

UCS1712 - GRAPHICS AND MULTIMEDIA LAB MINI PROJECT

INDIA'S CHANDRAYAAN-3

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Introduction to Tool Used - blender

Blender is a free and open source 3D software primarily used for modeling, animation, rendering, rigging and other components in a 3D pipeline. Blender is supported by a high quality 3D architecture enabling fast and efficient creation of workflow and it has several features allowing a wide variety of tasks to be done.

Blender's UI is based around a 3D viewport and it's configurable, responsive and intuitive. Its interface uses OpenGL to provide a consistent experience. It is a cross-platform application that runs well on Linux, Windows, and MacOS computers, which made it all the more suitable for our project.

Description

The animation created using Blender is a demo depicting the launch of a rocket at Satish Dhawan Space Centre, Sriharikota and its journey through space, before the Chandrayaan rover lands on the moon's surface. The animation mimics the journey of the Chandrayaan-3 rover and lander. The animated video showcases the described scene ending with the lander on the moon, which was a proud moment for the country.

Several objects with unique material, texture and shapes have been created. The moon's surface and the world scene depicting the earth from space and the stars in space have also been created. Camera and object movements include translation, rotation and scaling and they have been included with keyframes. Unique fire and smoke features have been used in the rocket's take off.

Object description

1. Rocket and Rover

Rocket and the rover were created as a combination of several objects and mesh materials including planes for the fins, engines, exhausts, details on the body, etc. Modifiers have also been included on these objects, giving them the required smooth and shadow edges. Materials like the metallic surface and several nodes for the textures have been included to give a realistic appearance. This entire rocket object or the rover object was then appended wherever required in the various scenes.

2. Rocket Fire and Smoke Simulation

Fire and smoke simulations have been animated using an empty plane and fire+smoke effect for the rocket takeoff. The plane was first rotated in the direction that the smoke and fire are expected to trail off and then a bounding box as a domain for the containment of the smoke and fire area was added. The flow type for both were set to inflow with a very high negative velocity. The domain type was set to gas for the bounding box. Data and noise were then baked to render a realistic fire and smoke in the animation. The textures and colors for the fire and smoke were modified using the color ramps and principled volume nodes.

3. Earth and moon

UV spheres were used as mesh objects for the earth and moon. The moon surface was animated using texture images and playing around with displacement and texture values in the nodes in the shade editor.

The earth's main surface was animated using a texture image, followed by another UV sphere over the surface sphere to mimic the clouds and give the earth a cloudy look. This was followed by another UV sphere on top for the atmosphere and horizon glow as seen from space.

4. Moon surface

The moon surface was mimicked by added planar surfaces and using a texture image. The displacement in the texture image was modified in the shade editor and by using color ramps and principled volume nodes and playing around with the displacement values to give it a rocky surface look.

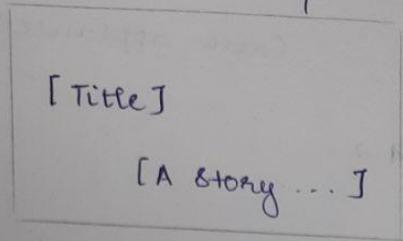
5. Space

The space and stars were animated by changing the world shade editor settings and increasing the grainy textures to get more stars on a dark black background to give it a realistic finish.

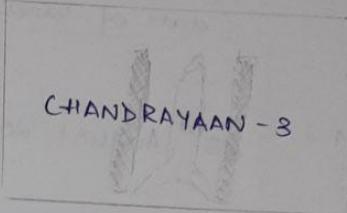
Storyboard

Introduction - Text & Audio with glimpses of scene

0.1

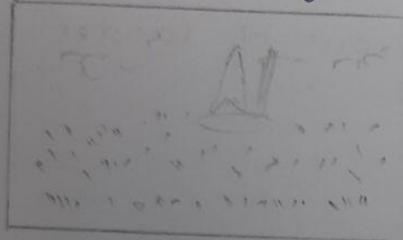


0.2



Scene 1 - Surroundings, rocket & countdown

1.1



1.2

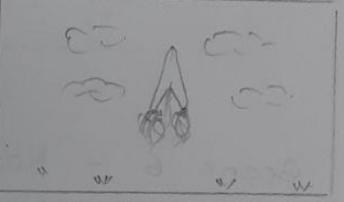


Scene 2 - Rocket launch with music

2.1

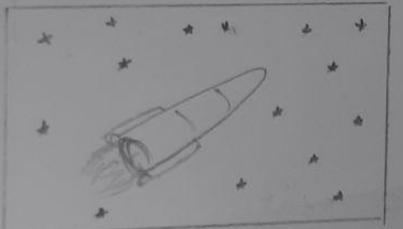


2.2



Scene 3 - Rocket in space

3.1

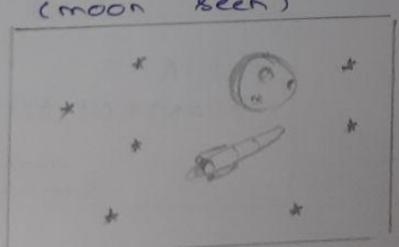


3.2



(moon seen)

3.3



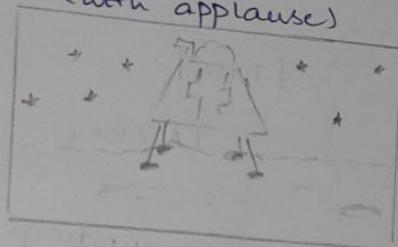
Scene 4 - Lander on Moon
(date of landing)

4.1

23rd August 2023

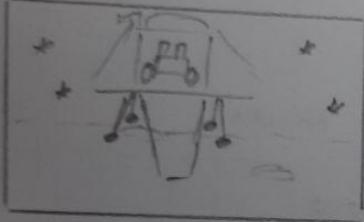
4.2

(with applause)



Scene 5 - Rover coming out of lander

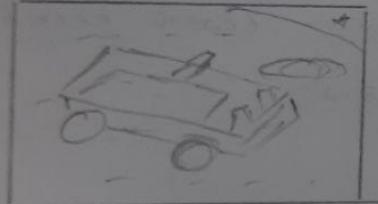
5.1



Scene 6 - Rover on moon surface

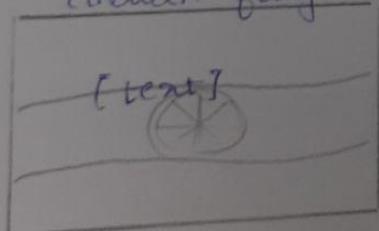
(camera rotate)

6.1



Scene 7 - Outro with text

(indian flag)



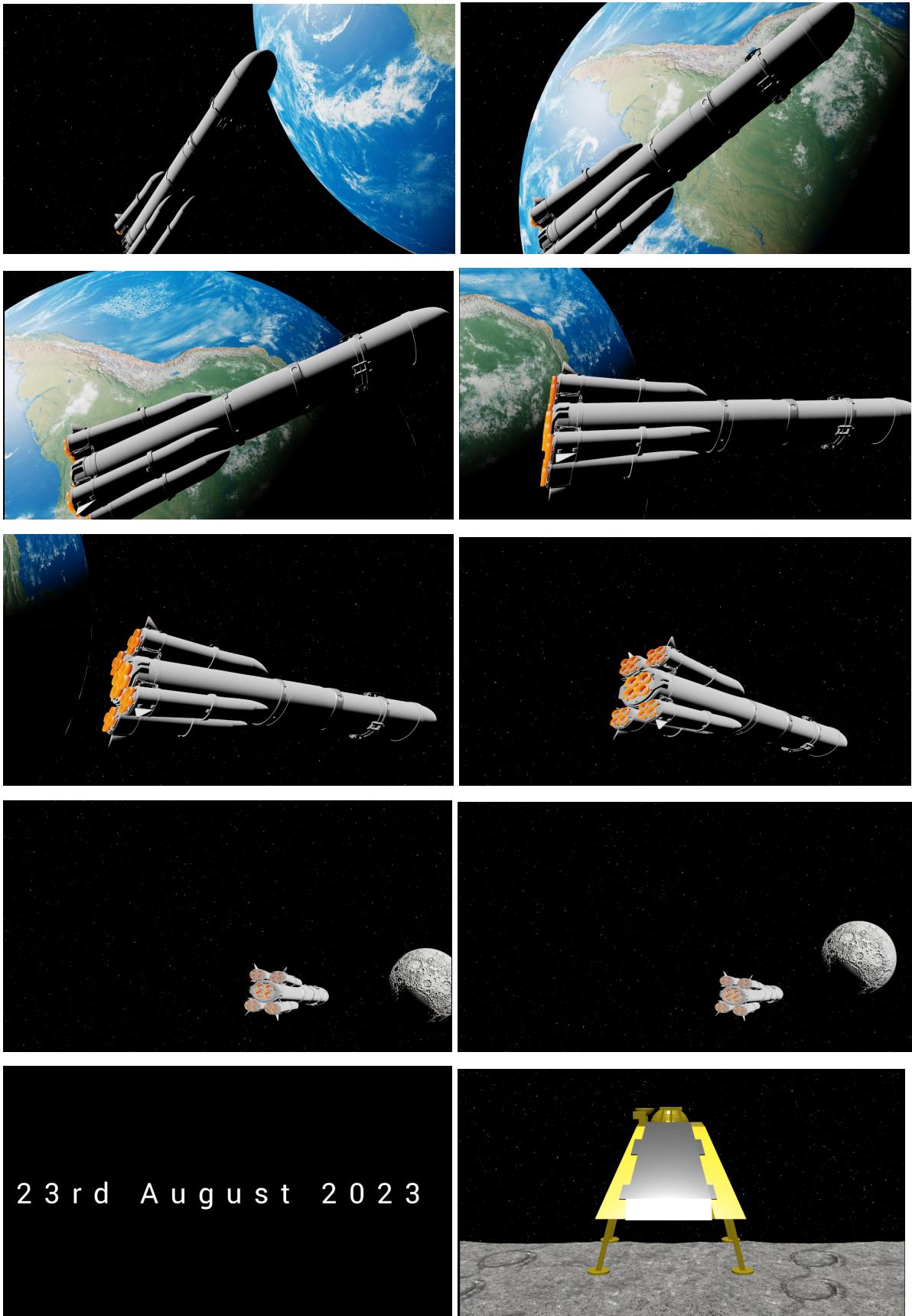
(moon surface)

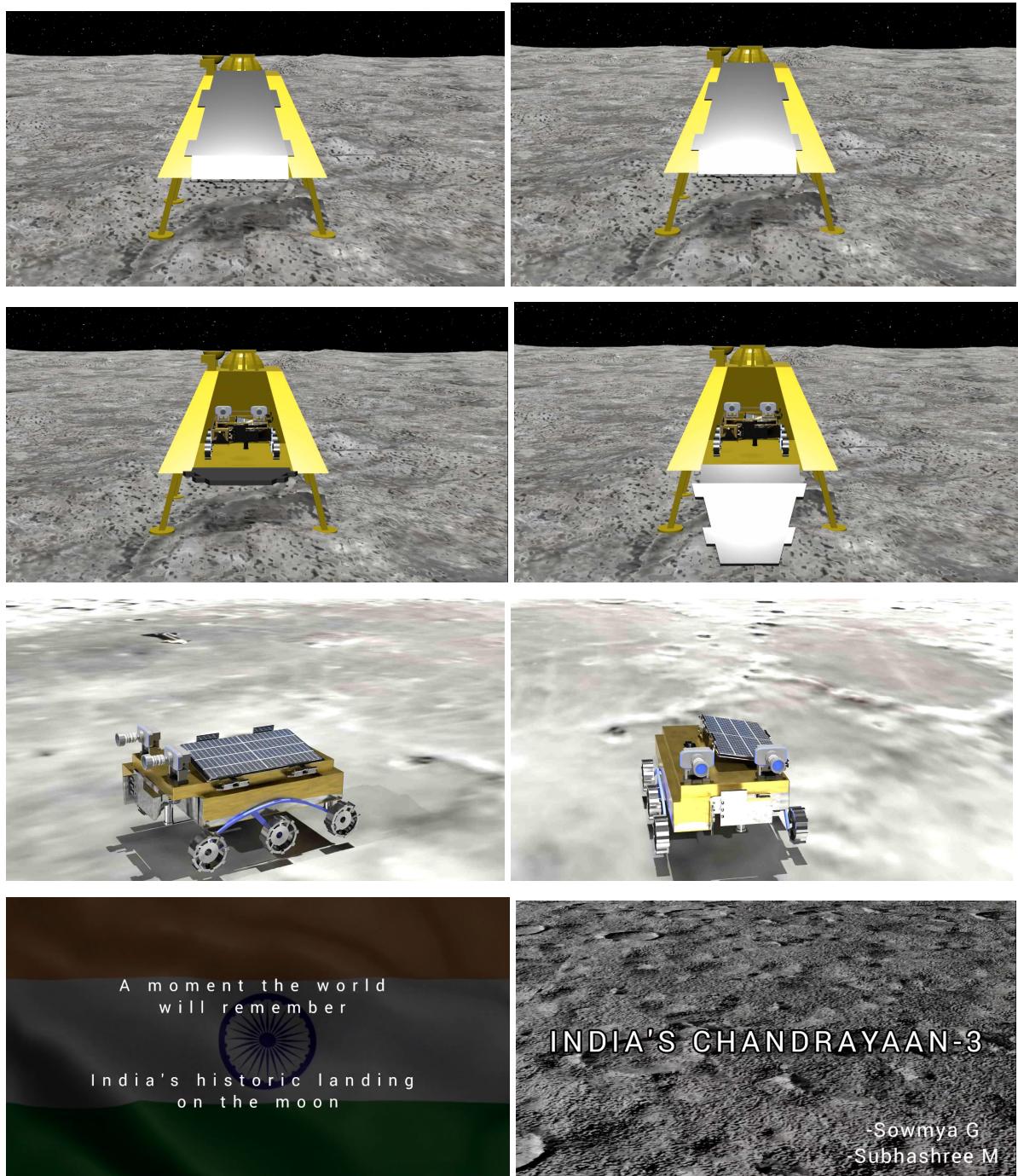
INDIA'S
CHANDRAYAAN-3

- Savanya G
- Suthashree M

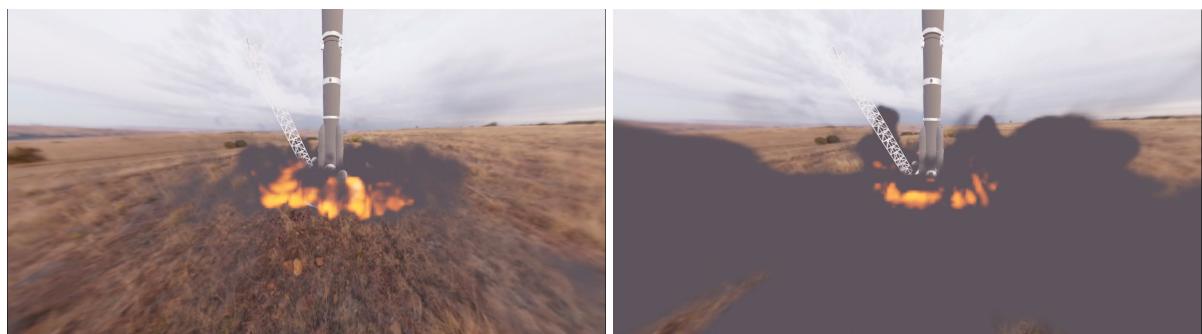
Screenshots - Main Keyframes

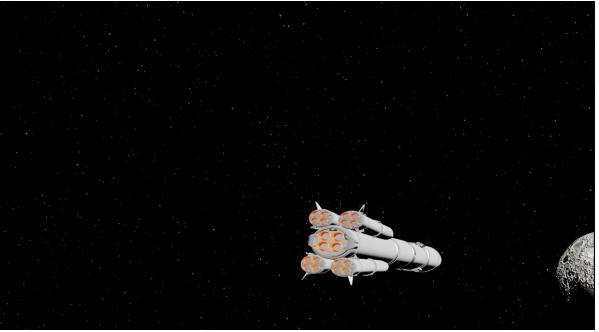
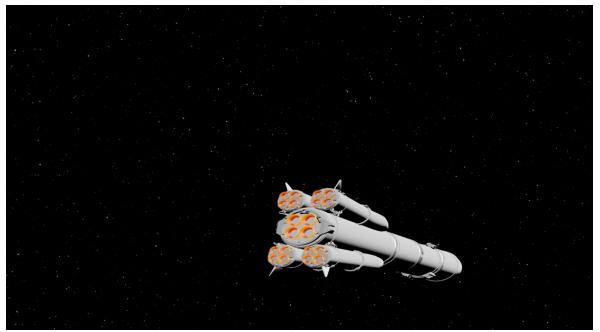
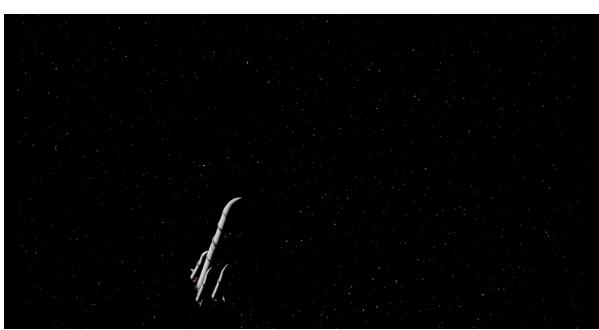


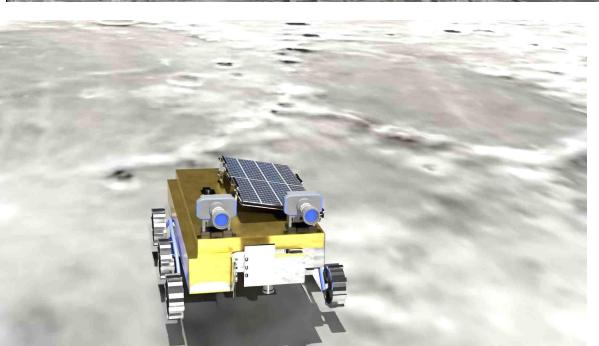
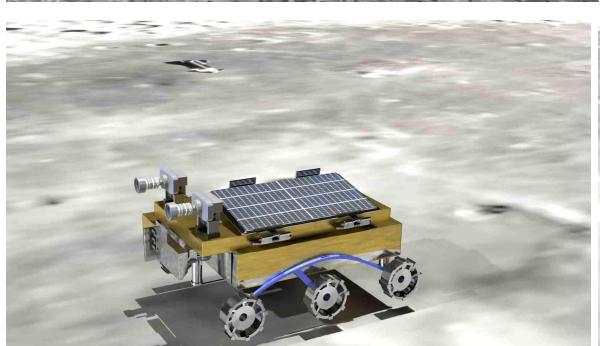
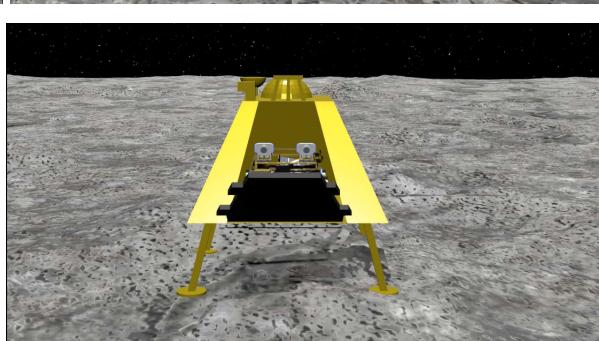
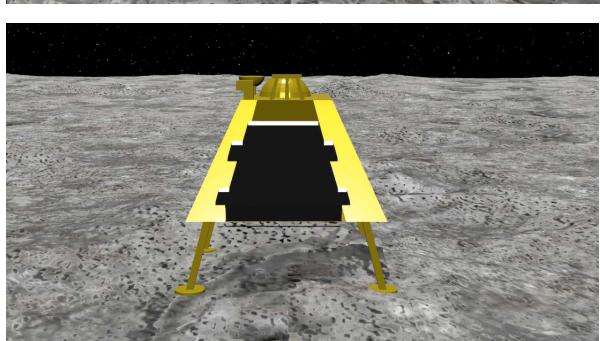
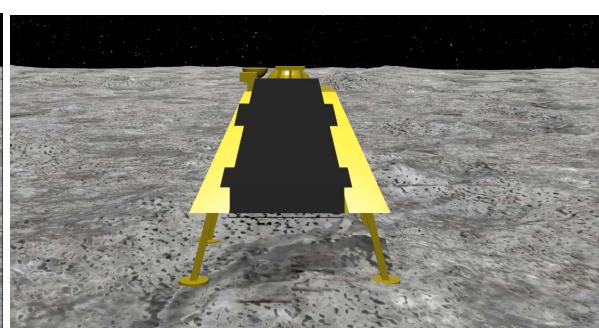
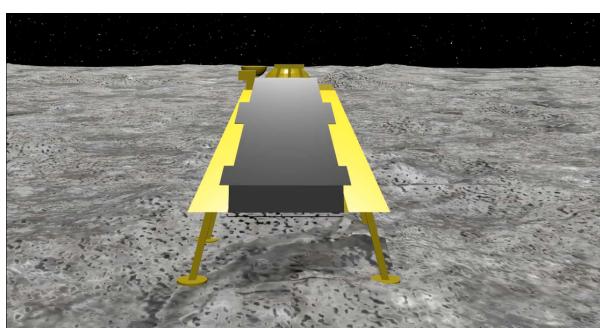
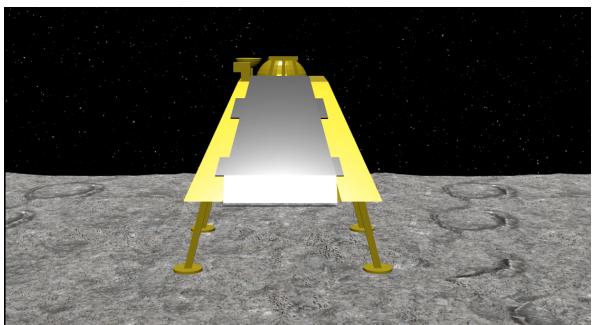
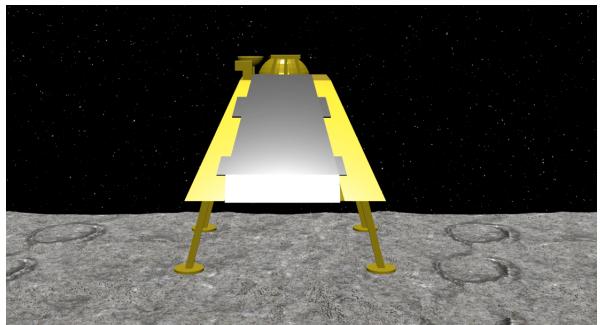
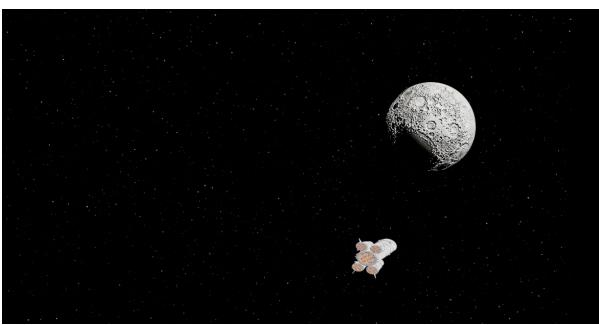


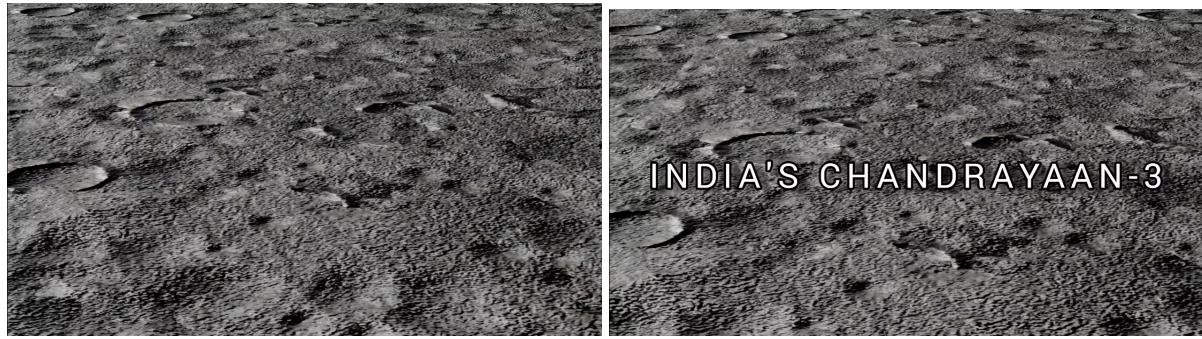


Screenshots - Intermediate Keyframes









Types of interpolation applied

While setting up the keyframes, most of them were done using linear interpolation mode. The camera movements, smoke and fire simulations, rocket takeoff, movement of rocket in the sky, etc were done in linear interpolation mode where we get constant speed of translation, rotation and other transitions.

Certain movements have been set using bezier interpolation mode. The shot of the rocket in space zipping past the earth has been set using bezier interpolation mode to render smooth movement of the rocket along with the curved shots of the earth and the moon.

Learning outcomes

- We learnt the basics of 3D animation, rendering and modeling in blender and experimented with the various features the software offers
- We learnt how to model the intricate details of objects like rockets, rover and moon surfaces in blender. This includes setting up modifiers, constraints, flow types, material and texture types etc.
- We learnt the setting up of a global scene to effectively render with all our objects
- We learnt setting up camera movements to create engaging and dynamic shots which includes zooming, panning etc
- We learnt the fundamentals of keyframe animation to create movement and transformations of objects, camera, lighting etc., over frames and time.
- We learnt different interpolation techniques in setting up keyframes for smooth animation
- We learnt the rendering process in Blender, including resolution, frame rate, and output settings
- We learnt how to represent animation scene as a storyboard