

VR Hardware System

CE/CZ 4001

Virtual and Augmented Reality

AY2021/2022 Semester 2

Learning Objectives

1. Integrate a VR headset into a game engine.
2. Analyze the main components of a VR headset.
3. Practice to use the controllers.

VR Devices for Consoles and PC



Oculus Rift Setup

- Need a facebook account, or create an account
- Follow the setup instructions in the rift.
- Download SteamVR in Steam.

Steam & SteamVR

The screenshot shows the Unity Asset Store interface with a search for 'steamVR'. The top navigation bar includes tabs for Scene, Game, and Asset Store. The search bar contains 'steamVR' with a filter icon. Below the search bar are several filter sliders: Maximum Price (set to \$0), Maximum Size (set to 4GB), Released (set to 1d), and Updated (set to 1d). There are also buttons for 'FREE ONLY', 'PAID ONLY', 'PACKAGES ONLY', and 'LISTS ONLY'. A sidebar on the right lists various asset categories like 3D Models, Animation, Audio, etc. The main content area displays a grid of search results. The first result, 'SteamVR Plugin Complete Projects...', is circled in red. It is by Valve Corporation, has a 5-star rating from 1967 users, and is free. Other results include 'SteamVR Input for...', 'SteamVR - UI Input...', 'VR Movement Sys...', 'Focal Point & Stea...', 'ArmSwinger VR Lo...', 'Room Scale Repo...', and 'Multiplayer VR Sta...'. Each result shows a thumbnail, title, author, rating, and price.

Asset Store Search Results for "steamVR":

- SteamVR Plugin Complete Projects...**
Valve Corporation
★★★★★ (1967)
FREE
- SteamVR Input for...**
Scripting/Input - O...
3lbGames
Not enough ratings
\$5.00
- SteamVR - UI Input...**
Scripting/Input - O...
Arklay
★★★★★ (14)
\$30.00
- VR Movement Sys...**
Scripting/Input - O...
3lbGames
★★★★★ (16)
\$20.00
- Focal Point & Stea...**
Scripting
Albert Hwang
★★★★★ (120)
FREE
- ArmSwinger VR Lo...**
Scripting/Input - O...
Electric Night Owl
★★★★★ (10)
\$15.00
- Room Scale Repo...**
Editor Extensions/...
DO Assets
Not enough ratings
\$4.00
- Multiplayer VR Sta...**
Complete Projects...
Clean Code
★★★★★ (8)
\$20.00

SteamVR in Unity

- Easy VR with Unity SteamVR plugin – Installation

4. Install Steam and SteamVR

- A. You can download and install Steam [here](#). You will need to create an account.
- B. Once Steam is installed, or if you already have Steam, you can install SteamVR [here](#).
 - The installer window may pop up behind this browser.
 - Alternatively, you can install SteamVR from Steam > Library > Tools.
- C. Once SteamVR is installed, set it to SteamVR Beta.
 - To do this, right click on SteamVR in the Library (under Tools) and click Properties.
 - Select the Betas tab.
 - Click the drop down and select beta - SteamVR Beta Update. Wait for it to update.
- D. Launch SteamVR.
 - You can launch SteamVR by clicking the VR button that appears in the top right corner of the Steam client.
 - If the VR button doesn't appear, launch SteamVR from the Library under Tools. Then look at the Double check your headset section below.
- E. The SteamVR Status window will show up. (You may also see a Room Setup screen pop up)
- F. Let's look at the SteamVR Status window.
 - This app will report the state of your VR system. Green is good, flashing green means you aren't tracking (ie, the device can't see the base stations), red is bad, and grey means off or not connected.
 - There will be some helpful alerts that will tell you what to do next.

https://support.steampowered.com/kb_article.php?ref=2001-UXCM-4439

Oculus rift S

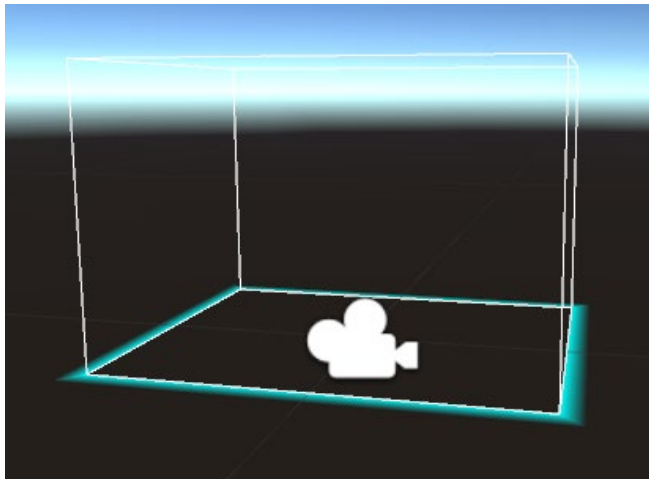


Install SteamVR plugin in Unity:

1. Go to **Asset Store /Unity Package**
2. Search and download SteamVR
3. Import to your Unity project
4. Accept all the recommended modifications

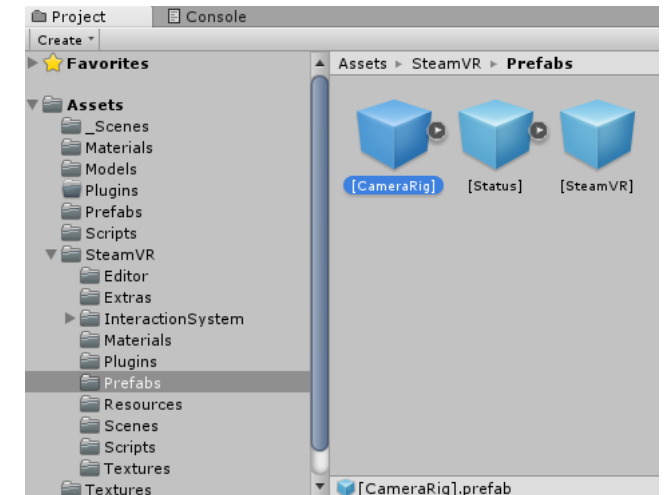
SteamVR in Unity

- Easy VR with Unity SteamVR plugin – Utilization.



1. Drag the **CameraRig** prefab into the scene

2. You will see a “shining” quad in the scene, which is the virtual area that you can play on. **Don’t forget to delete the default Main Camera.**



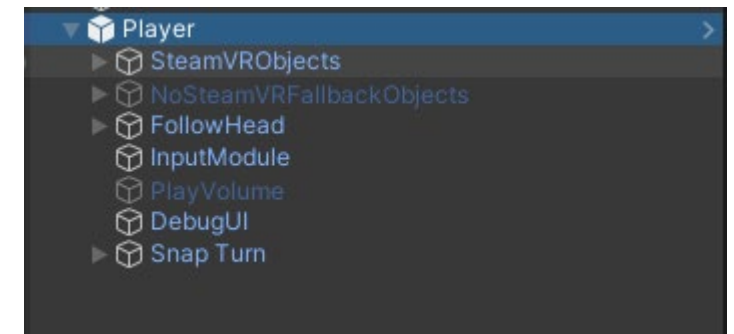
Adding XR plugin Management

- Go to Window-> SteamVR input->Save and generate.
- This will allow you to generate default controls for your VR headset.

That's it! You can wear your headset and navigate your VR scene.

[Player] Prefab

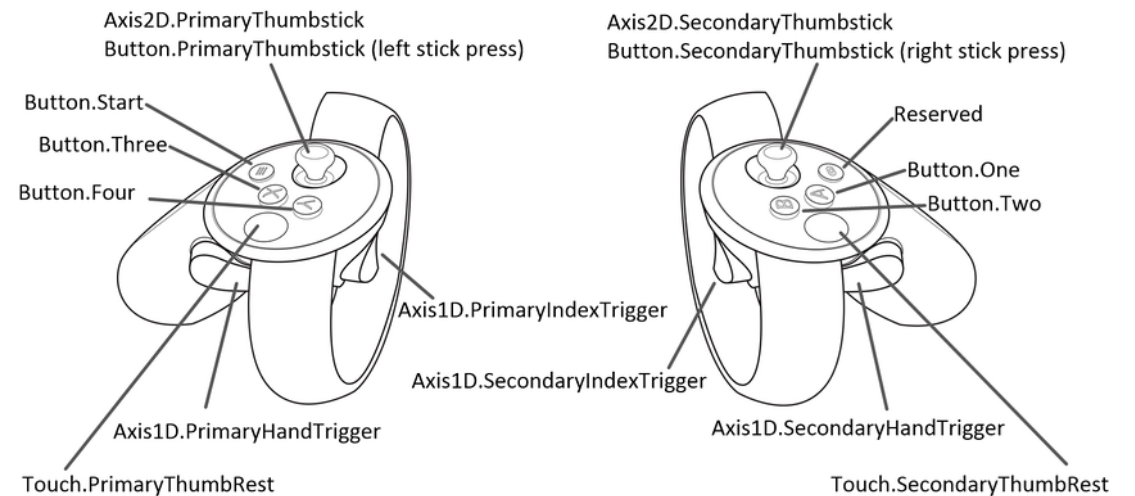
- Delete the **CameraRig**, add the Player prefab from steamVR.
- It is a more advanced version of **CameraRig**.



SteamVR in Unity

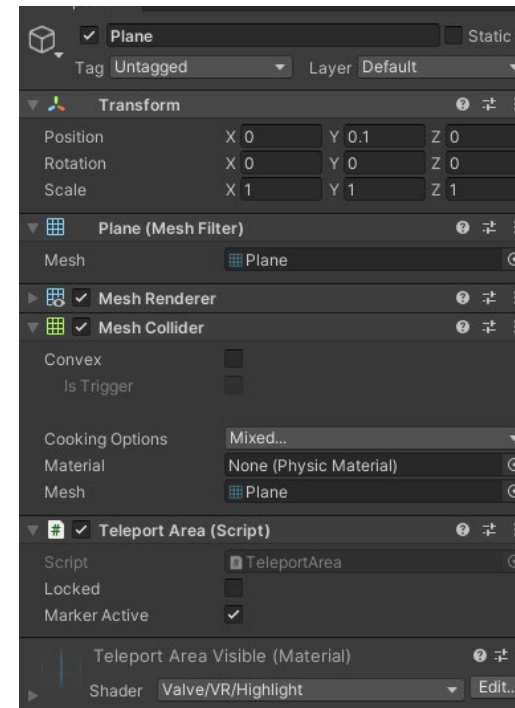
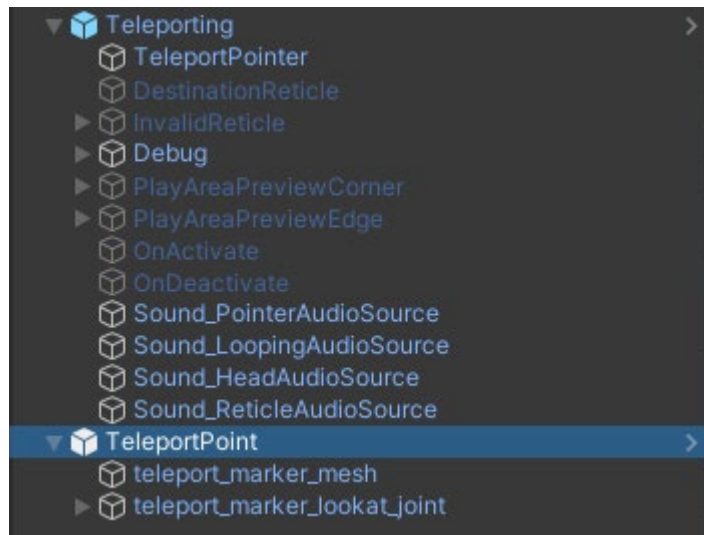
- Easy VR with Unity SteamVR plugin – Controllers.

- To add interactive experience to your scene, it is necessary to understand the basic prefabs created by SteamVR.
- Teleportation
- Interactions between controller and object
- Mapping the Controllers



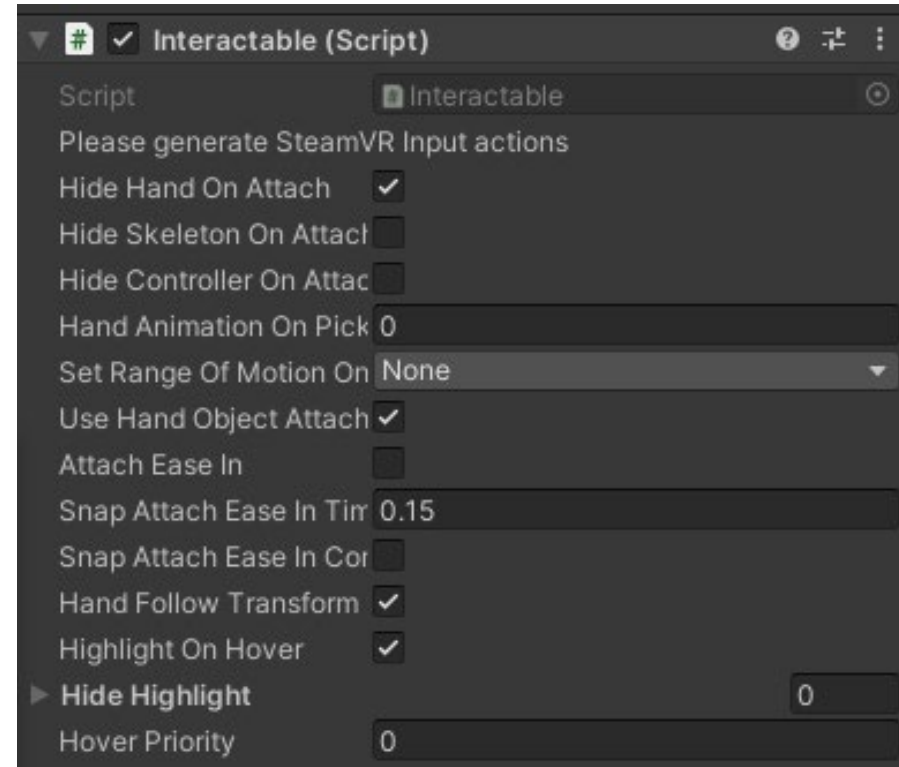
Teleportation

- Using prefabs created by SteamVR.
- Teleporting Prefab.
- Teleporting points.
- Create a teleporting area.
- Make a plane, add the teleport area component.



Grab and interact

- Using prefabs created by SteamVR.
- Add the Interactable script from SteamVR on to the object you wish to grab.
- Hover the controller over the object to see if it lights up.
- Adjust the setting and see what it does.



Grab and Interact

- Add Interactable Hover Events to the object.
- This allows events to happen when controller collider interact with object collider.
- Use the hover event to change the color of the object, move the ball.

Grab and Interact

- We can now create our own grabbing script using the interactable script from before.
- Some version uses fixedjoint to do attachment.
- The link below has more details and other methods to teleport and interact.

<https://www.youtube.com/watch?v=5C6zr4Q5AlA&t=1s>

```
using Valve.VR.InteractionSystem;

@ Unity Script | 0 references
public class SimpleAttach : MonoBehaviour
{
    private Interactable interactable;
    // Start is called before the first frame update
    @ Unity Message | 0 references
    void Start()
    {
        interactable = GetComponent<Interactable>();
    }

    // Update is called once per frame
    @ Unity Message | 0 references
    void Update()
    {
    }

    0 references
    private void OnHandHoverBegin(Hand hand)
    {
        hand.ShowGrabHint();
    }

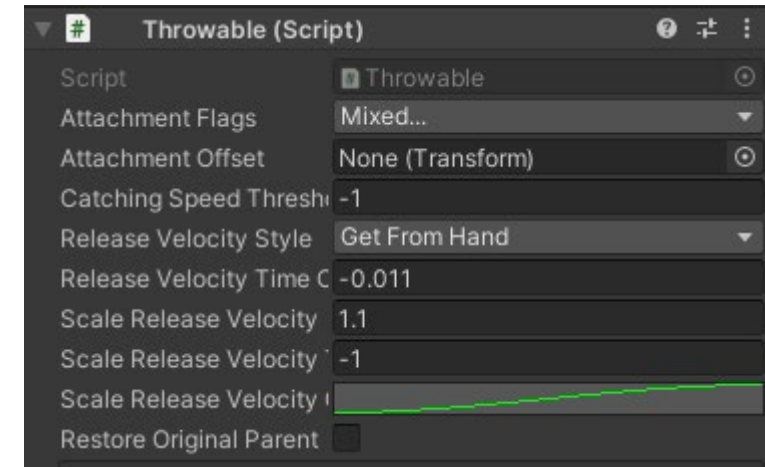
    0 references
    private void OnHandHoverEnd(Hand hand)
    {
    }

    0 references
    private void OnHandHoverUpdate(Hand hand)
    {
        GrabTypes grabtype = hand.GetGrabStarting();
        bool isGrabEnding = hand.IsGrabEnding(gameObject);

        if (interactable.attachedToHand == null && grabtype != GrabTypes.None )
        {
            hand.AttachObject(gameObject, grabtype);
            hand.HoverLock(interactable);
        }
        else if(isGrabEnding)
        {
            hand.DetachObject(gameObject);
            hand.HoverUnlock(interactable);
        }
    }
}
```

Grab and Interact

- Using SteamVR Throwable.
- Better interactions and allow throwing of the object.

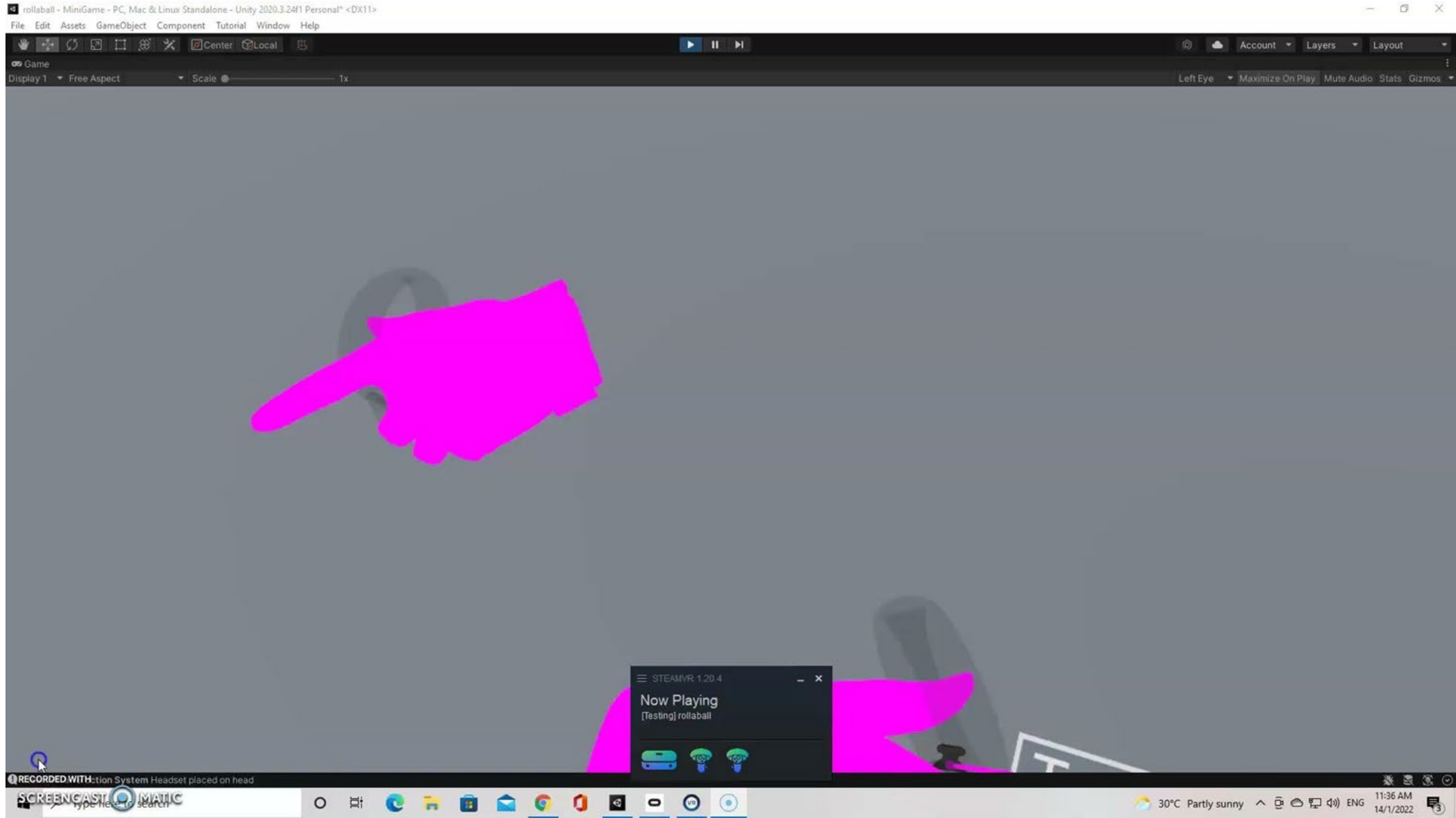


Binding Controls

- Go to windows->steamVR input->open binding UI.
- Previously we use the default, you can edit it here.
- Change setups of your controller.
- Change teleportation method, movement methods. Add other methods.
- More info:
- <https://www.youtube.com/watch?v=bn8eMxBcl70>



Demo



Additional Objective

- Find other movement methods, using Dpad to move.
- Change the size of the roll a ball game and grab the edges to move the ball around.

Useful things to look through

- <https://www.youtube.com/watch?v=Z0Z7xc18CcA&list=PLX2vGYjWbI0S9-X2Q021GUtoITqbUBB9B&index=1>
- This is for basic unity scripting tutorial
- <https://www.raywenderlich.com/9189-htc-vive-tutorial-for-unity>
- Using the HTC vive controller instead, but many of the example can be used for Oculus

End