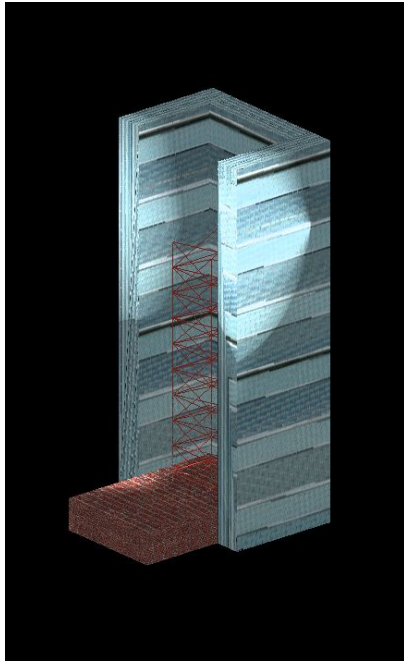
Hierarchical modelling is used to render the model.

It mainly consists of 2 nodes : The centre and the launch pad.

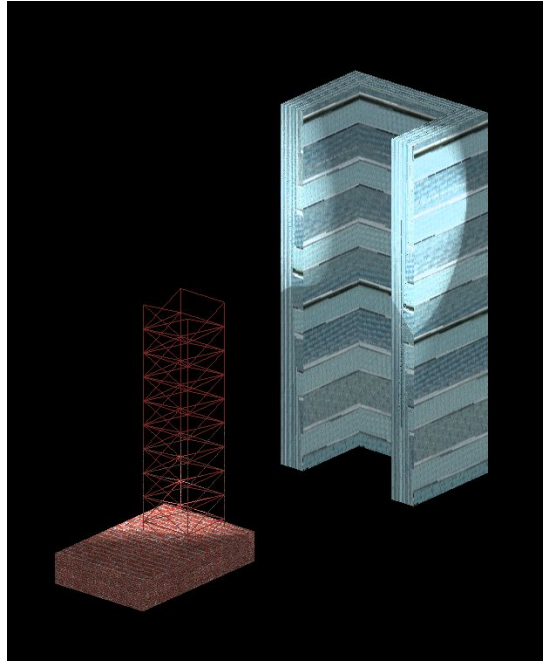
Keys **LEFT, RIGHT, UP, DOWN** can be used to rotate the model.

Key **2** can be used to switch to launch pad.

After this, keys **LEFT and RIGHT** can be used to move the launch pad.



Initially



Just before launching



The real space centre launch pad

3. a3-model-2 : Rocket (PSLV+strap-on-boosters)

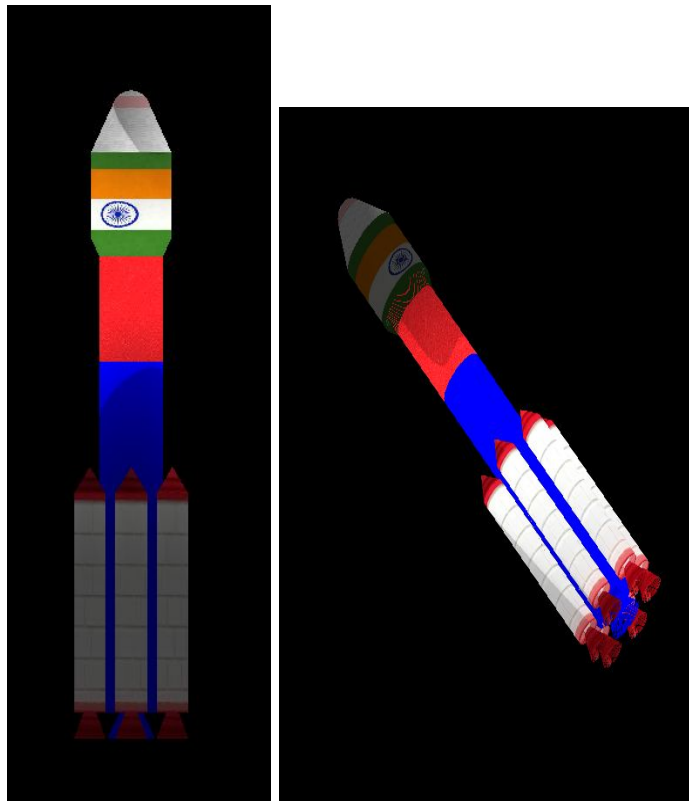
This model renders the PSLV rocket used to carry the orbiter to Mars.

Hierarchical modelling is used to render the rocket but not used for any motion in this assignment.

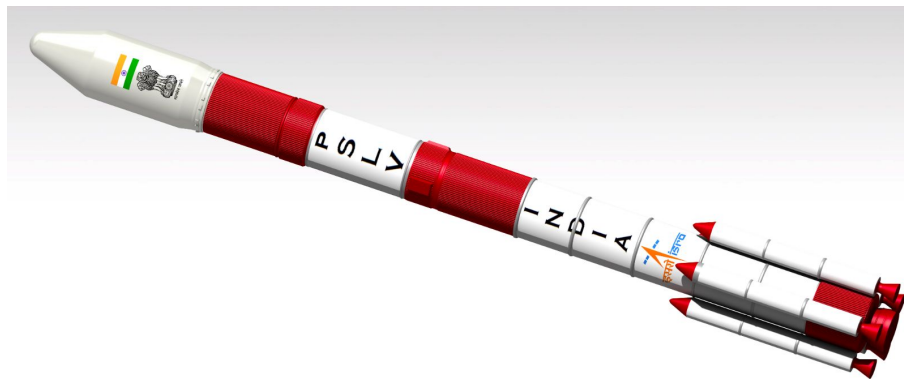
It consists of one main propeller with 6 strap-on-boosters.

The orbiter was placed in the topmost cylinder(covered by cone).

Keys **LEFT**, **RIGHT**, **UP**, **DOWN**, '**pg up**' and '**pg down**' can be used to rotate the rocket.



The model

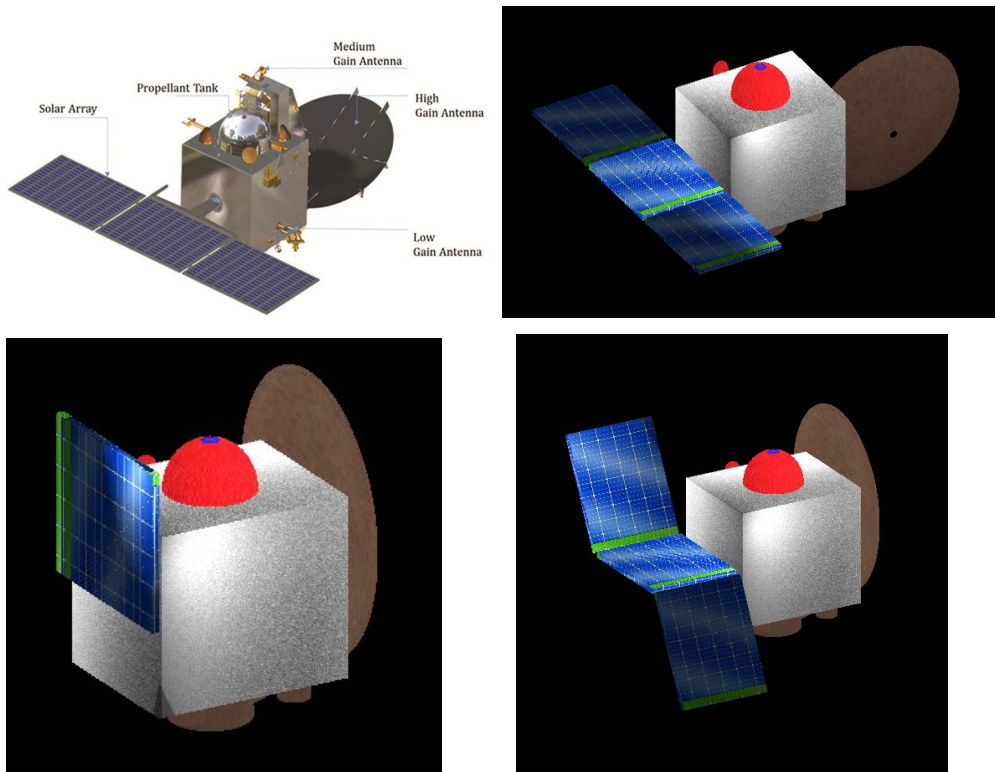


The real PSLV rocket

4. a3-model-3 : Orbiter

This model renders the most important part of the mission, the orbiter.

The main parts consist of the cubical box (middle one), the propellant tank(spherical at the top), the solar panels(3 solar panels), the reflector(high gain antenna), the TIC antenna(red colored) and the propeller with 4 thrusters used in the last stage.



The first image is from the model of ISRO.

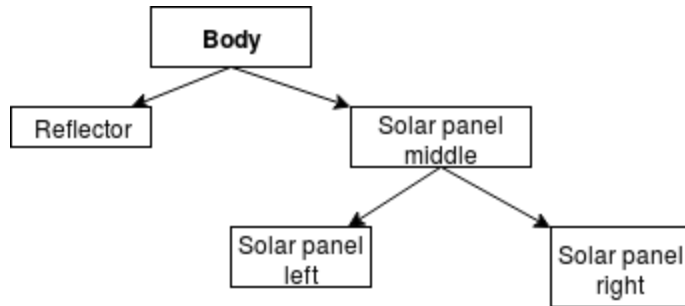
https://upload.wikimedia.org/wikipedia/commons/thumb/e/e0/Assembly_Animation_of_Mars_Orbiter_Mission.webm/325px-see%3D3-Assembly_Animation_of_Mars_Orbiter_Mission.webm.jpg

The other 3 are pictures of our model.

Modelling the orbiter:-

We have used Hierarchical modelling to design the orbiter.

Hierarchy is as follows:-



We used texture mapping for coloring the various faces make it look as close to the original model.

Body Parts Description -

- The main body is clad in steel texture as the original model.
- There is a propeller and four thrusters at the bottom for steering the orbiter to get it into orbit.
- There are 3 solar panels(cuboids) which have only one degree of freedom per panel .
- There is a reflector(clipped sphere) on the opposite side of the solar panels.
- There are some extra fixed important parts to the rocket which are added to the model.

Keys Description :-

Main Body:

- Default part
- Keys UP, DOWN, LEFT, RIGHT, 'pg up' and 'pg down' to rotate the model.

The Main Solar panel:

- Press 2 to switch to this panel
- To rotate the panel about its hinges press : LEFT_ARROW_KEY or RIGHT_ARROW_KEY

Solar Panels (left and right):

- To get to move the panel press : 3
- To rotate the panels about their hinges press : LEFT_ARROW_KEY or RIGHT_ARROW_KEY

Reflector :

- To get to move the panel press : 4
- To rotate the panel about its hinges press : LEFT_ARROW_KEY or RIGHT_ARROW_KEY
-

5. a3-scene : Combining all together

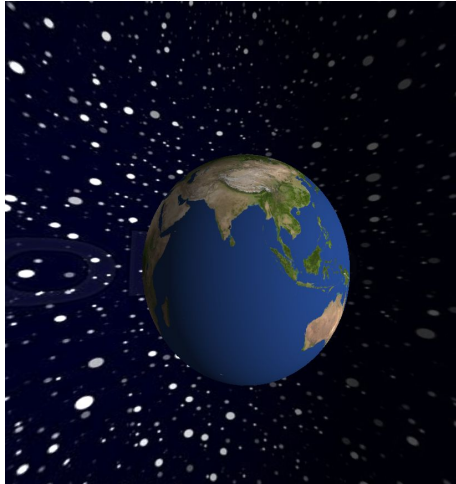
This comes all the above parts : earth, launch site, rocket and the orbiter.

The rocket was launched from Satish Dhawan Space Centre(Sriharikota),

https://en.wikipedia.org/wiki/Satish_Dhawan_Space_Centre.

It is located near Chennai and the location is taken care of.

There are two cameras, C1 and C2. C1 is located near the earth and hence is better to record at the start of take-off. C2 is located far from the earth to record the trajectory of the rocket and the orbiter.



A picture from C2



A picture from C1



Launching as observed from C2



Launching as observed from C1

For launching, first the launch pad moves far from the centre and then the rocket launches.

Key 'T' can be used to toggle the camera mode.

Key **'L' or 'I'** can be used to start the animation.

Keys **LEFT, RIGHT, UP, DOWN, '[' and '']** can be used to move both the cameras independently.

IMPORTANT POINTS :-

- The location of the space centre.
- The animation starts with moving the launch pad far from the centre, resembling the real.
- The time of the launch (9:08 am). The shading resembles with the real time of the launch.
- Various parts of the orbiter : The motion of the solar panels and the reflector antenna resembles that of the real orbiter.