# Interactive Space Exploration Video Game in Virtual Reality using Unity Tool

**Name:** Shanuj Shekhar

**Unity Version:** 2018.4.16f1 Personal

**Hardware used:**

*Laptop Configurations:* Inspiron 5580, Memory: 8 GB
Processor: Intel(R) Core(TM) i7-8565U CPU @ 1.80GHz[Cores 4] [Logical/Core 2]
Operating System: Microsoft Windows 10 Home Single Language
*Graphic Card Configurations:* NVIDIA GeForce MX150, Shared Memory - 3999MB
*Oculus Quest Device (HMD):* 64 GB

**Directory Hierarchy:**

| Name | Date modified | Type | Size |
|---|---|---|---|
| Assets | 03-03-2020 21:37 | File folder | |
| Blender Models | 27-02-2020 14:40 | File folder | |
| Library | 03-03-2020 22:13 | File folder | |
| Logs | 10-02-2020 20:44 | File folder | |
| obj | 13-02-2020 02:49 | File folder | |
| Packages | 10-02-2020 20:44 | File folder | |
| ProjectSettings | 03-03-2020 21:38 | File folder | |
| UnityPackageManager | 10-02-2020 20:43 | File folder | |
| Assembly-CSharp | 03-03-2020 06:22 | Visual C# Project fi... | 56 KB |
| Assembly-CSharp-Editor | 02-03-2020 13:09 | Visual C# Project fi... | 28 KB |
| Assembly-CSharp-firstpass | 26-02-2020 20:46 | Visual C# Project fi... | 23 KB |
| CSE 566 Assignment 0.sln | 13-02-2020 02:35 | Visual Studio Solut... | 3 KB |
| CSE 566 Assignment 2.sln | 26-02-2020 22:42 | Visual Studio Solut... | 3 KB |
| Demo.sln | 31-01-2020 19:04 | Visual Studio Solut... | 2 KB |
| Oculus.VR | 22-02-2020 17:01 | Visual C# Project fi... | 30 KB |
| Oculus.VR.Editor | 22-02-2020 17:01 | Visual C# Project fi... | 26 KB |
| Oculus.VR.Scripts.Editor | 22-02-2020 17:01 | Visual C# Project fi... | 25 KB |

**Implementation Details:**

*Setting up the scene:*

- I have designed different 3D objects inside the spaceship's cockpit like the handle of the spaceship. Handle gets rotated according to the movement of the spaceship.
- I have made cargo boxes in Blender 2.8. Also, the cargo ship included in the scene is made in Blender 2.8. References are given in the reference section.
- I have designed a semi-sphere Planet CSE566 using Blender 2.8. On top of it, I have built a greenhouse in the unity tool itself.



*Initial Scene of Game*

*Flying the spaceship:*

- The feature of flying the spaceship is implemented through the VR controller. Mainly the left joystick of VR Controller is used to drive the spaceship. Moving the joystick to the left, rotates the spaceship around its own axis. Similarly, moving the joystick to the right, rotates the spaceship to its right on its own axis.
- I have added an extra feature that when the player starts flying the spaceship, the handle is rotated according to the direction of the spaceship.

- When the user walks towards the cockpit, the game prompts the user to control the spaceship by pressing a button on the controller.

- **MiniMap:** I made this using a youtube tutorial (mentioned in the references section). First, I have made a canvas which basically adds all the UI elements into the game. Then I created a camera whose culling mask is to only the layer which I want on the Minimap.
- I have made a WIM layer which contains all the minimap elements i.e. for Sun, Earth, Mars, PlanetCSE 566, etc.
- This camera has the culling mask set to WIM Layer. Also, this camera is set in a top-down position so that it looks like 2D mapping of objects.
- Each element in this minimap has a UI texture. Planets are Spheres with UI Texture whereas, spaceship has a separate marker to distinguish it from other objects.
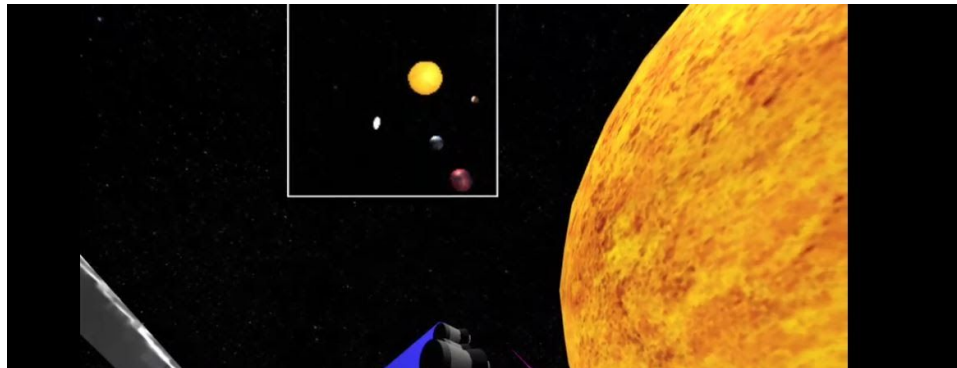


*Minimap of World (WIM)*

### *Teleportation Tube:*
- I designed the teleportation tube in Blender 2.8. The reference is given below.
- As stated in the assignment, this object is used to teleport to the PlanetCSE566 from the spaceship when the spaceship is in the vicinity of the Planet.
- The teleportation happens when we want to teleport to any location inside the greenhouse on the Planet.
- Tube is like a cylindrical object which when prompted to teleports the user to the desired location.
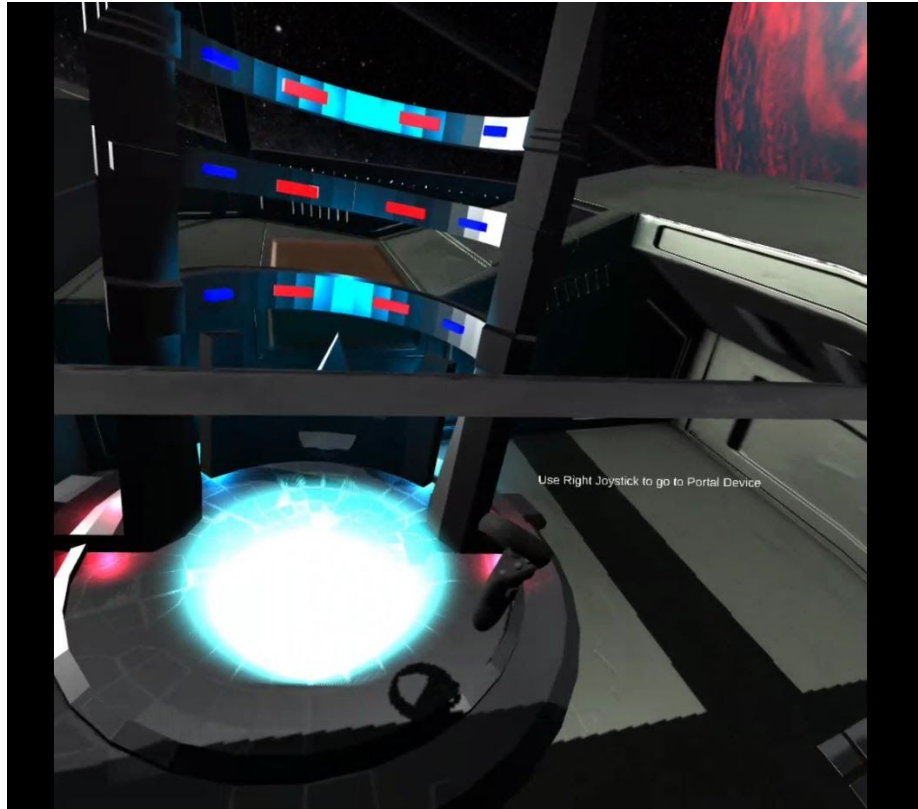
*Teleportation Device*

### Interacting with the cargo ship:
- I have designed the cargo ship in Blender 2.8. So basically at the start of the scene, the cargo ship is kept in front of the spaceship with cargo on board.
- When the user is prompted is to either accept a cargo or disregard this request, depending upon the choice, the game proceeds.
- When the user decides to accept a cargo, it is released into some random location. The user has to retrieve the cargo using the rays from the controller.
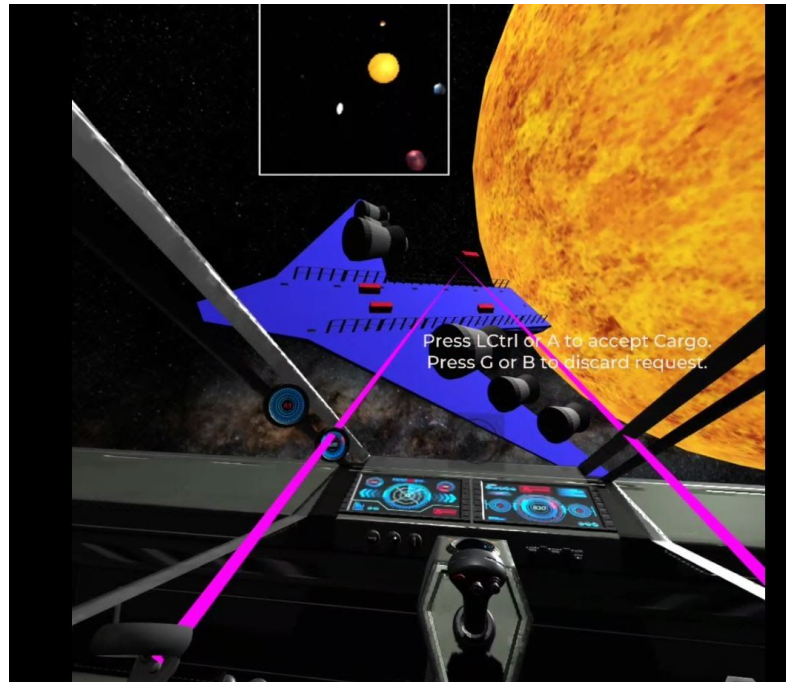
*Interaction with the cargo*

- Each ray has been extended to a very large distance, since we cannot draw a line to infinity. Once the cargo box is selected using the rays, then using the right joystick the cargo is moved closer to the spaceship. An additional feature is that when the cargo box is selected, I have enabled the emission feature on the cargo. When I stop moving the joystick the emission of the cargo box is also disabled.
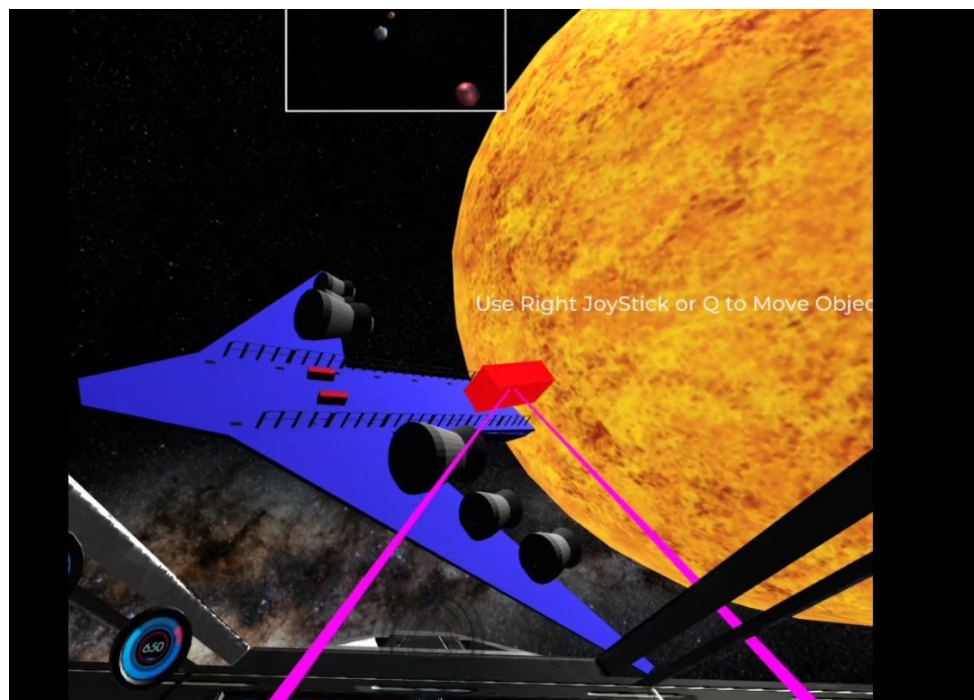


*Selected Cargo Box's Emission is Enabled*

- When it is near the spaceship, a message displays saying that "Cargo Loaded".
- After all the cargo boxes (4) are retrieved into the spaceship, then it's time for the mission.
- Using the minimap the user can easily navigate to the PlanetCSE566 by flying the spaceship.

### *Getting ready for the mission:*

- When the user lands on the planet, he/she receives tasks to be performed later on the planet. Tools like pop-menu (3D Text) and etc, are used to populate the spaceship.
- Every time the game starts the user has prompts to guide throughout the planet to perform tasks. A selection technique using rays from the controllers is used here. Cart is used to store the objects on the spaceship. Depending on the task, the corresponding objects are taken out from the cart and kept at their particular place.
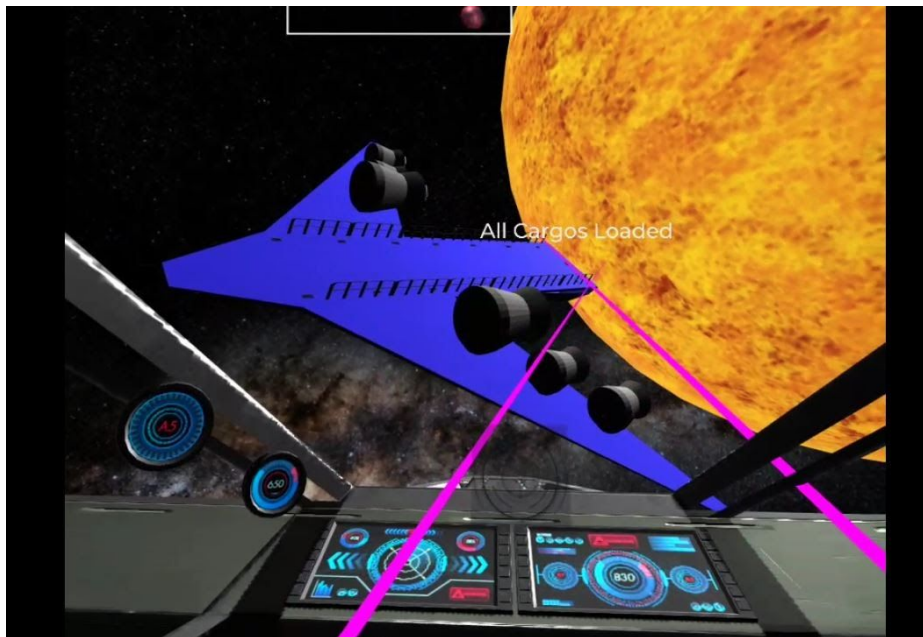


*Getting Ready for Mission*

### *Teleportation:*

- When the spaceship has reached the planet, I have used OnTriggerEnter to detect the spaceship. After this, the user is prompted to go to the portal device kept in the spaceship.
- When the user goes near the portal, the game prompts to teleport to the planet. When a user says yes to teleportation, it first teleports to a top-down aerial view

of the planet. At this location, the user selects any random location inside the greenhouse to teleport to.
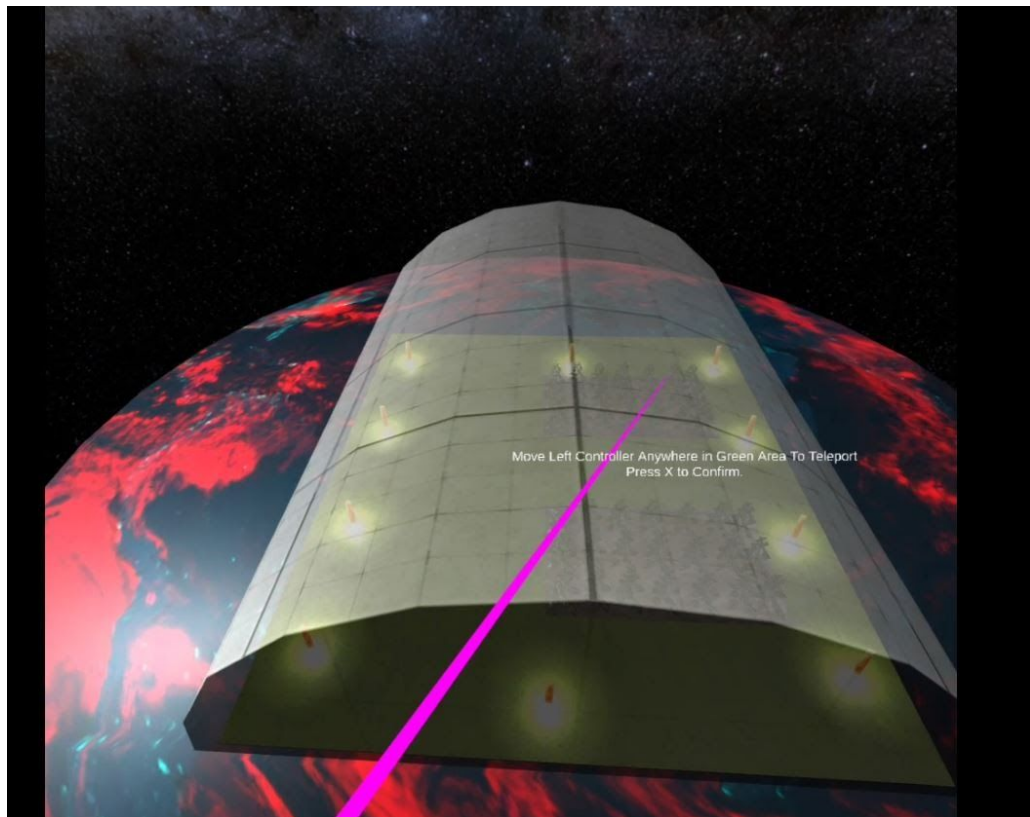


*Aerial View*

- After selection of location, the user is teleported to that specific location. This all has been done by use of buttons or joystick on both VR controllers.
- Once the user has been teleported to the greenhouse, the user is also able to teleport back into the spaceship once all the tasks are completed in the greenhouse. The user just has to go the teleportation device present on the field of greenhouse, then a prompt from the user is asked to teleport back into the spaceship. Now, the user is back into the spaceship and can therefore use left joystick or W, A, S, D to fly the spaceship.

### *Planet CSE566 Greenhouse:*
- I have made my greenhouse on top of the planet I designed using Blender 2.8.
- Greenhouse consists of a green field with two patches of plants growing on them. It has lights present all along the boundary of the greenhouse.
- From the aerial top-down view of the greenhouse, the user is able to teleport to any desired location inside the greenhouse. There is plenty of empty space to carry out the tasks that are explained in detail below.

- I have made a menu of tasks where using the controllers the user can select the task that the user wants to carry out.
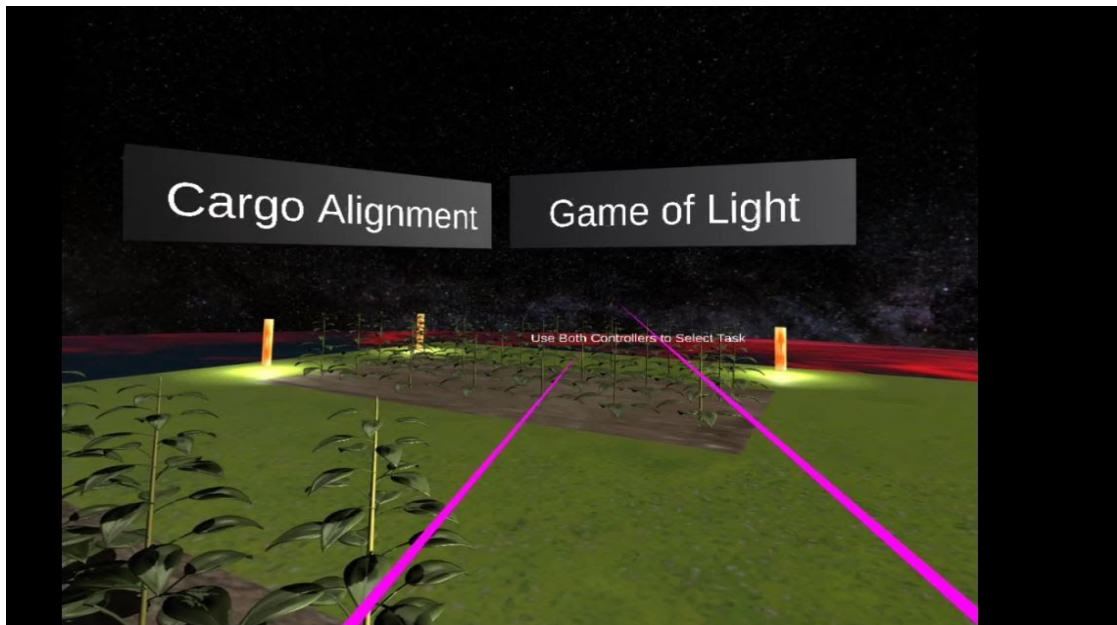


*Task Menu On Planet CSE 566*
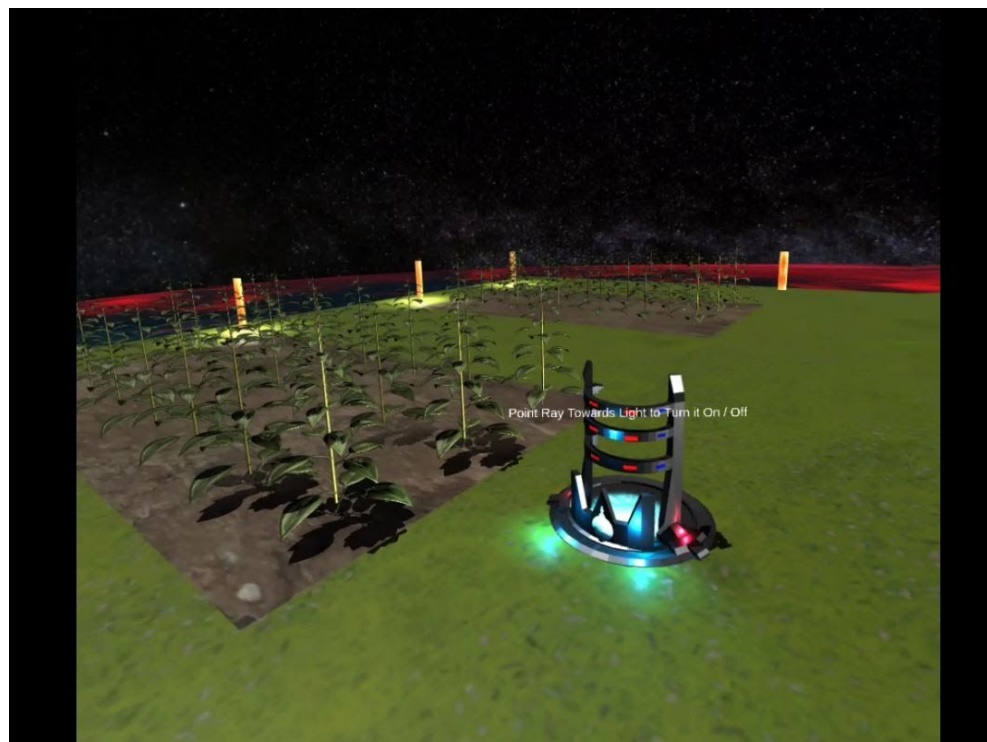


*Planet CSE 566 Surface*

*PlanetCSE 566*

- Following are the tasks:
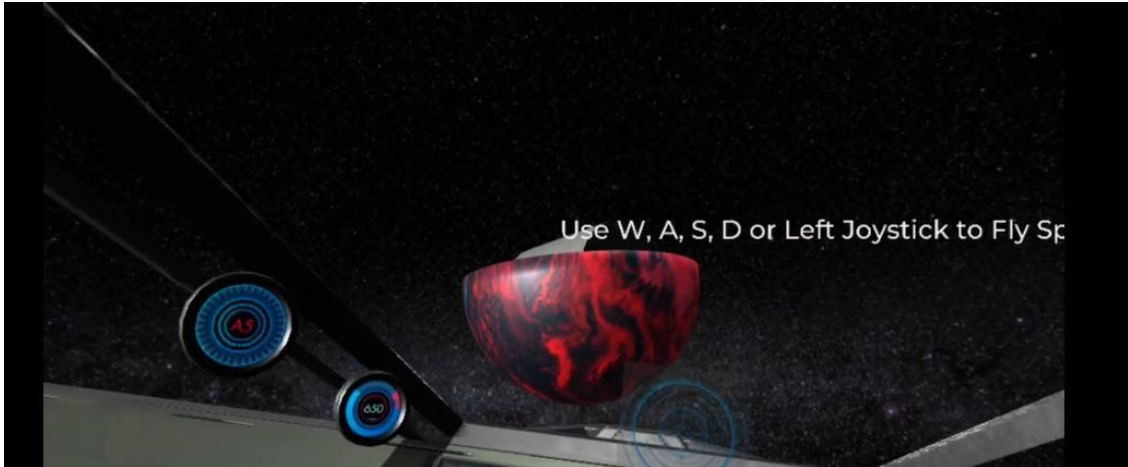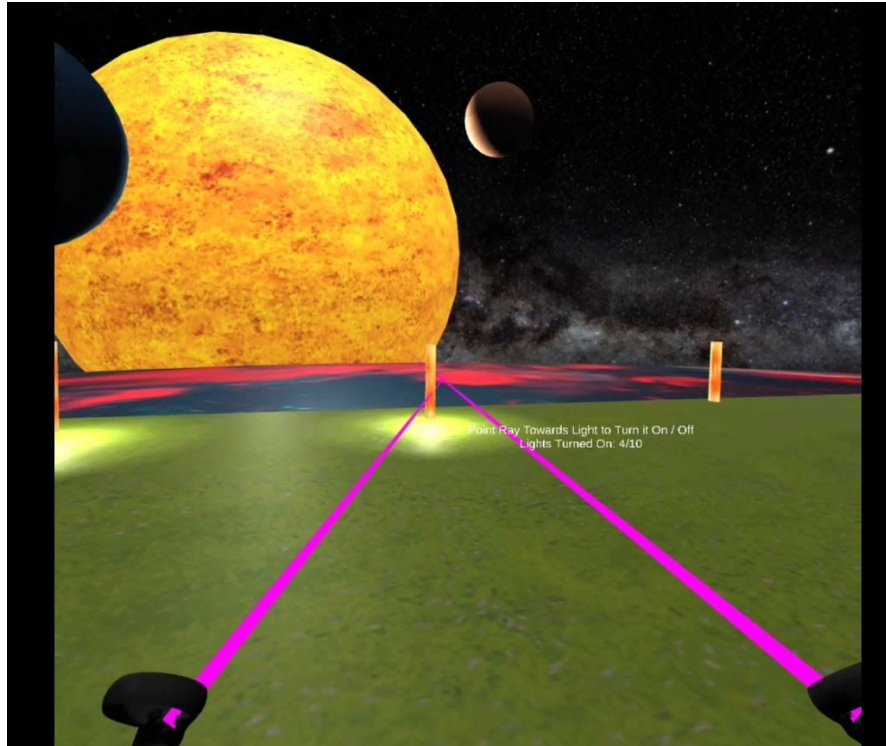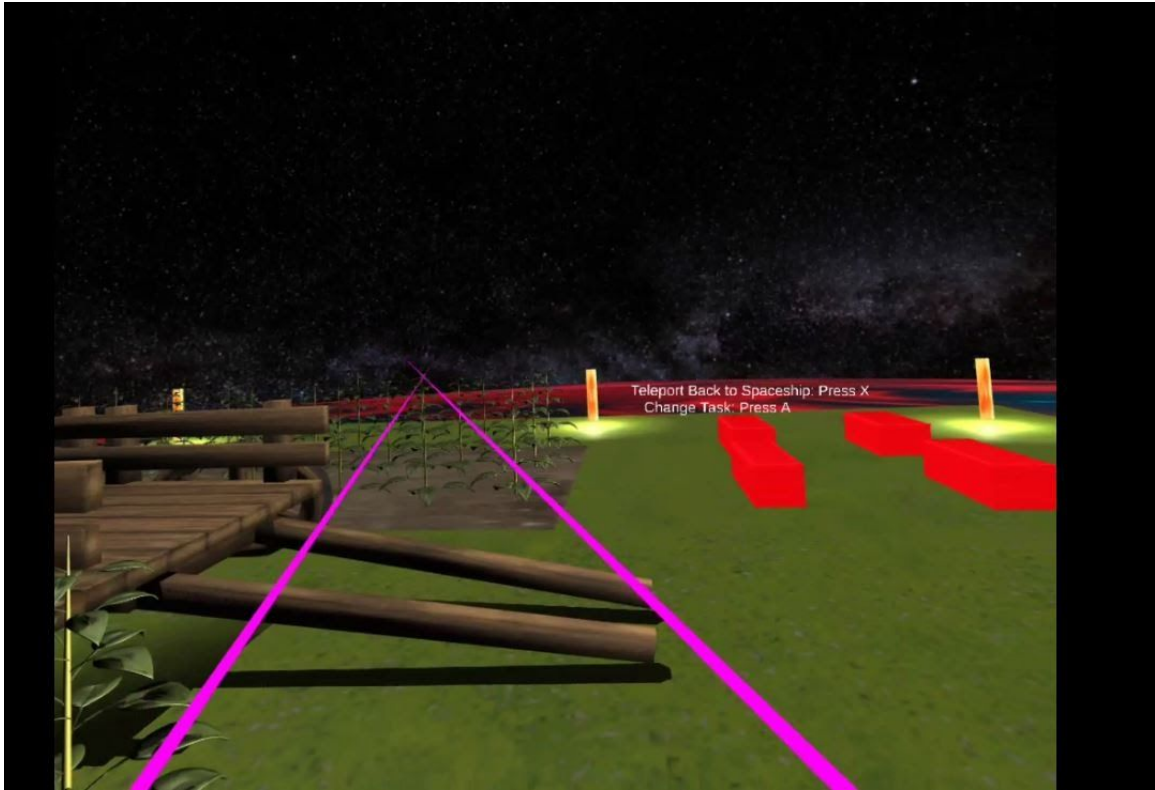  - **Task 1 - Game of Light**
    - In this task, the user has to turn on/off the lights present all along the boundary of the greenhouse.
    - The main objective of this task is that the user has to use the VR controllers to do this task.
    - The user has to cast rays from both the controllers and when both rays intersect at certain light, then the light component of this 3D object is disabled.
    - Once all the lights are turned off, then the user can start switching on the light.
    - Therefore, making an efficient use of controllers to point at different 3D objects present at different locations.
    - After or while the tasking is going on, the user is given the provision to either change the task or teleport back into the spaceship.
    - If the user prompts to change the task, then the task menu is again shown to the user, otherwise if the user chooses to teleport back into the spaceship, then using the right joystick, the user can move and go to the portal device and perform teleportation.

*Game of Light Task*

- ○ **Task 2 - Cargo Alignment**
    - ■ In this task, the cargoes loaded in the beginning of the game, will be used to place or you can say align them onto a cart present in the greenhouse.
    - ■ Again, I have used rays from the controllers to select a particular cargo. After the cargo is selected, then the user can easily pick them up using the left controller. The user is given the feature of moving the object along the ray of the left controller in order for it to get placed into the cart.
    - ■ After all the cargoes are loaded into the cart, the user is prompted to either change the task or teleport back into the spaceship.
    - ■ This feature is available while the user is performing one of the tasks or after the task is completed.
    - ■ If the user prompts to change the task, then the task menu is again shown to the user, otherwise if the user chooses to teleport back into the spaceship, then using the right joystick, the user can move and go to the portal device and perform teleportation.

*Cargo Alignment Task (Cart and Cargo)*

**References:**

Skybox- Asset Store

https://assetstore.unity.com/packages/2d/textures-materials/milky-way-skybox-94001

Earth, Moon, Mars, PlanetCSE566 - Asset Store

https://assetstore.unity.com/packages/2d/textures-materials/sky/earth-planets-skyboxes-53752

Spaceship

https://assetstore.unity.com/packages/3d/vehicles/space/hi-rez-spaceships-creator-free-sample-153363

CargoShip

https://www.3dcadbrowser.com/3d-model/barge

Cart

https://assetstore.unity.com/packages/3d/environments/fantasy/wooden-cart-65835

Plant

https://www.youtube.com/watch?v=JoW1XWi4Lw0

Portal

https://www.turbosquid.com/3d-models/3d-sci-fi-teleporter/860716

MiniMap

https://www.youtube.com/watch?v=28JTTXqMvOU

https://www.youtube.com/watch?v=faXQQ5b6GEs

https://www.youtube.com/watch?v=28JTTXqMvOU

Oculus Joystick

https://developer.oculus.com/documentation/unity/unity-ovrinput/?locale=en_US&device=QUEST

https://forum.unity.com/threads/hi-i-am-trying-to-get-movment-of-the-ovrplayer controller-with-the-gear-vr-trackpad.507240/

Grass Texture

https://assetstore.unity.com/?category=3d&free=true&q=grass&orderBy=0