ASSIGNMENT

of

Augmented Reality and Virtual Reality

CS 437

Bachelor of Technology (CSE)

By

Dhruv Sharma (21124012)

Last Year, Semester 7

Course In-charge: Prof. Darshan Parmar

NAVRACHANA UNIVERSITY

a UGC recognized University

Department of Computer Science and Engineering

School Engineering and Technology Navrachana University,

Vadodara

Spring – 2024.

Github Repo Link: https://github.com/OPSdrag/LavaZone-VR

DemoVideo Link: DEMO VIDEO

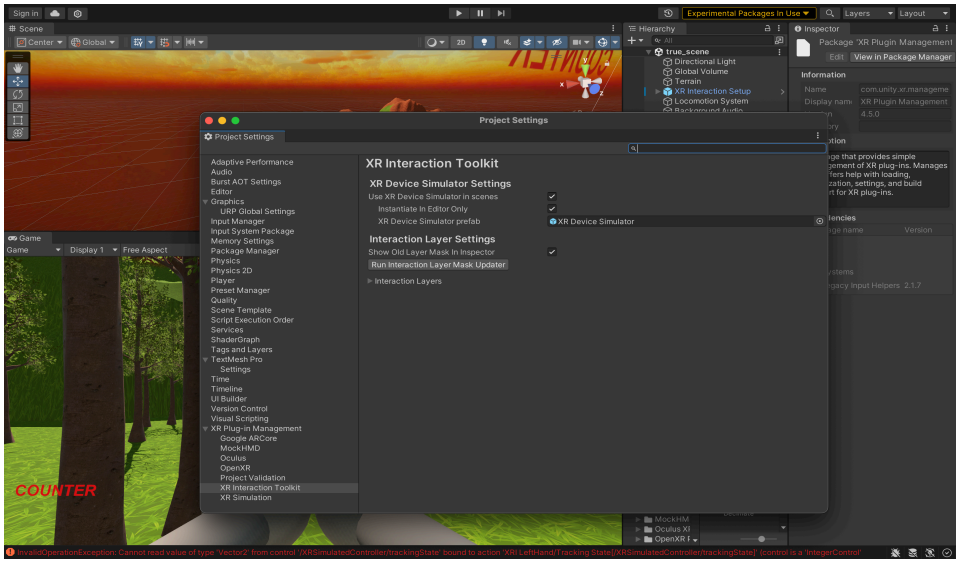
Objective : To create a basic VR game with a virtual environment in Unity that includes a ground plane, a skybox, environmental objects, lighting, and simple VR interaction. The player should be able to grab and move the grabale objects in the environment to score points.

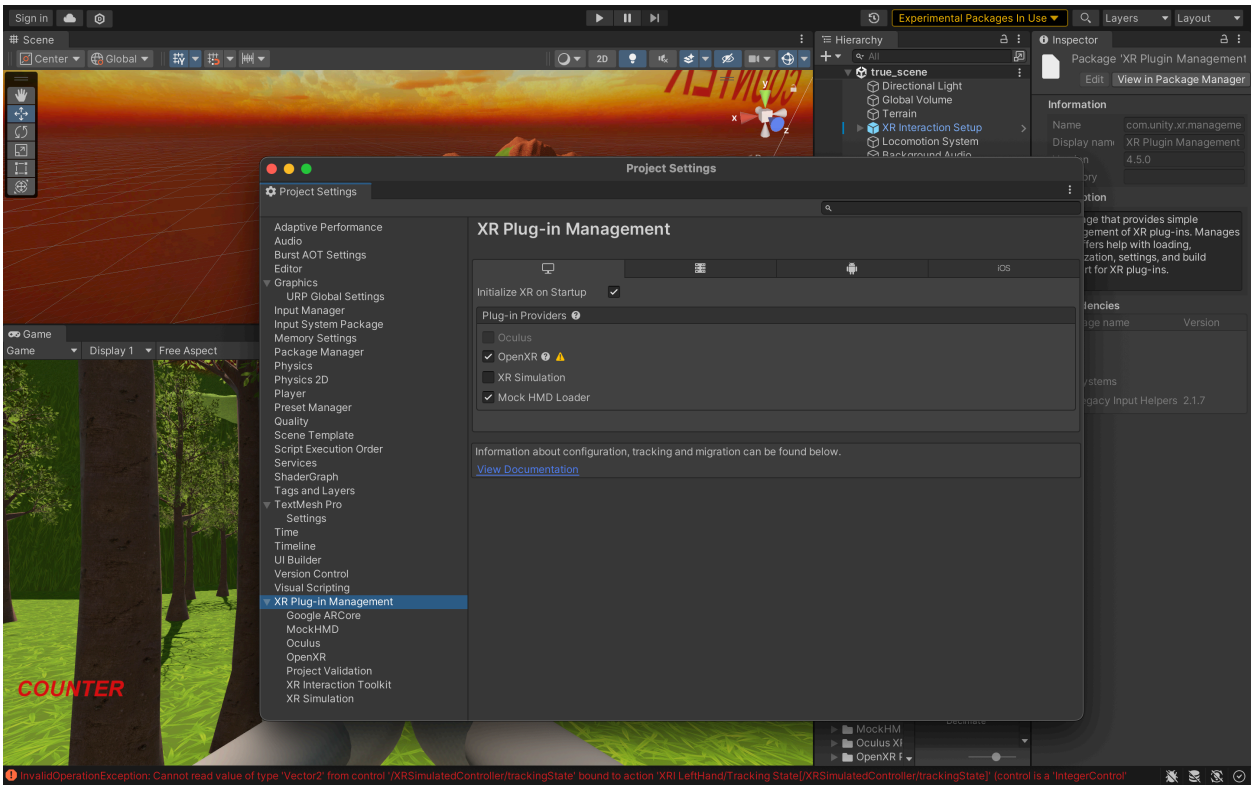
TASK 1 : Setting unity project and configuring vr environment

Steps :-

- Create a new unity project in URP{universal rendering pipeline} 3d project.
- Installing XR interaction toolkit
- Installing XR plugin management
- Setup the XR origin (VR)

Screenshots :-

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Initialize XR on Startup
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OpenXR
XR Simulation
Mock HMD Loader
Information about configuration, tracking and migration can be found below.
View Documentation
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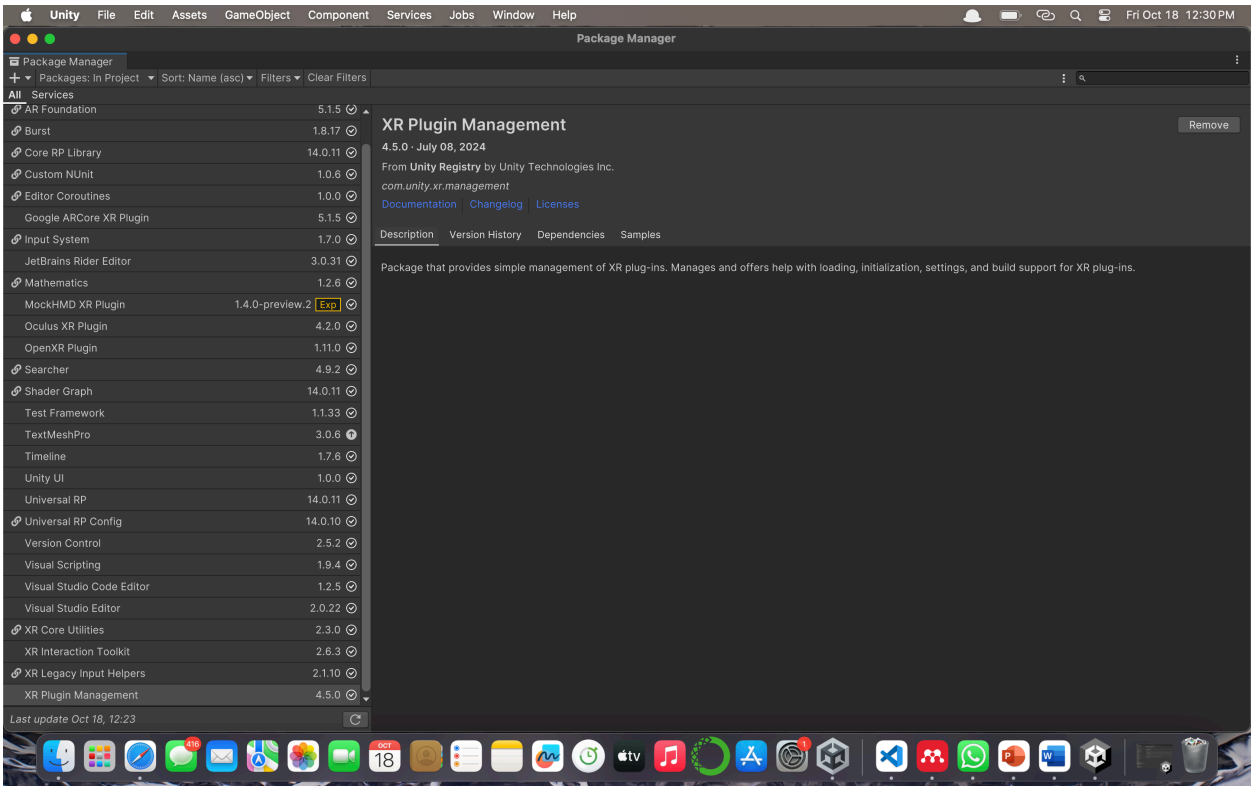
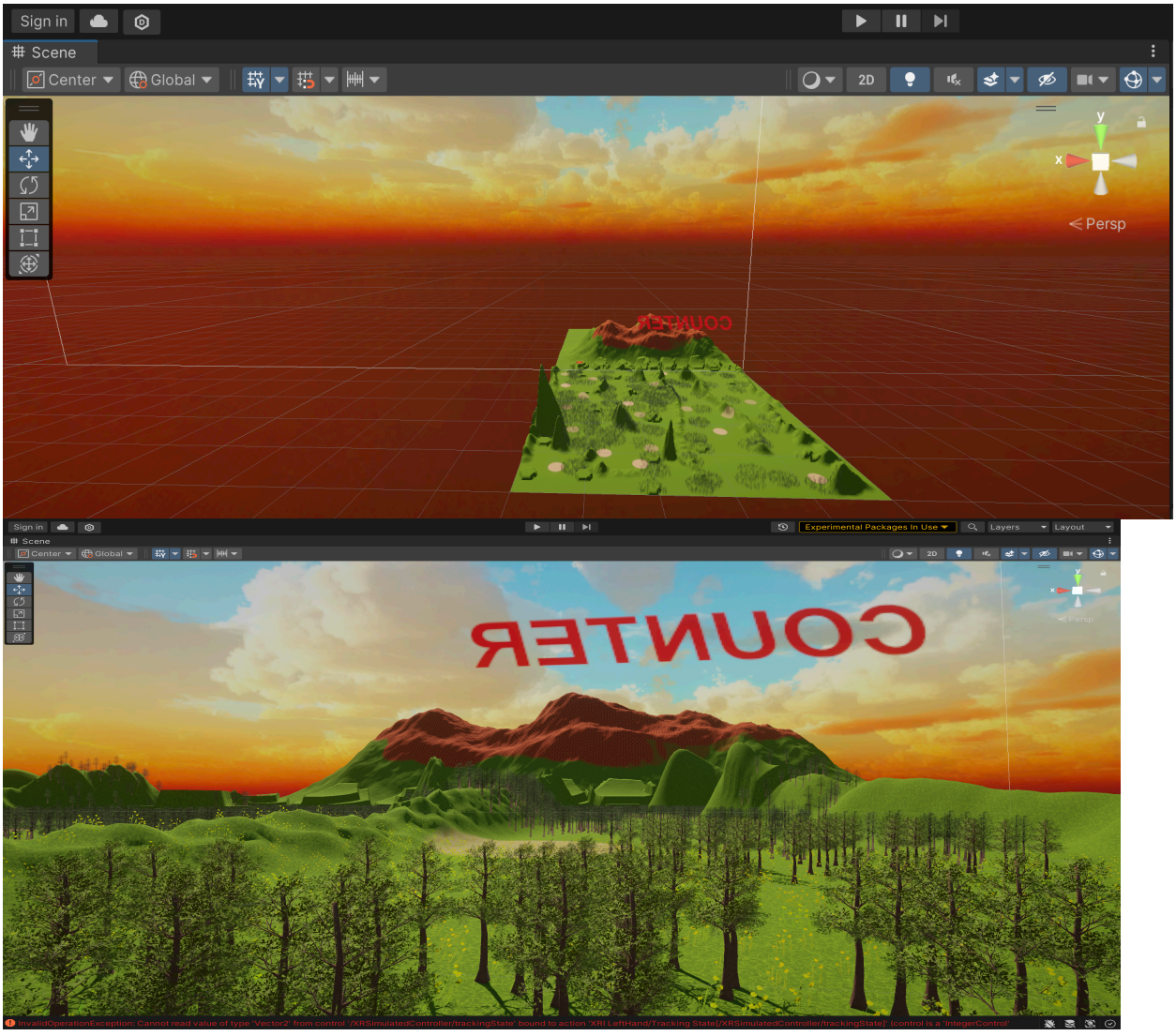

Package Manager
XR Plugin Management
4.5.0 · July 08, 2024
From Unity Registry by Unity Technologies Inc.
com.unity.xr.management
Documentation
Changelog
Licenses
Description
Version History
Dependencies
Samples
Package that provides simple management of XR plug-ins. Manages and offers help with loading, initialization, settings, and build support for XR plug-ins.
Remove

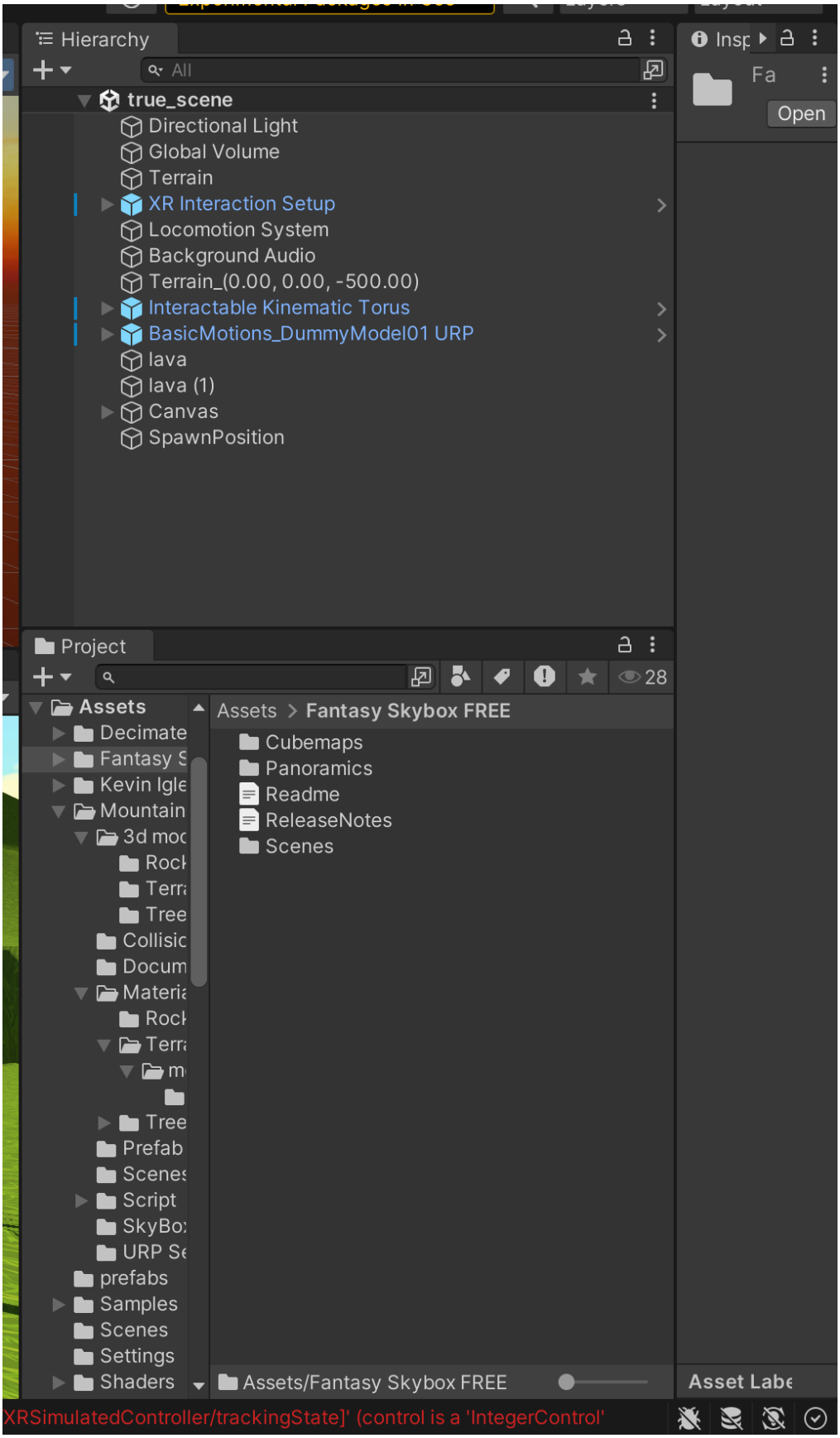
TASK 2 : Create the ground plane and add skybox

Steps:-

- Importing free asset of terrain from online unity's asset store.
- Importing free asset of skybox from online unity's asset store.
- With the help of terrain brush made the bulges on the terrains to look like mountains and used the hole painter of unity to create a hole for lava.

Screenshots:-

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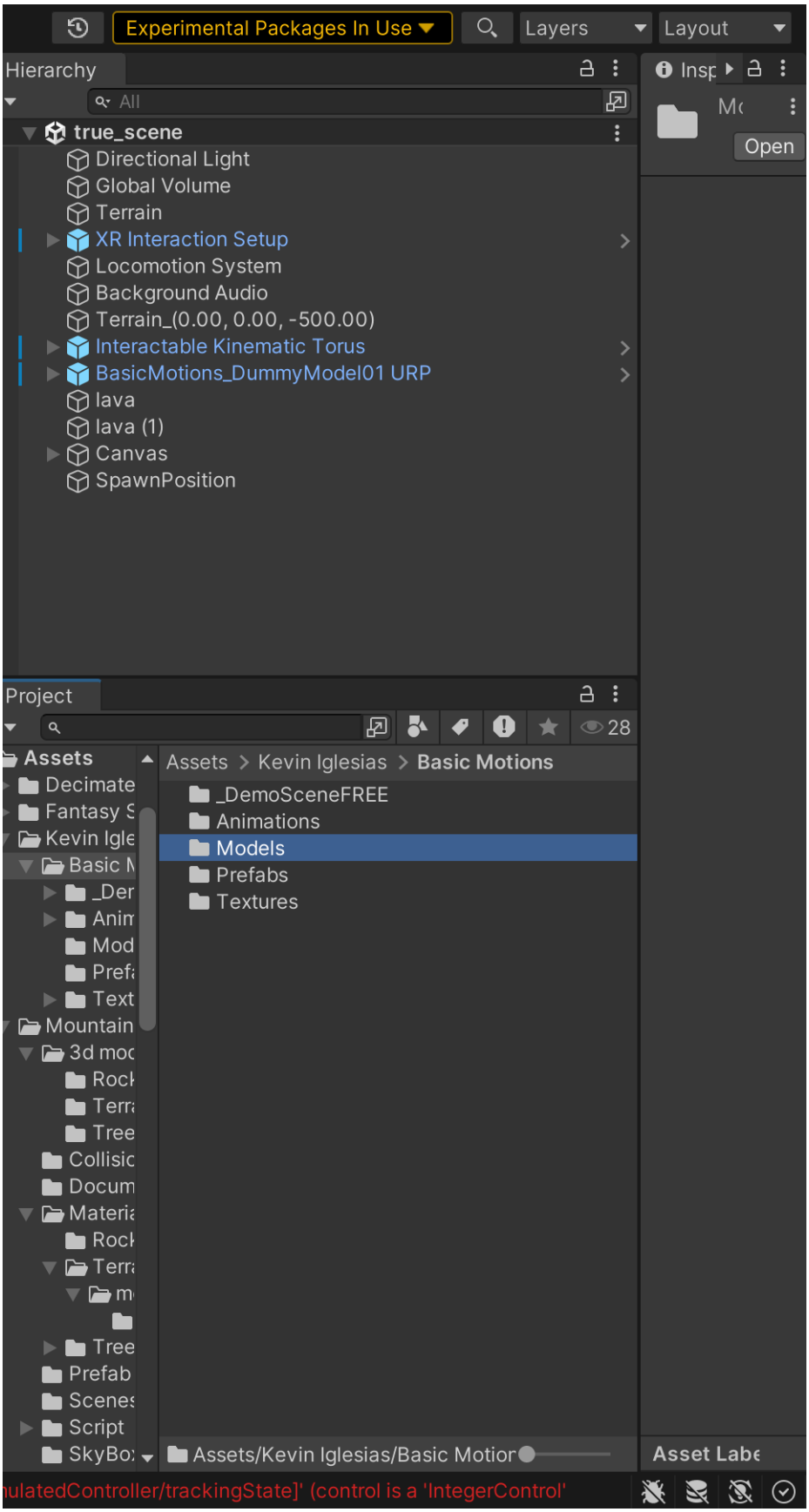
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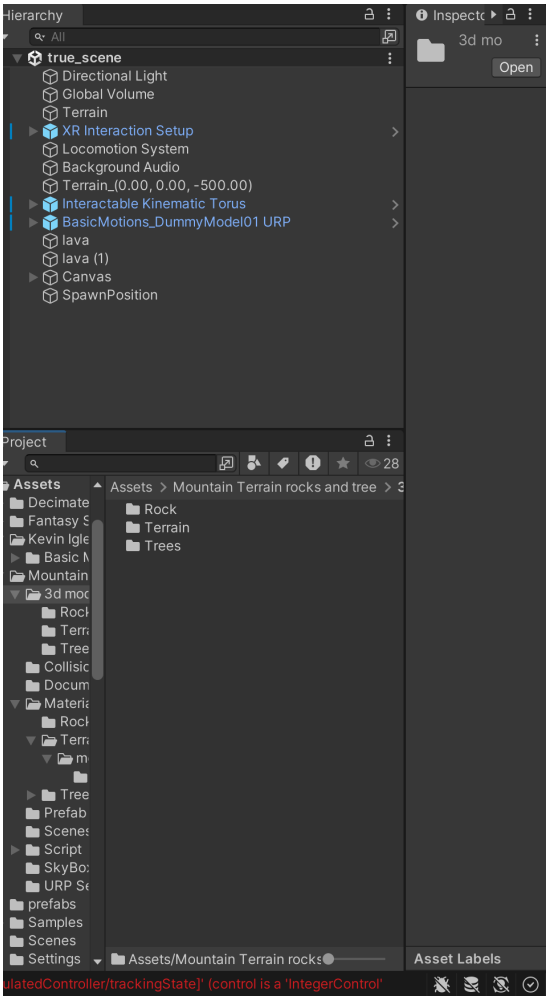
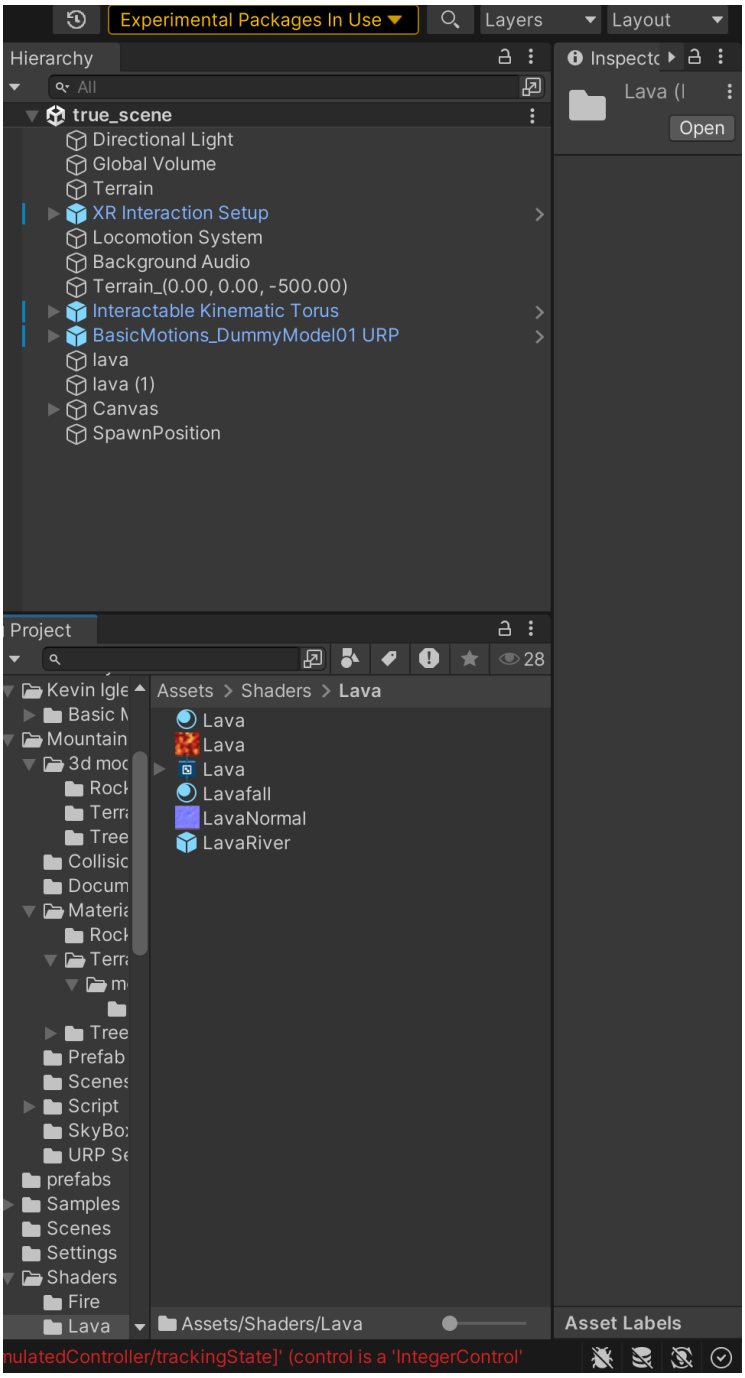
TASK 3 : Add environment object

Steps:-

- Expanded the size of terrain x:100 | y:1| z:100 so that there is enough place for the player to walkthrough.
- Imported free assets of trees, flowers and rocks to make terrain look more appealing.
- Added free assets of lava to increment in the game logic and added it's flowing animation.

Screenshots:-

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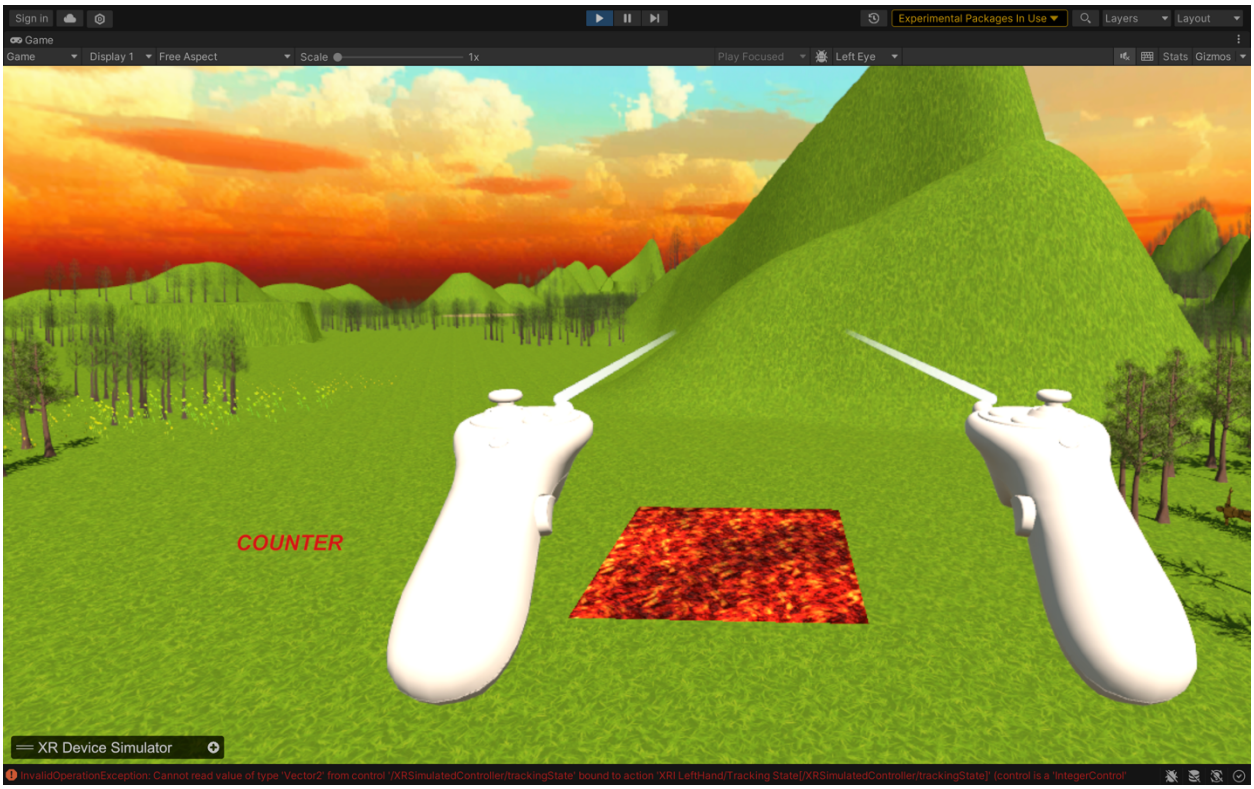
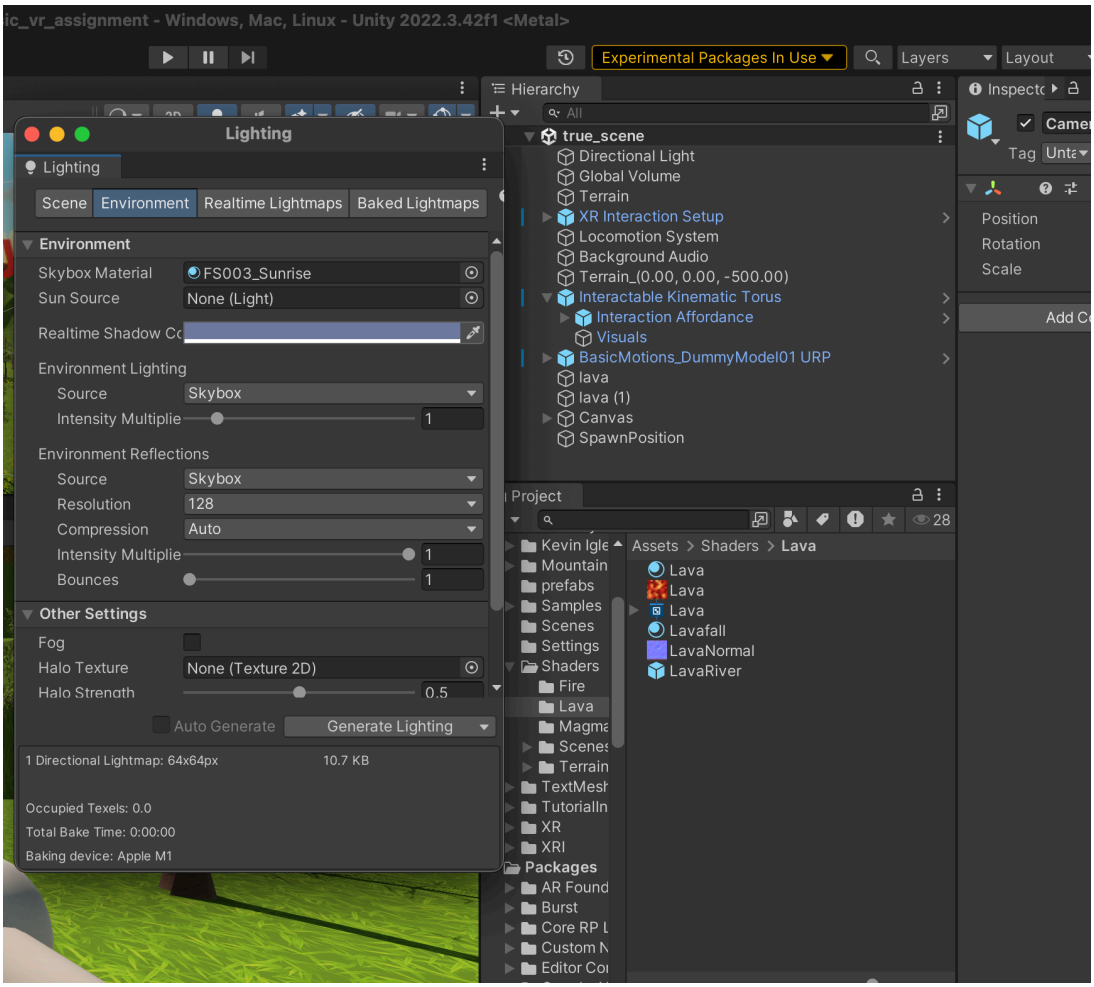


TASK 4 : Configure lighting and shadow

Steps:-

- Added directional light to simulate the sunlight
- Baked lightmaps
- Generated and configured real-time lightmaps

Screenshots:-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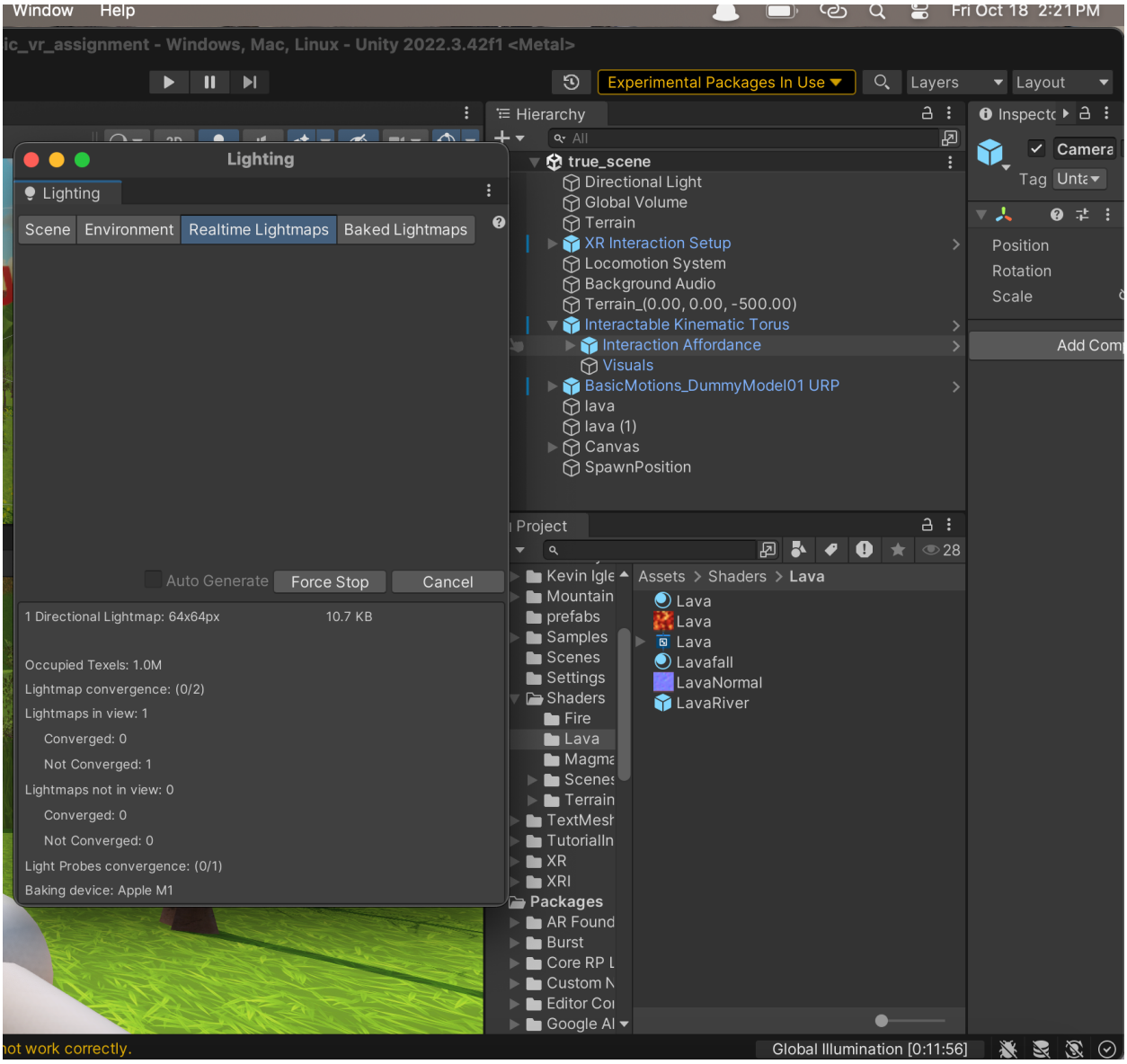
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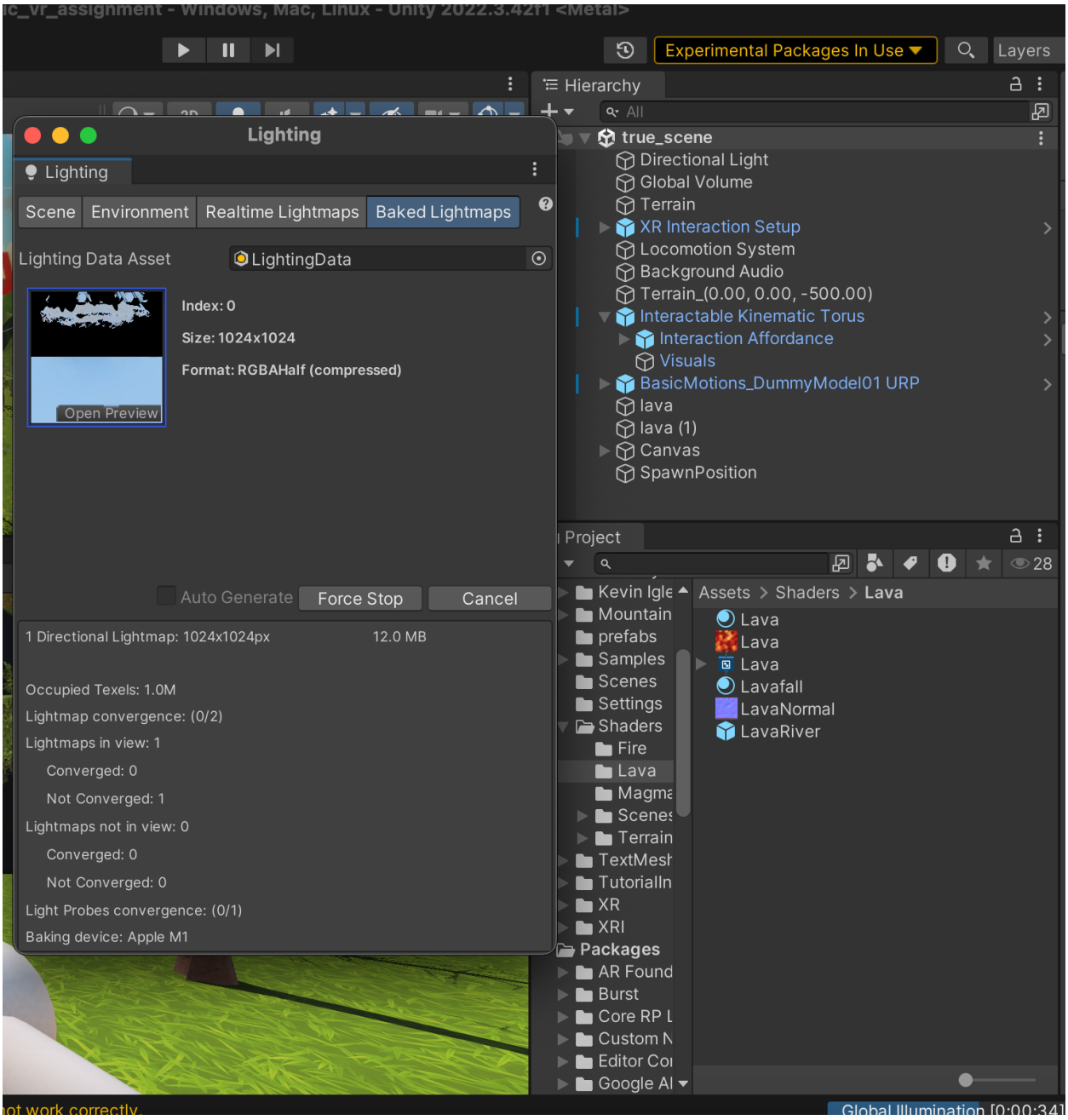
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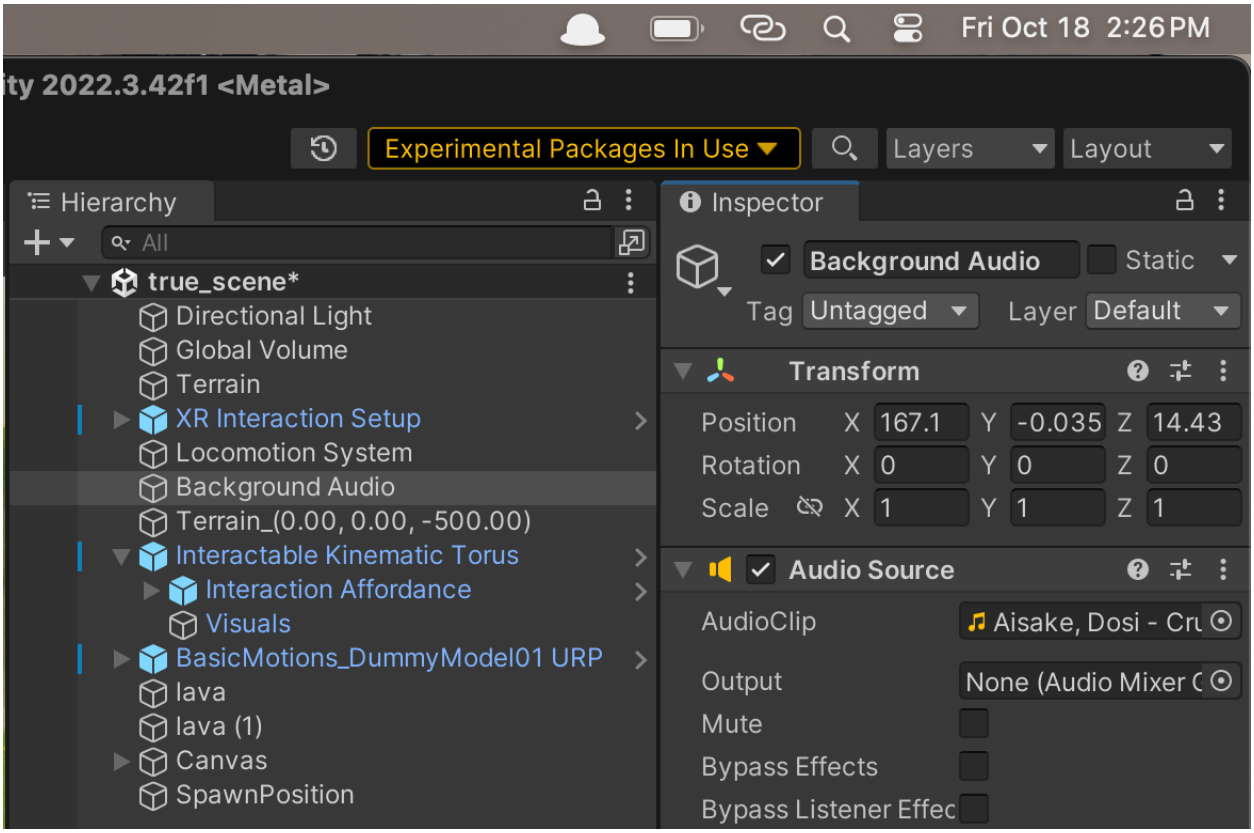
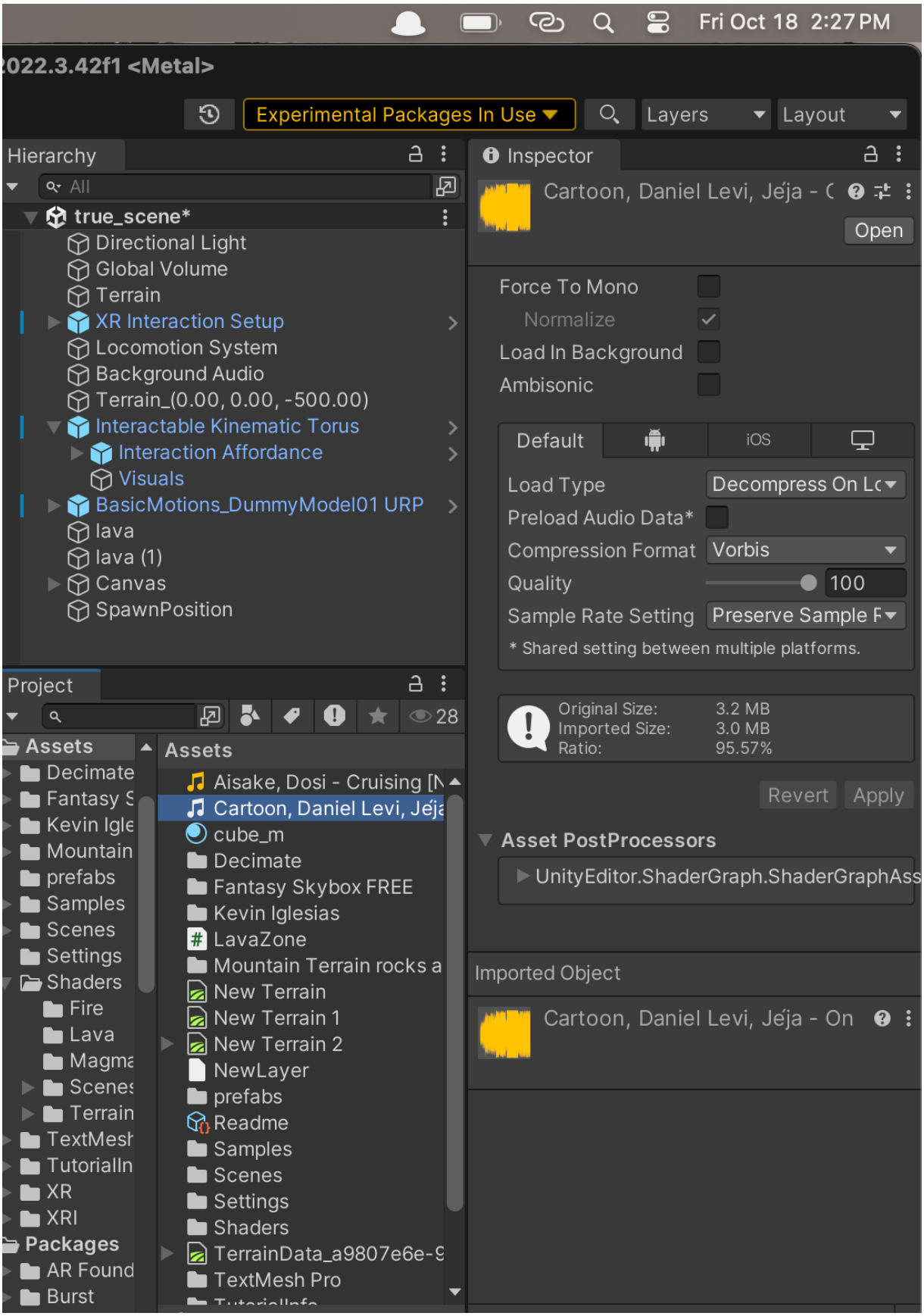
TASK 5 : Add Audio

Steps:-

- Got a NCS (non-copyright sound) from internet
- Created an empty game object name background-music
- Added audio component in that game object and then assigned the audio to the component

Screenshots:-

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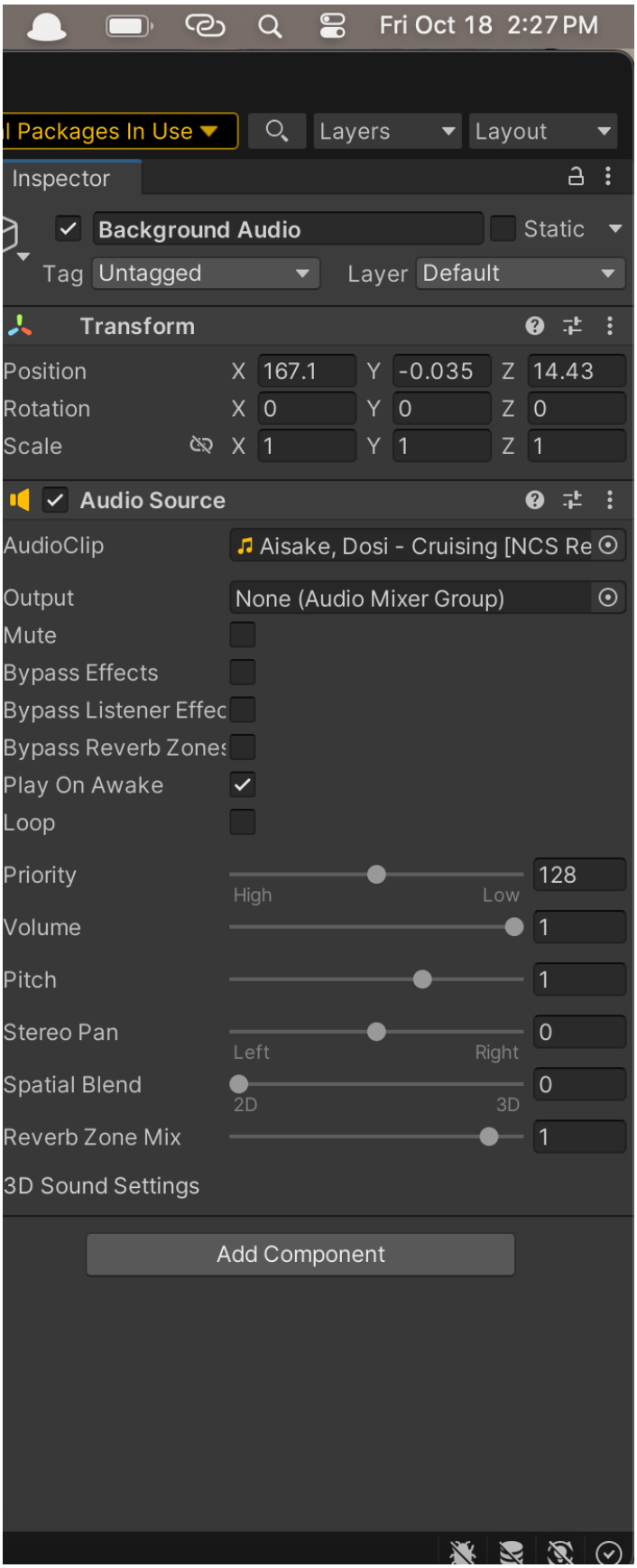
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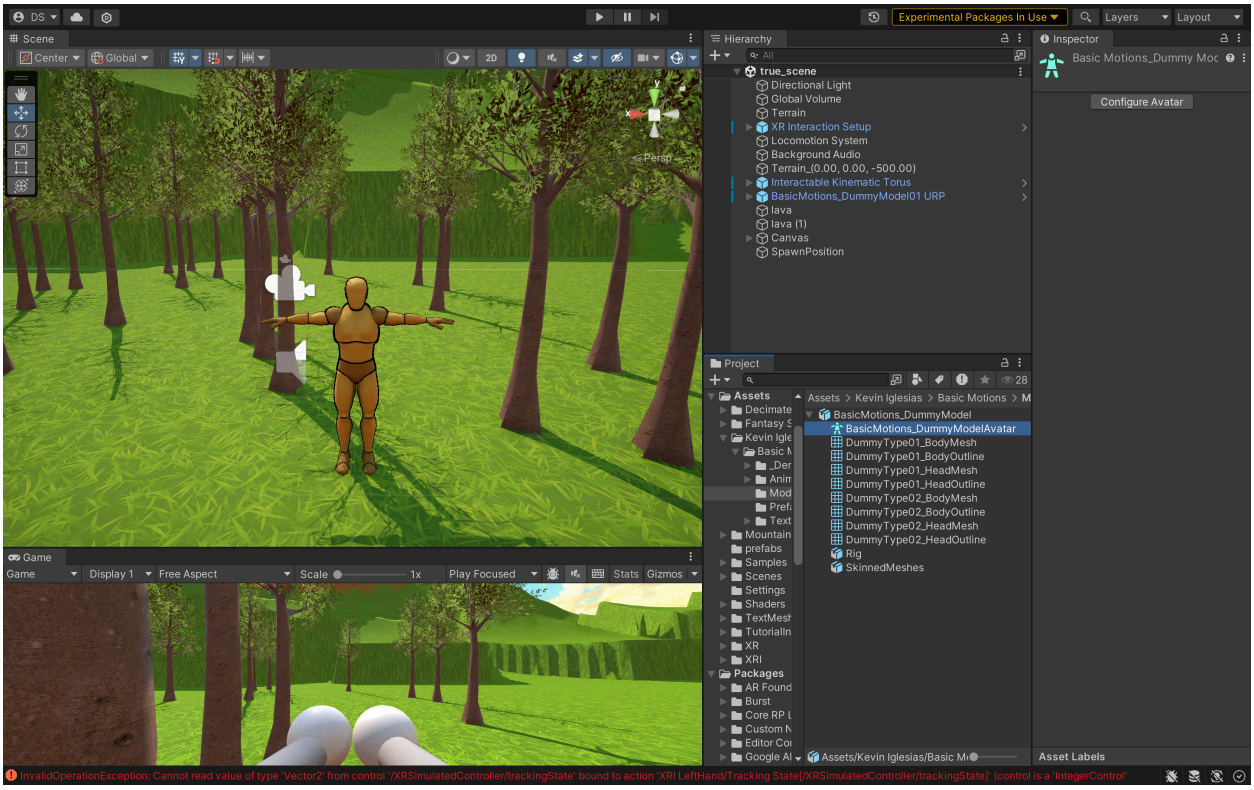
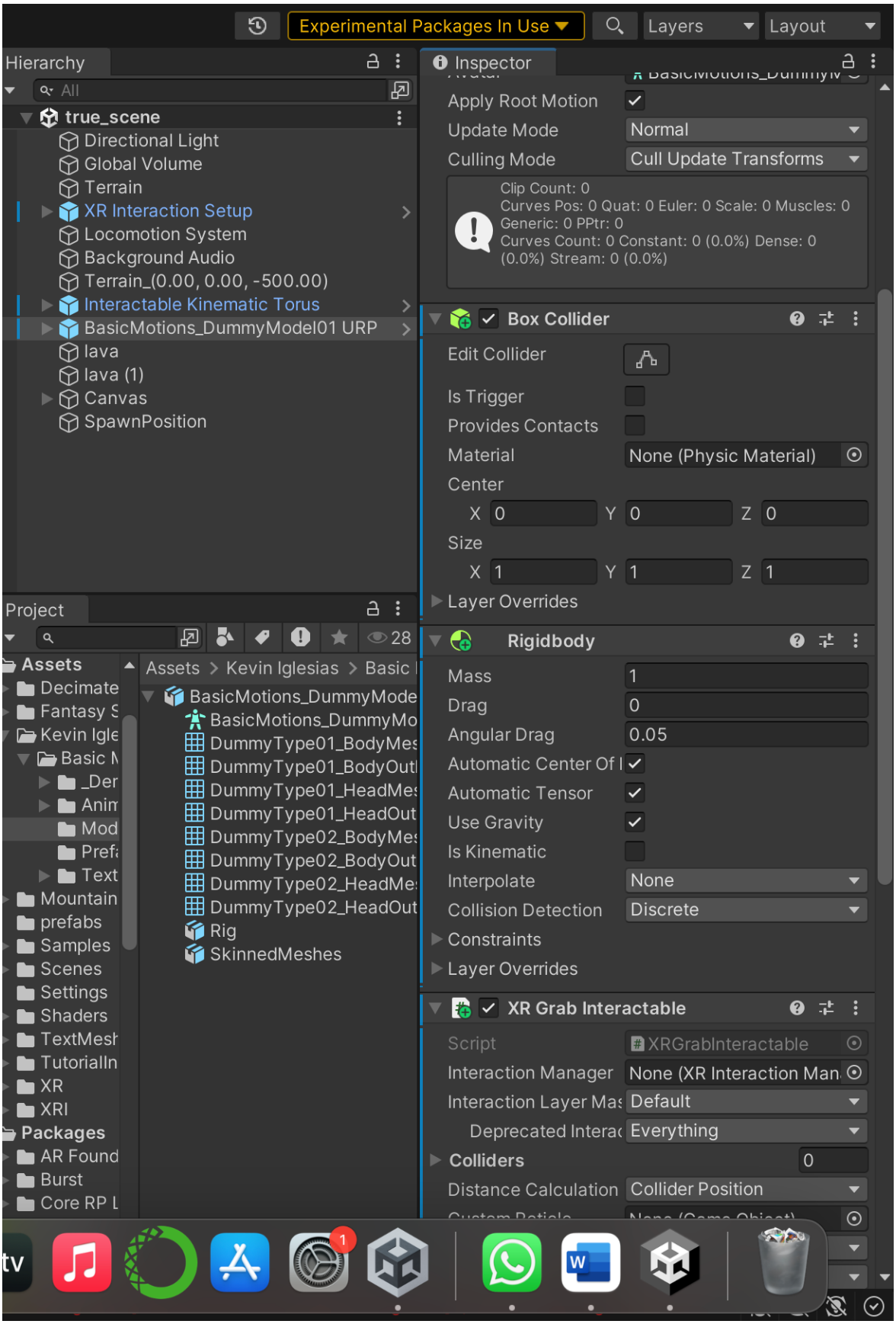
TASK 6 : Implement basic vr interaction

Steps:-

- Configure the grabbable object using xr toolkit's xr grab interactable script.
- Add grabber components to the controllers.
- Importing asset of dummy for free from unity asset store.
- Adding xr grabinteractable component to it.
- Add in the animations on the dummy through animators.
- Configure vr simulator's interaction.

Screenshots:-

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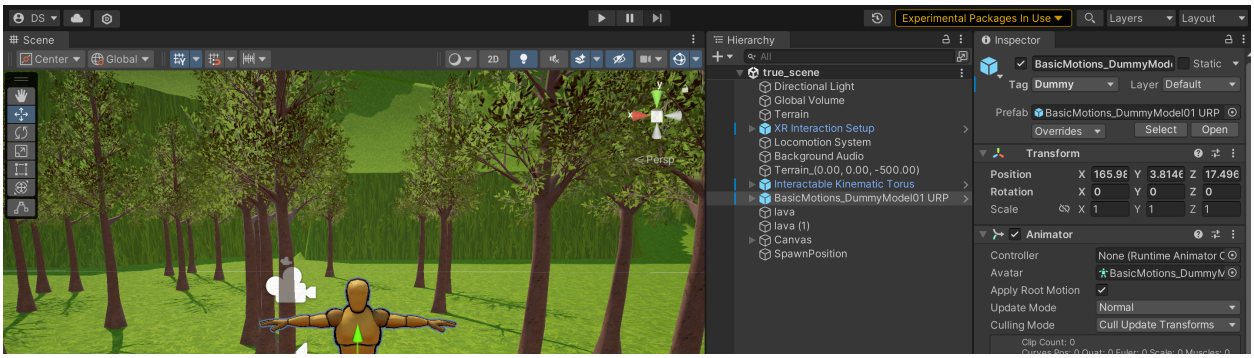
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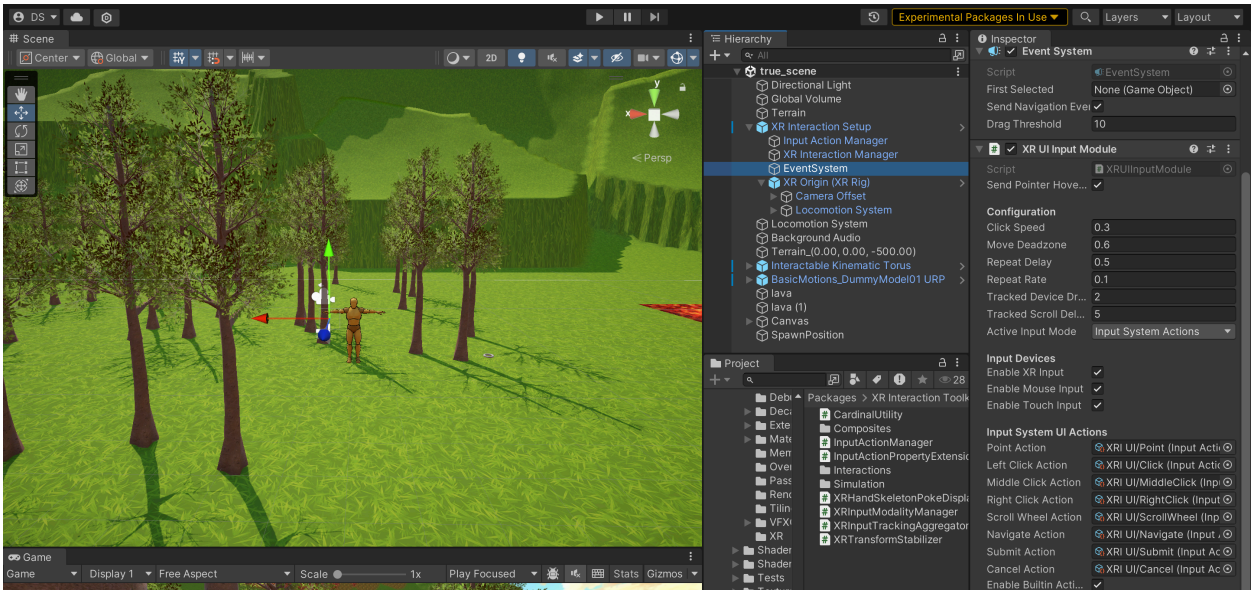
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Enable Mouse Input
Enable Touch Input
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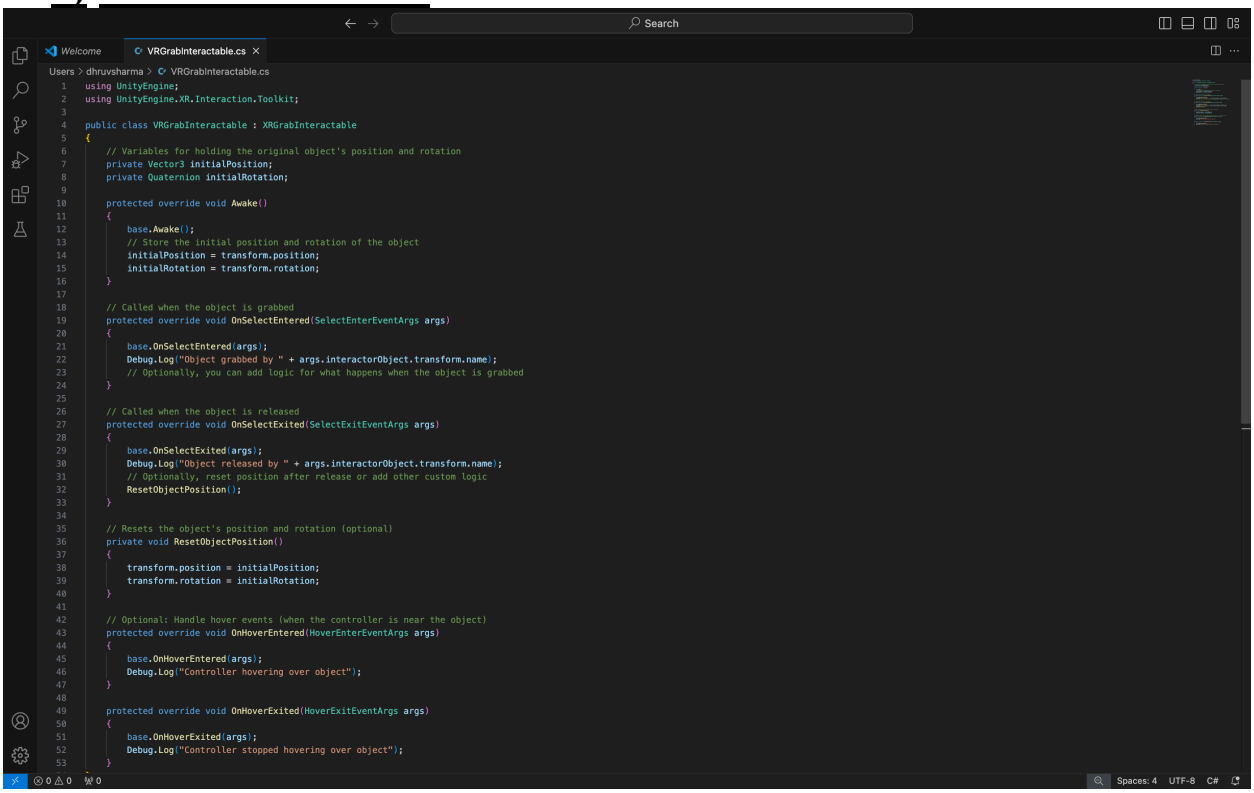
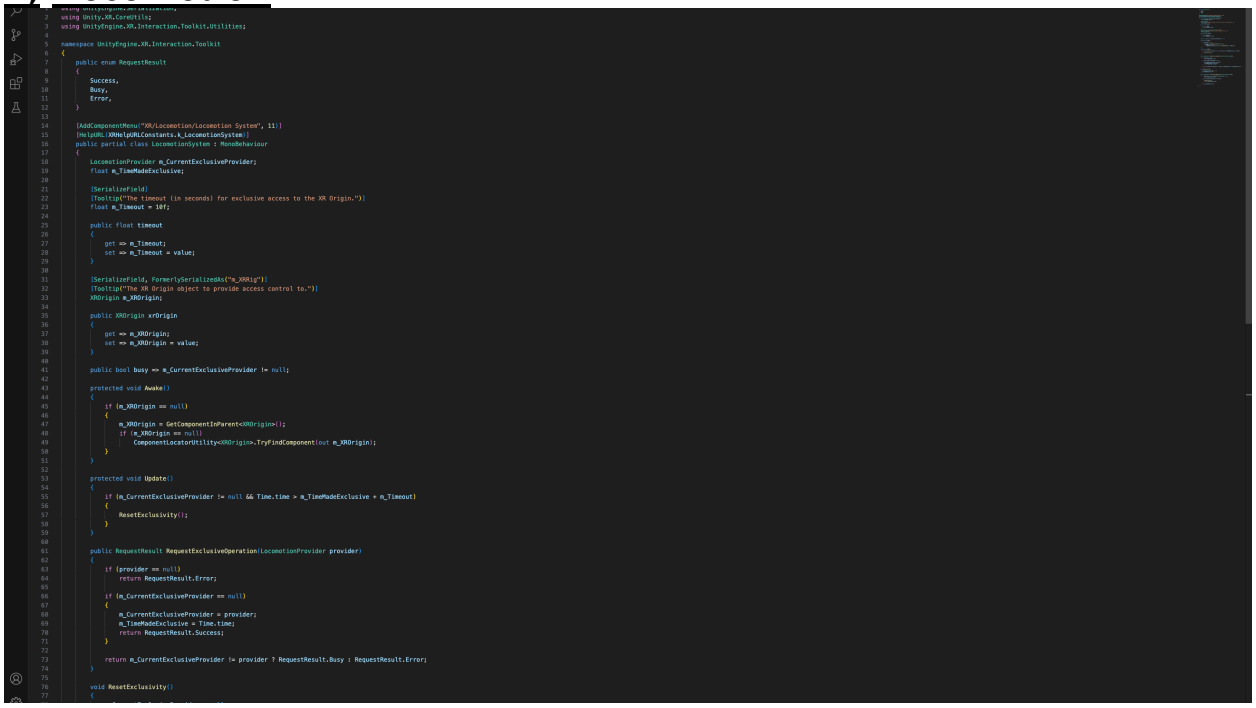
TASK 7 : Write VR interaction script

1) Grab Interactable



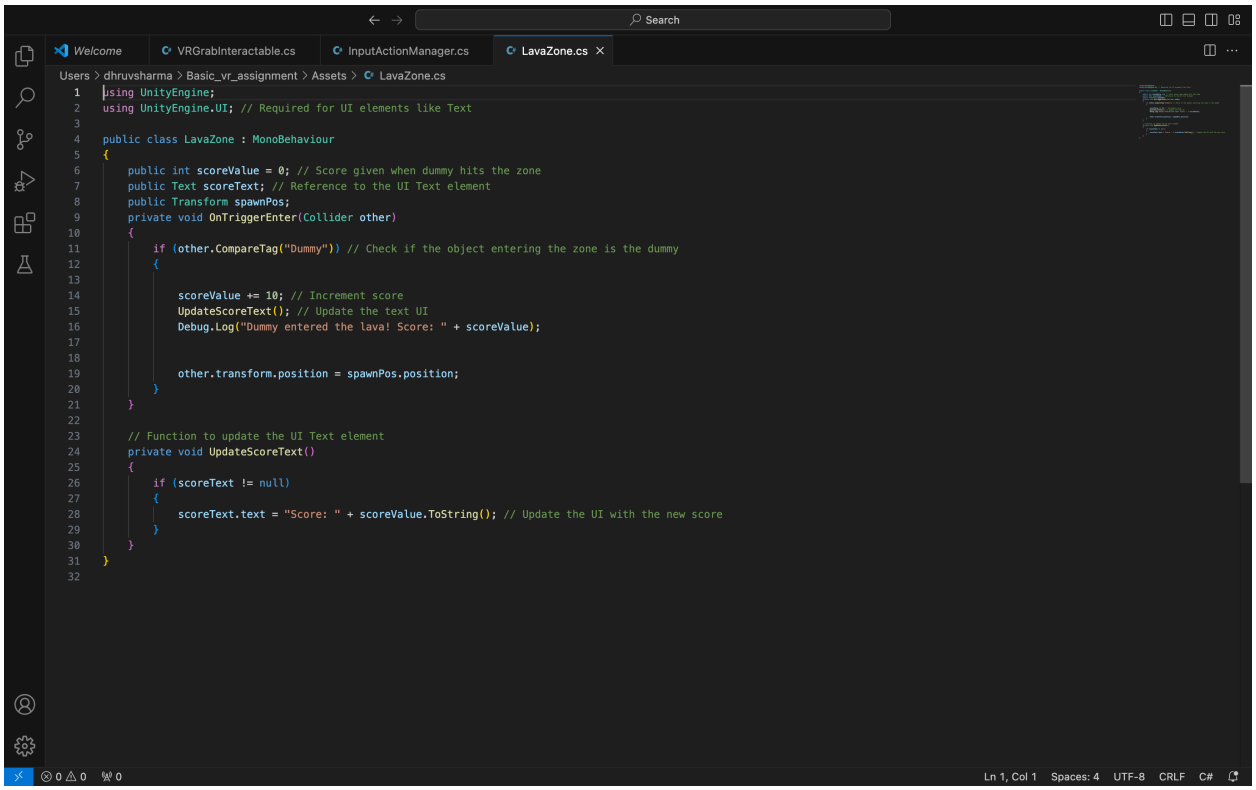
```
using UnityEngine;
using UnityEngine.XR.Interaction.Toolkit;

public class VRGrabInteractable : XRGrabInteractable
{
    // Variables for holding the original object's position and rotation
    private Vector3 initialPosition;
    private Quaternion initialRotation;

    protected override void Awake()
    {
        base.Awake();
        // Store the initial position and rotation of the object
        initialPosition = transform.position;
        initialRotation = transform.rotation;
    }

    // Called when the object is grabbed
    protected override void OnSelectEntered(SelectEnterEventArgs args)
    {
        base.OnSelectEntered(args);
        Debug.Log("Object grabbed by " + args.interactorObject.transform.name);
        // Optionally, you can add logic for what happens when the object is grabbed
    }

    // Called when the object is released
    protected override void OnSelectExited(SelectExitEventArgs args)
    {
        base.OnSelectExited(args);
        Debug.Log("Object released by " + args.interactorObject.transform.name);
        // Optionally, reset position after release or add other custom logic
        ResetObjectPosition();
    }

    // Resets the object's position and rotation (optional)
    private void ResetObjectPosition()
    {
        transform.position = initialPosition;
        transform.rotation = initialRotation;
    }

    // Optional: Handle hover events (when the controller is near the object)
    protected override void OnHoverEntered(HoverEnterEventArgs args)
    {
        base.OnHoverEntered(args);
        Debug.Log("Controller hovering over object");
    }

    protected override void OnHoverExited(HoverExitEventArgs args)
    {
        base.OnHoverExited(args);
        Debug.Log("Controller stopped hovering over object");
    }
}
```

2) Locomotion

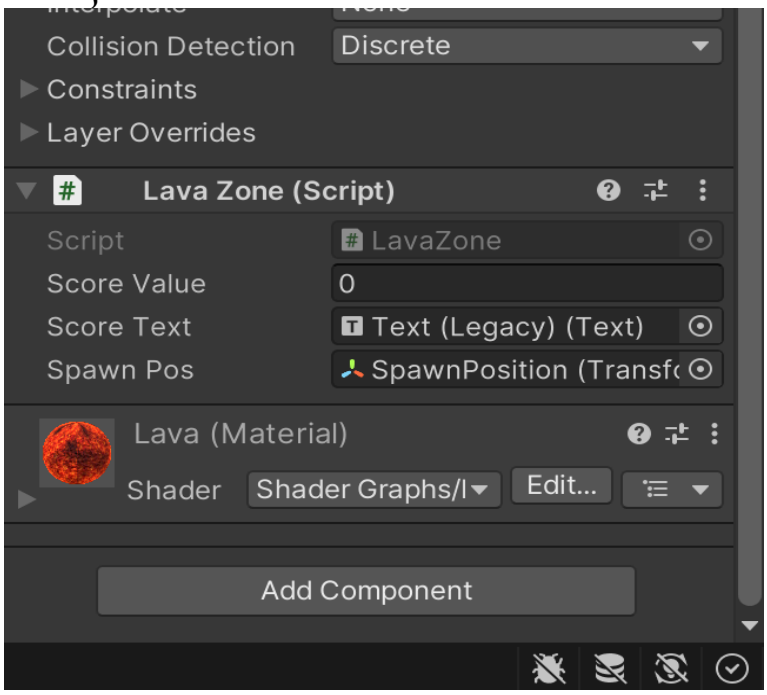


```
using Unity.XR.CoreUtils;
using UnityEngine.XR.Interaction.Toolkit.Utilities;

namespace UnityEngine.XR.Interaction.Toolkit
{
    public enum RequestResult
    {
        Success,
        Busy,
        Error,
    }

    [AddComponentMenu("XR/Locomotion/Locomotion System", 11)]
    [HelpURL(XRHelpURLConstants.k_LocomotionSystem)]
    public partial class LocomotionSystem : MonoBehaviour
    {
        LocomotionProvider m_CurrentExclusiveProvider;
        float m_TimeMadeExclusive;

        [SerializeField]
        [Tooltip("The timeout (in seconds) for exclusive access to the XR Origin.")]
        float m_Timeout = 10f;

        public float timeout
        {
            get => m_Timeout;
            set => m_Timeout = value;
        }

        [SerializeField, FormerlySerializedAs("m_XRRig")]
        [Tooltip("The XR Origin object to provide access control to.")]
        XROrigin m_XROrigin;

        public XROrigin xrOrigin
        {
            get => m_XROrigin;
            set => m_XROrigin = value;
        }

        public bool busy => m_CurrentExclusiveProvider != null;

        protected void Awake()
        {
            if (m_XROrigin == null)
            {
                m_XROrigin = GetComponentInParent<XROrigin>();
                if (m_XROrigin == null)
                    ComponentLocatorUtility<XROrigin>.TryFindComponent(out m_XROrigin);
            }
        }

        protected void Update()
        {
            if (m_CurrentExclusiveProvider != null && Time.time > m_TimeMadeExclusive + m_Timeout)
            {
                ResetExclusivity();
            }
        }

        public RequestResult RequestExclusiveOperation(LocomotionProvider provider)
        {
            if (provider == null)
                return RequestResult.Error;

            if (m_CurrentExclusiveProvider == null)
            {
                m_CurrentExclusiveProvider = provider;
                m_TimeMadeExclusive = Time.time;
                return RequestResult.Success;
            }

            return m_CurrentExclusiveProvider != provider ? RequestResult.Busy : RequestResult.Error;
        }

        void ResetExclusivity()
        {
```

3) Re-spawnner and counter [LAVAZONE]



{This particular script consists of both respawn at the same location and increment on the counter when the dummy is disposed in the lava.}



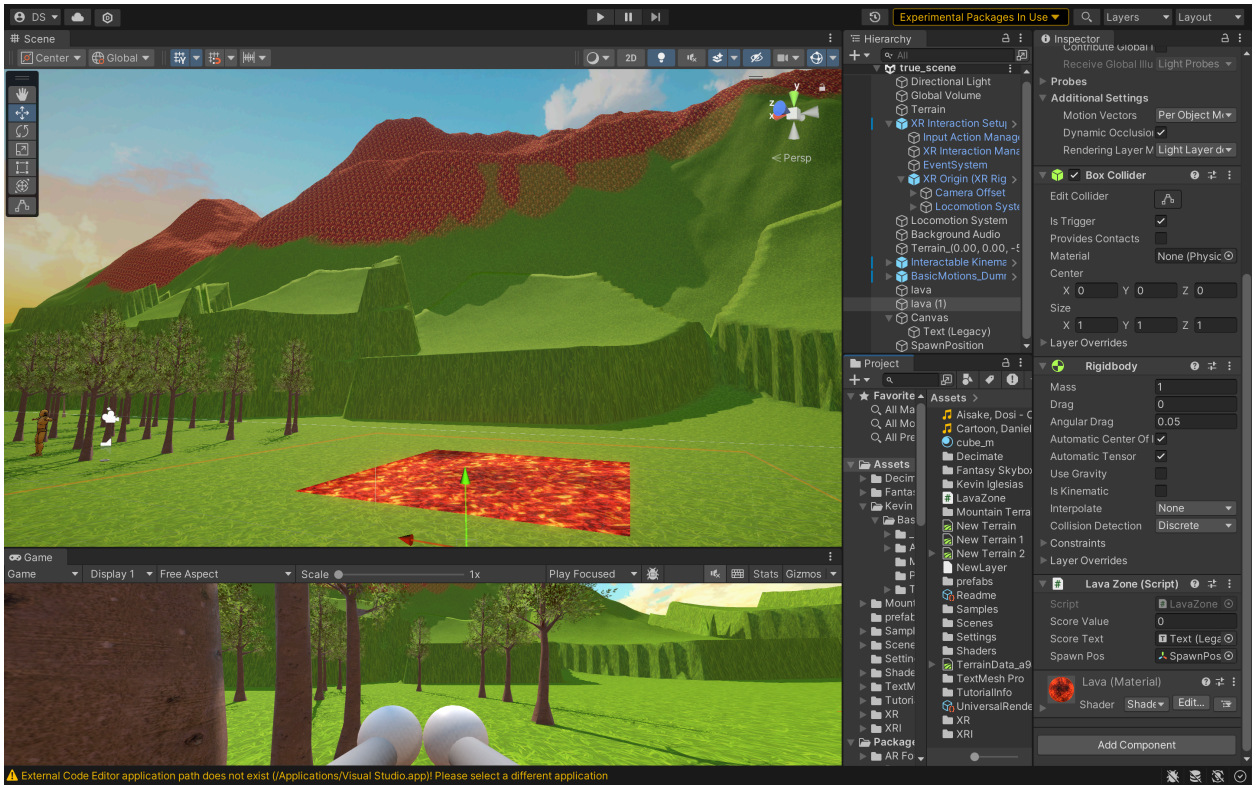
TASK 8 : Create a scoring mechanism

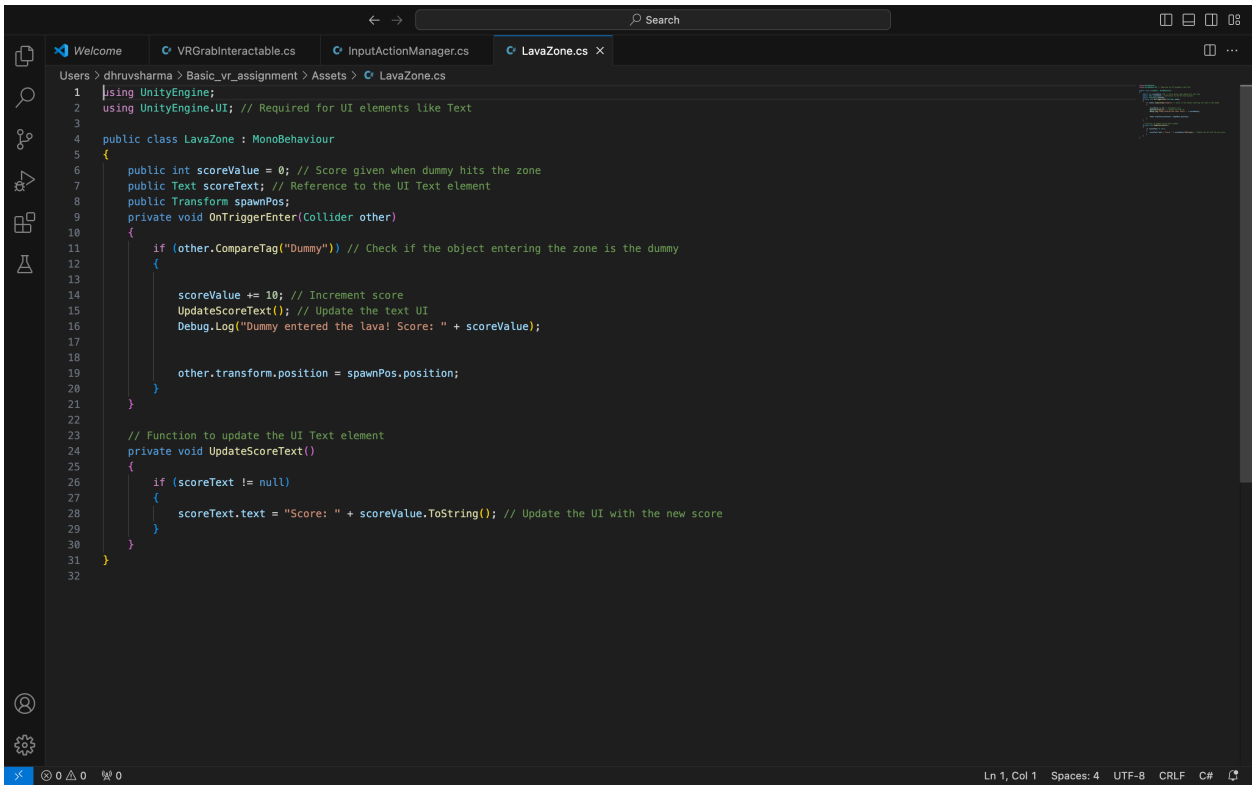
Created a scoring mechanism where when a player grabs the grabbable dummy and throws it through the lava pit the score increments by 10.

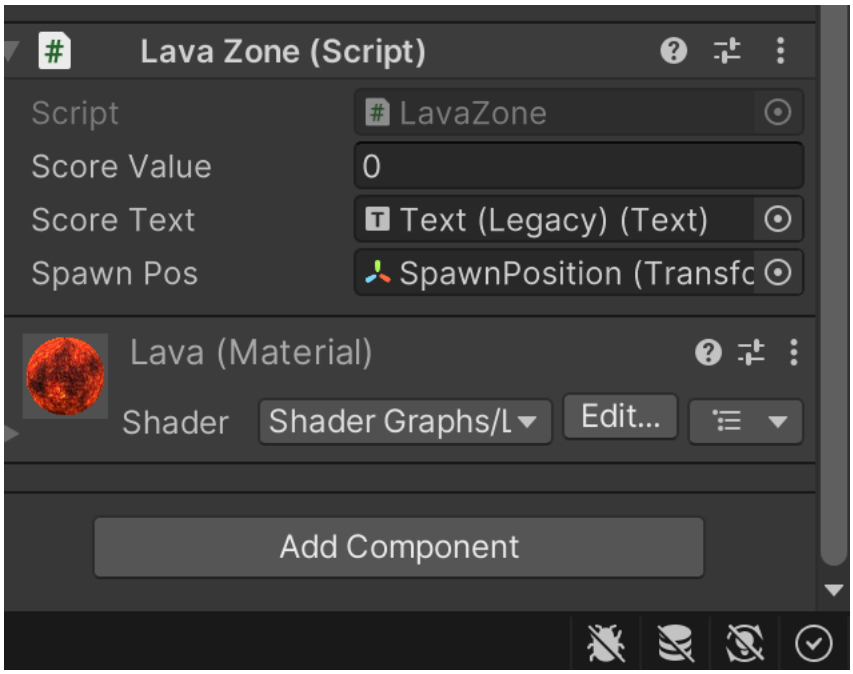
Steps :-

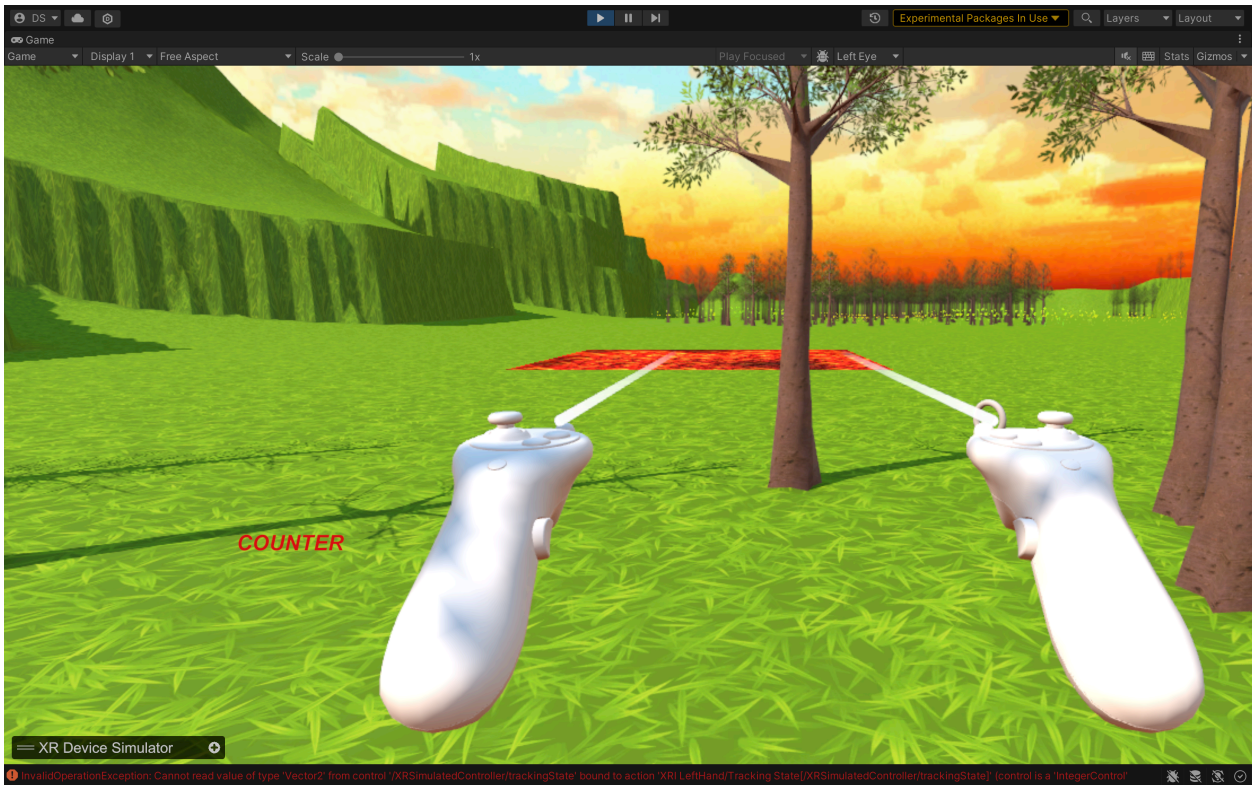
- Create a lava pit by erasing some terrain blocks and replacing them with a lava block.
- Keep the box to on trigger and keep the lava passable.
- Adding the script LavaZone as assign the prefabs to the variables created in the script for them.
- Detect the dummy passing through with help of OnTriggre event.
- Display the score to the player using legacy text and add this text to the variable position in the script LavaZone.

Screenshots:-




Search
Welcome
VRGrabInteractable.cs
InputActionManager.cs
LavaZone.cs
Users > dhruvsharma > Basic_vr_assignment > Assets > LavaZone.cs
using UnityEngine;
using UnityEngine.UI; // Required for UI elements like Text
public class LavaZone : MonoBehaviour
{
public int scoreValue = 0; // Score given when dummy hits the zone
public Text scoreText; // Reference to the UI Text element
public Transform spawnPos;
private void OnTriggerEnter(Collider other)
{
if (other.CompareTag("Dummy")) // Check if the object entering the zone is the dummy
{
scoreValue += 10; // Increment score
UpdateScoreText(); // Update the text UI
Debug.Log("Dummy entered the lava! Score: " + scoreValue);
other.transform.position = spawnPos.position;
}
}
// Function to update the UI Text element
private void UpdateScoreText()
{
if (scoreText != null)
{
scoreText.text = "Score: " + scoreValue.ToString(); // Update the UI with the new score
}
}
}
Ln 1, Col 1
Spaces: 4
UTF-8
CRLF
C#


Lava Zone (Script)
Script
LavaZone
Score Value
0
Score Text
Text (Legacy) (Text)
Spawn Pos
SpawnPosition (Transfc
Lava (Material)
Shader
Shader Graphs/L
Edit...
Add Component


Experimental Packages In Use
Layers
Layout
Game
Display 1
Free Aspect
Scale
1x
Play Focused
Left Eye
Stats
Gizmos
COUNTER
XR Device Simulator
InvalidOperationException: Cannot read value of type 'Vector2' from control '/XRSimulatedController/trackingState' bound to action 'XRI LeftHand/Tracking State[/XRSimulatedController/trackingState]' (control is a 'IntegerControl'


Experimental Packages In Use
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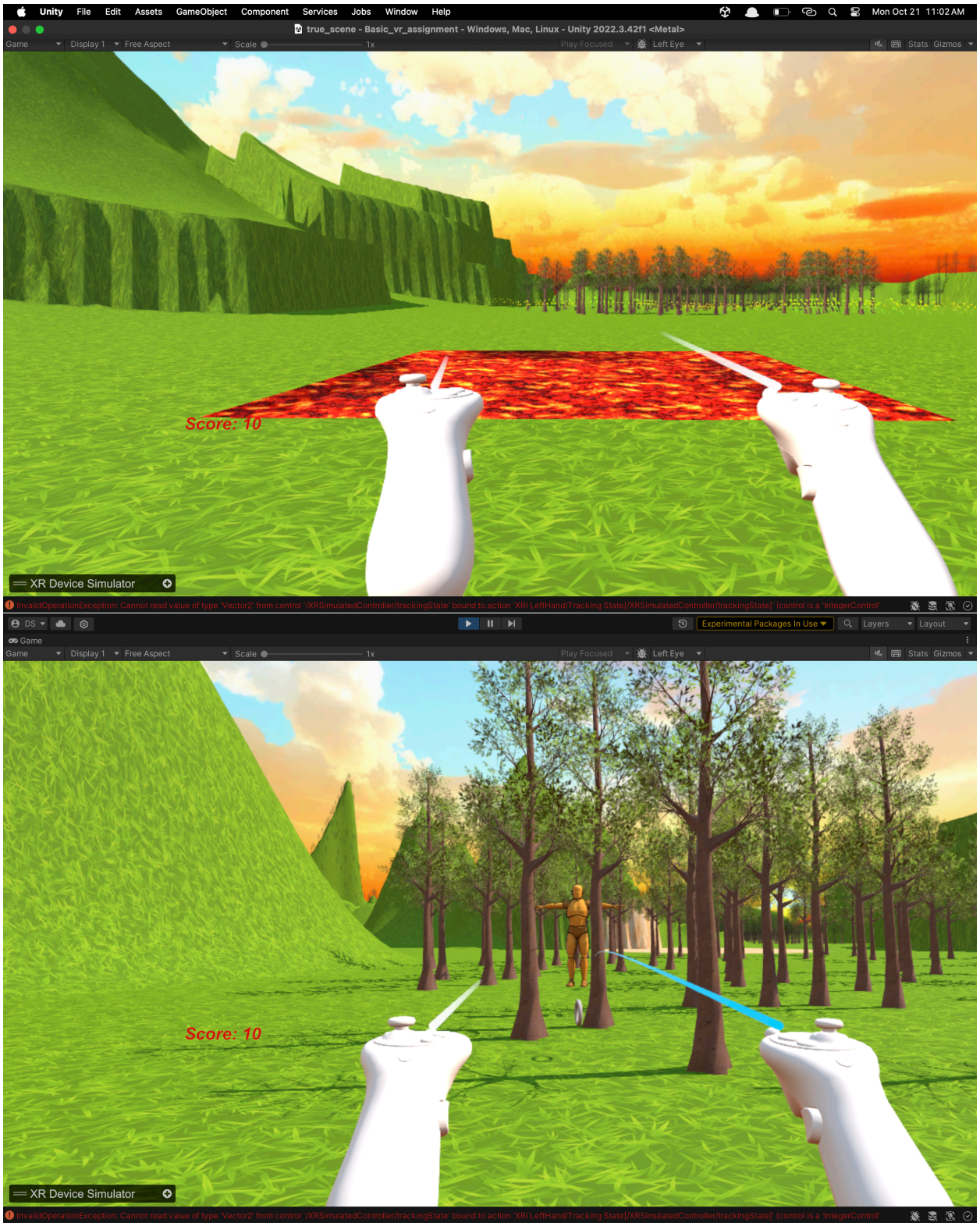
Unity File Edit Assets GameObject Component Services Jobs Window Help
Mon Oct 21 11:02 AM
true_scene - Basic_vr_assignment - Windows, Mac, Linux - Unity 2022.3.42f1 <Metal>
Game Display 1 Free Aspect Scale 1x Play Focused Left Eye Stats Gizmos
Score: 10
XR Device Simulator
InvalidOperationException: Cannot read value of type 'Vector2' from control '/XRSimulatedController/trackingState' bound to action 'XRI LeftHand/Tracking State[/XRSimulatedController/trackingState]' (control is a 'IntegerControl'
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