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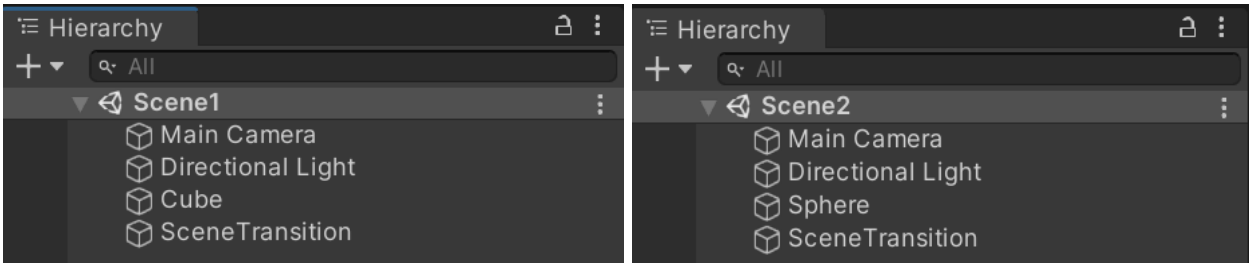
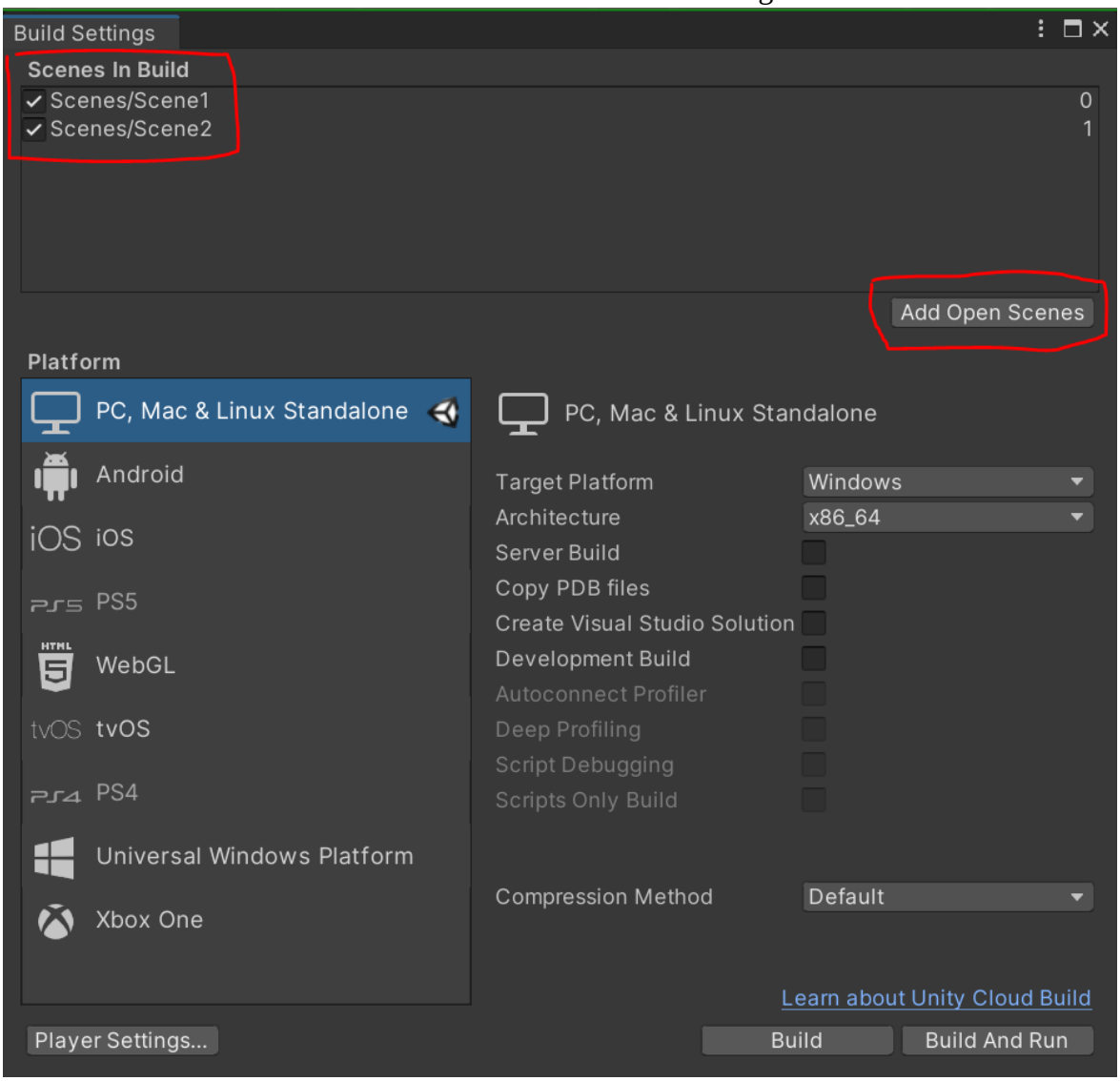
e. A button makes a scene transition (so you should make at least 2 scene)

Create two scenes with the following hierarchy:

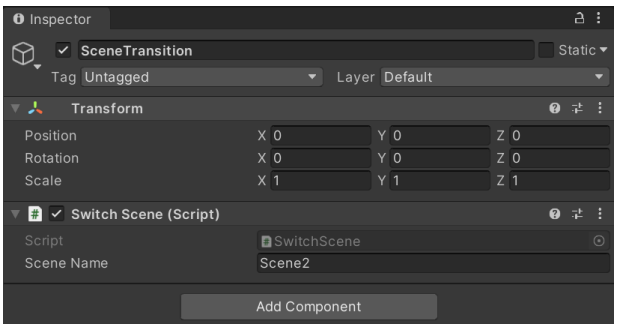


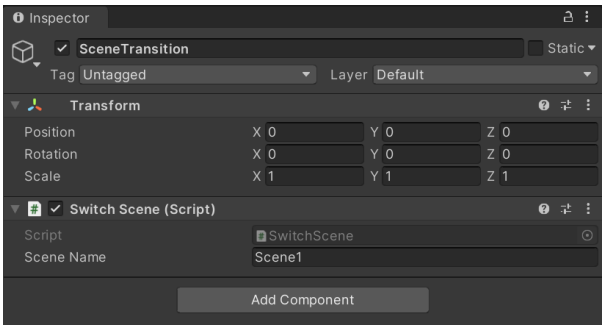
Make sure to add the scenes to the build in File > Build Settings



The SceneTransition objects have the SwitchScene component, with the following script:

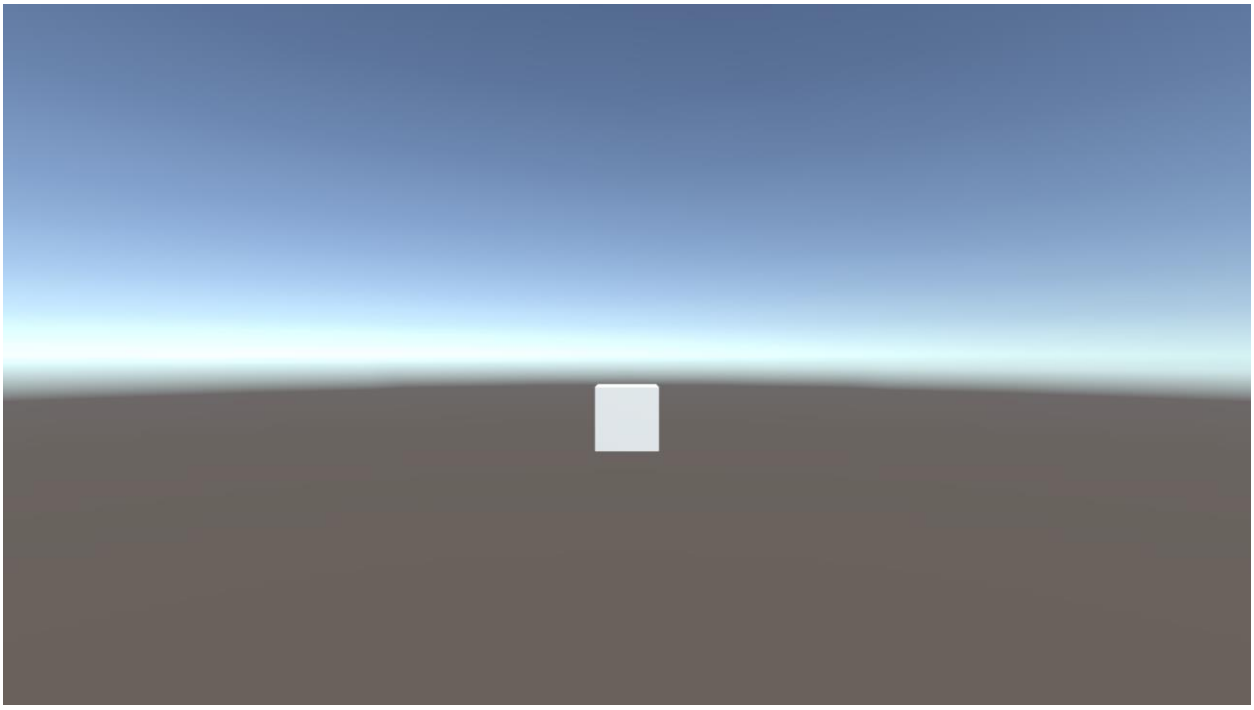
```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.SceneManagement;

public class SwitchScene : MonoBehaviour
{
    public string sceneName;

    // Start is called before the first frame update
    void Start()
    {

    }

    // Update is called once per frame
    void Update()
    {
        if (Input.GetKeyDown("space"))
        {
            SceneManager.LoadScene(sceneName, LoadSceneMode.Single);
        }
    }
}
```

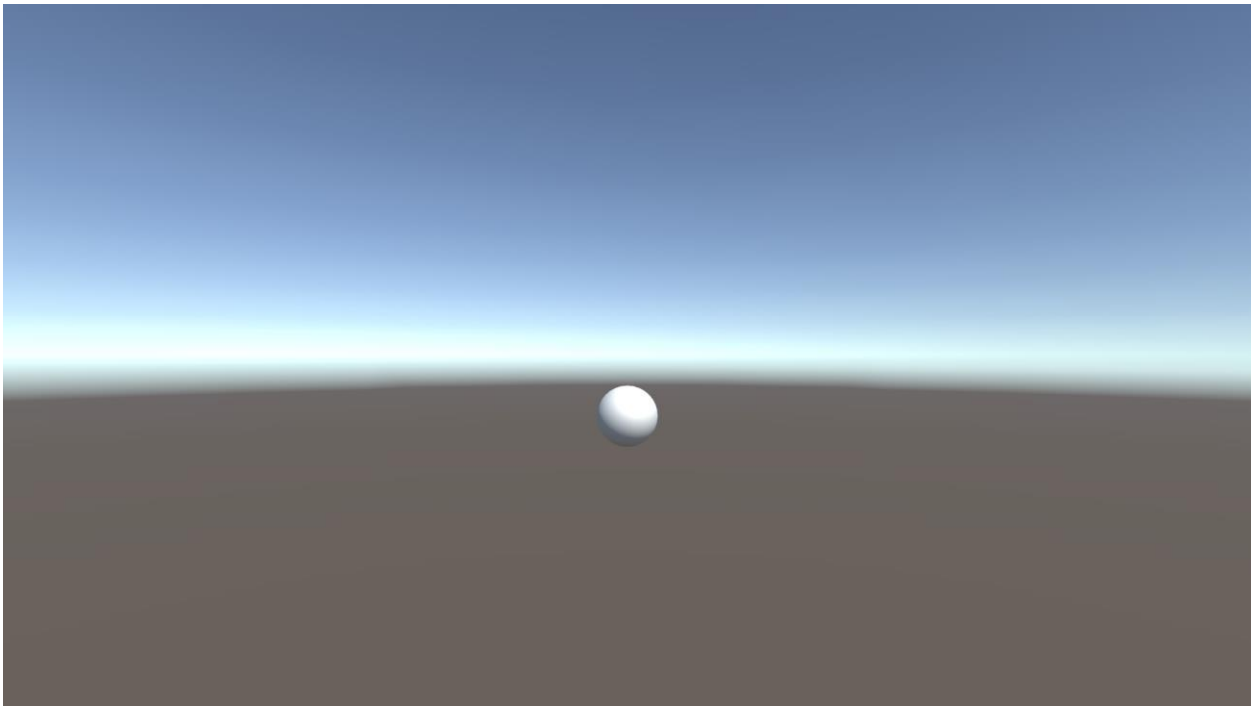




When the spacebar is pressed, the scene with the name provided in the Scene Name field will be loaded. After clicking Play, pressing spacebar will toggle the cube and sphere scenes.

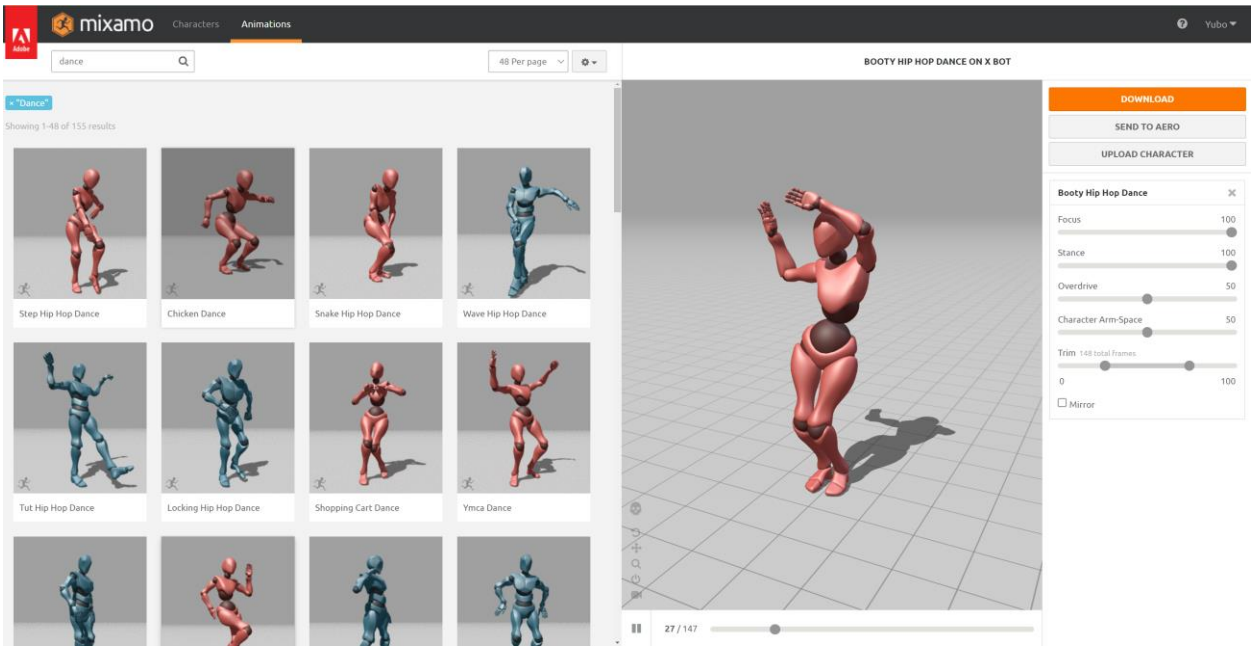
Result:



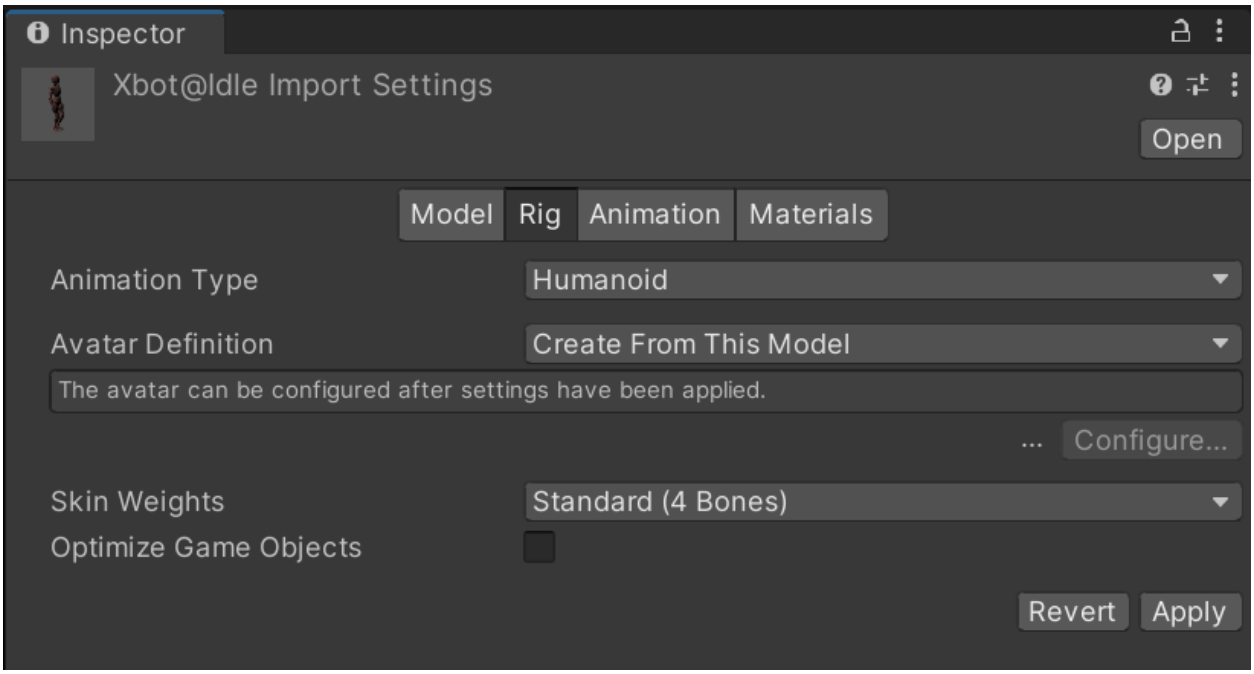


f. A button activates simple character animation

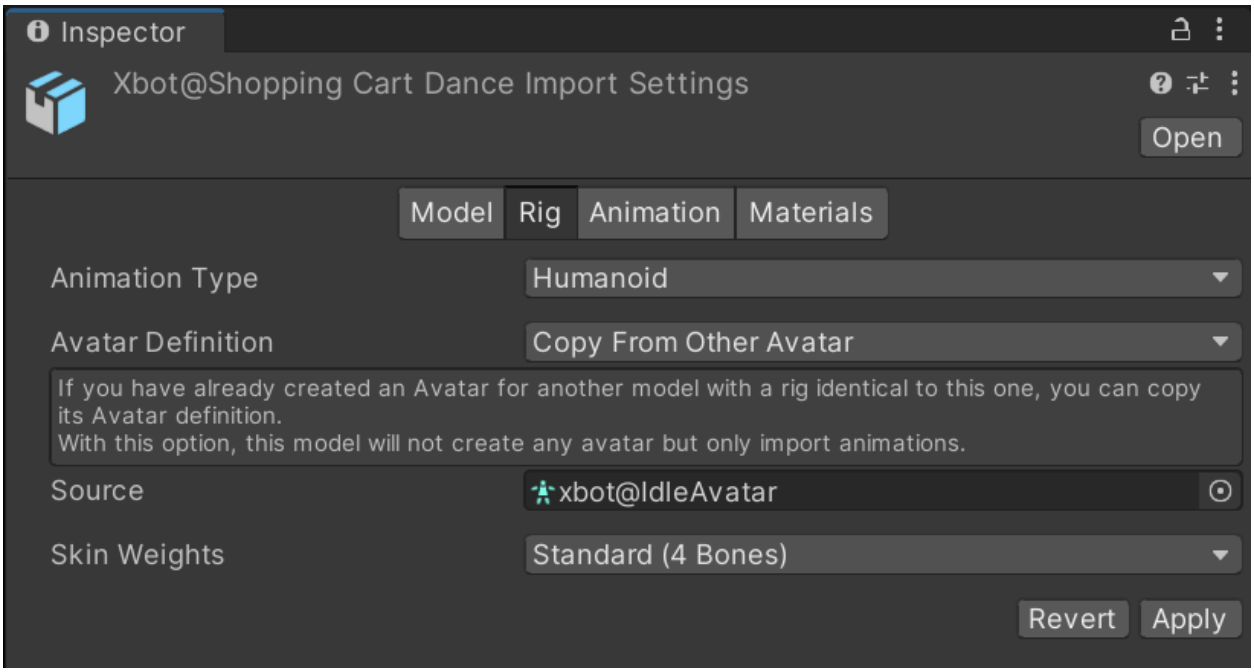
Download a character along with a few animations from Mixamo. I've chosen the Xbot character and the Idle, Shopping Cart Dance, YMCA Dance, and Booty Hip Hop Dance animations.



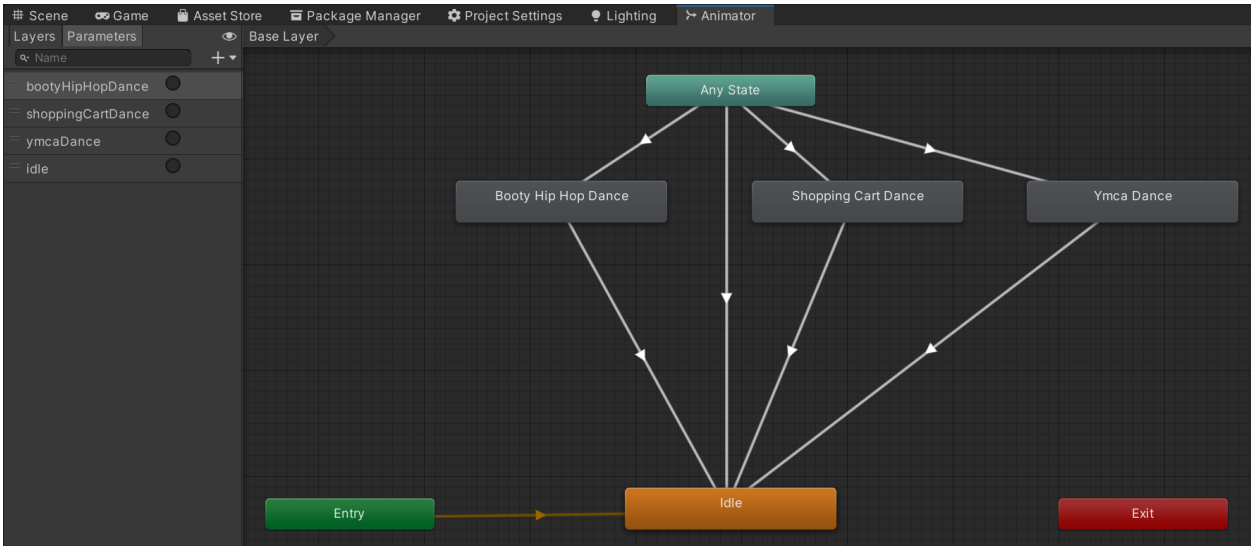
Import the assets to the project and add character to the scene. Click on the character and set the Rig Animation Type to Humanoid.



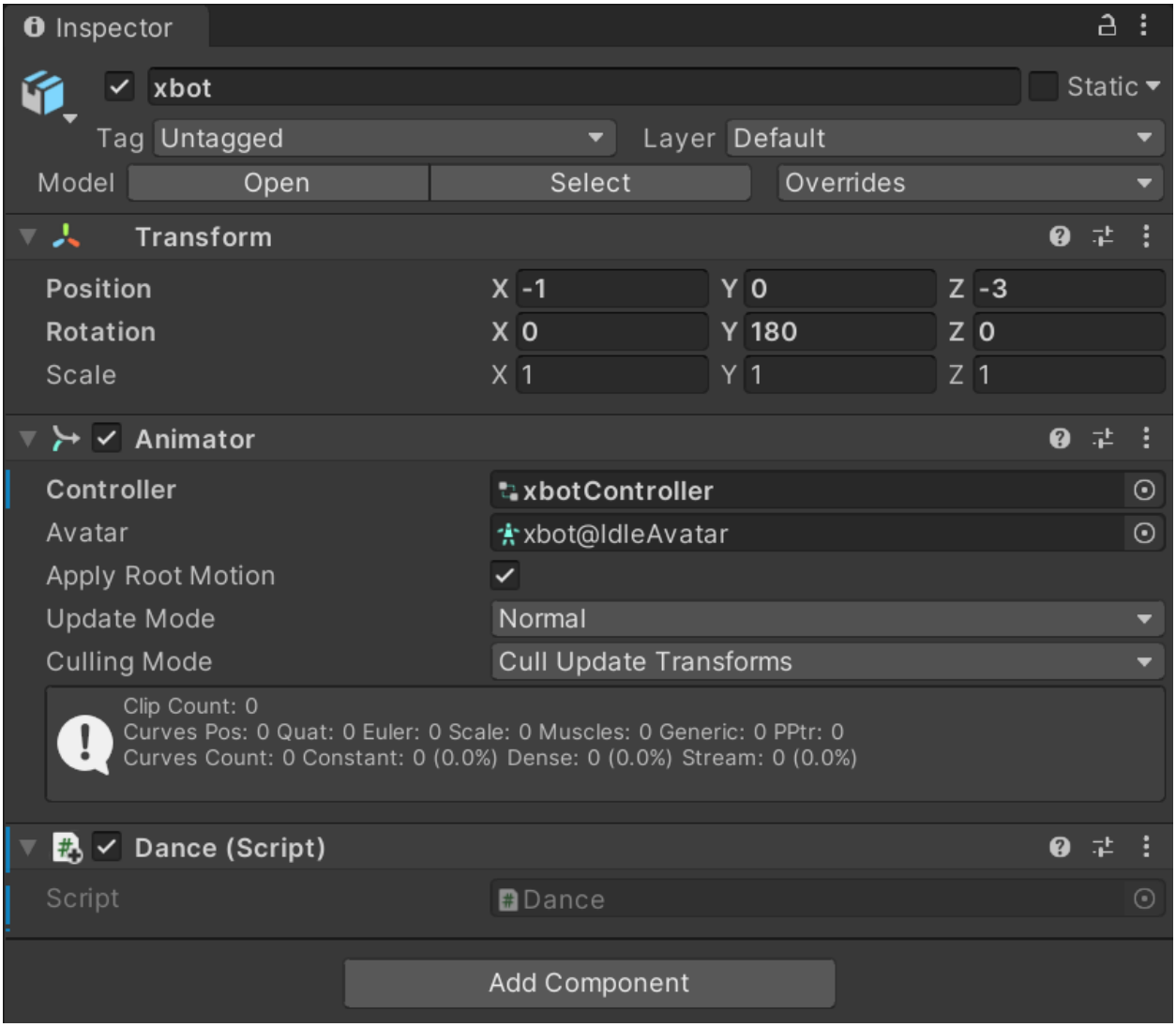
For the animation files, set the also set the Rig Animation Type to Humanoid, but the Avatar Definition to Copy From Other Avatar and select the character for the Source property.



Create am Animatior Controller similar to this:



On the character object, specify the Animator Controller.

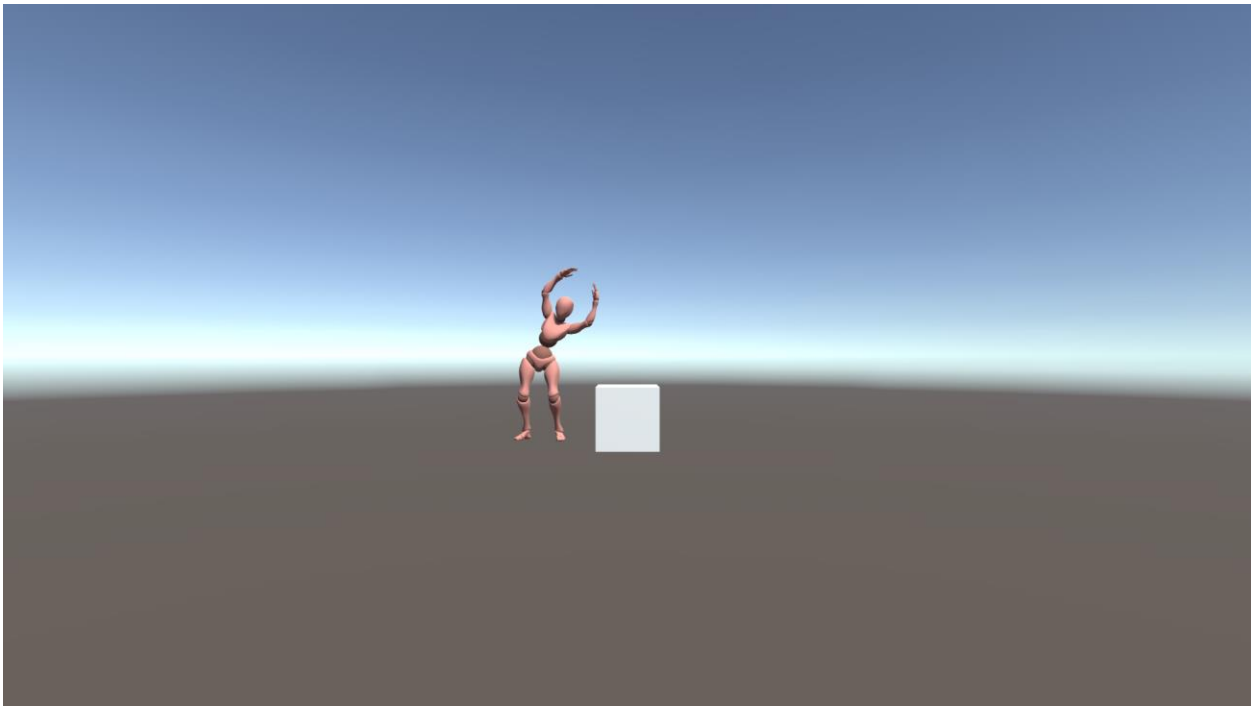


Attach the Dance component with the following script:

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class Dance : MonoBehaviour
{
    private Animator animator;

    // Start is called before the first frame update
    void Start()
    {
        animator = gameObject.GetComponent<Animator>();
    }

    // Update is called once per frame
    void Update()
    {
        if (Input.GetKey(KeyCode.DownArrow))
        {
            animator.SetTrigger("idle");
        }
        else if (Input.GetKey(KeyCode.LeftArrow))
        {
            animator.SetTrigger("bootyHipHopDance");
        }
        else if (Input.GetKey(KeyCode.UpArrow))
        {
            animator.SetTrigger("ymcaDance");
        }
        else if (Input.GetKey(KeyCode.RightArrow))
        {
            animator.SetTrigger("shoppingCartDance");
        }
    }
}
```

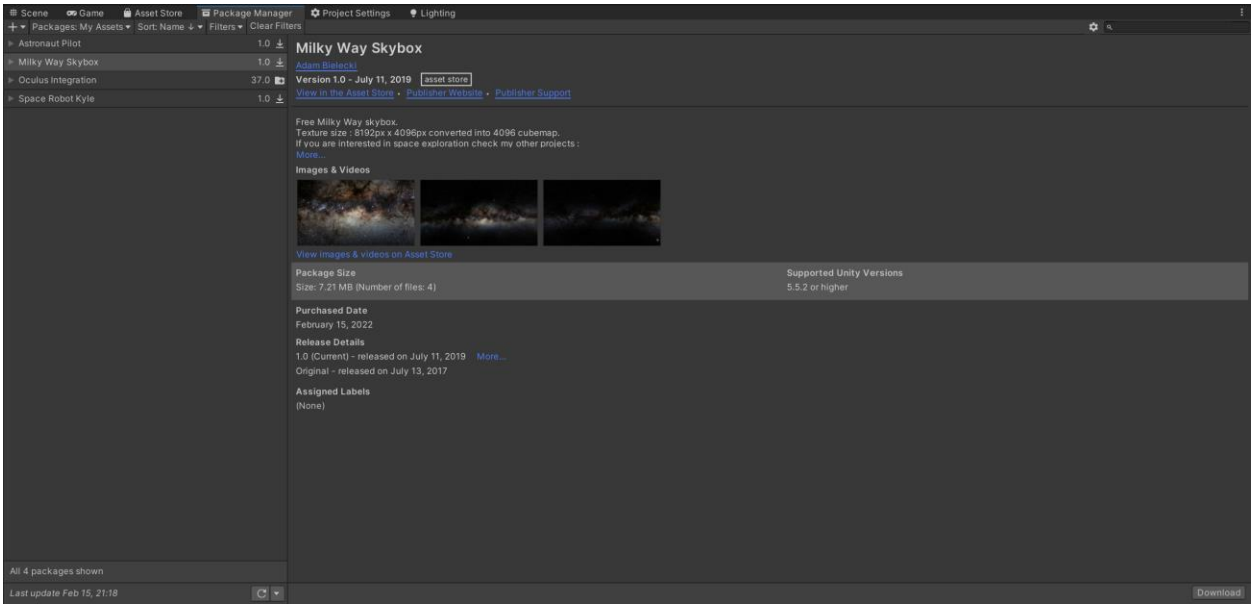
During the update, arrow key press will trigger a transition in the Animator Controller to play the specified animations.

Result:



g. A button changes shading effect (day to night scene or something else)

Add the Milky Way Skybox asset. Open it in Unity, download, and import it.

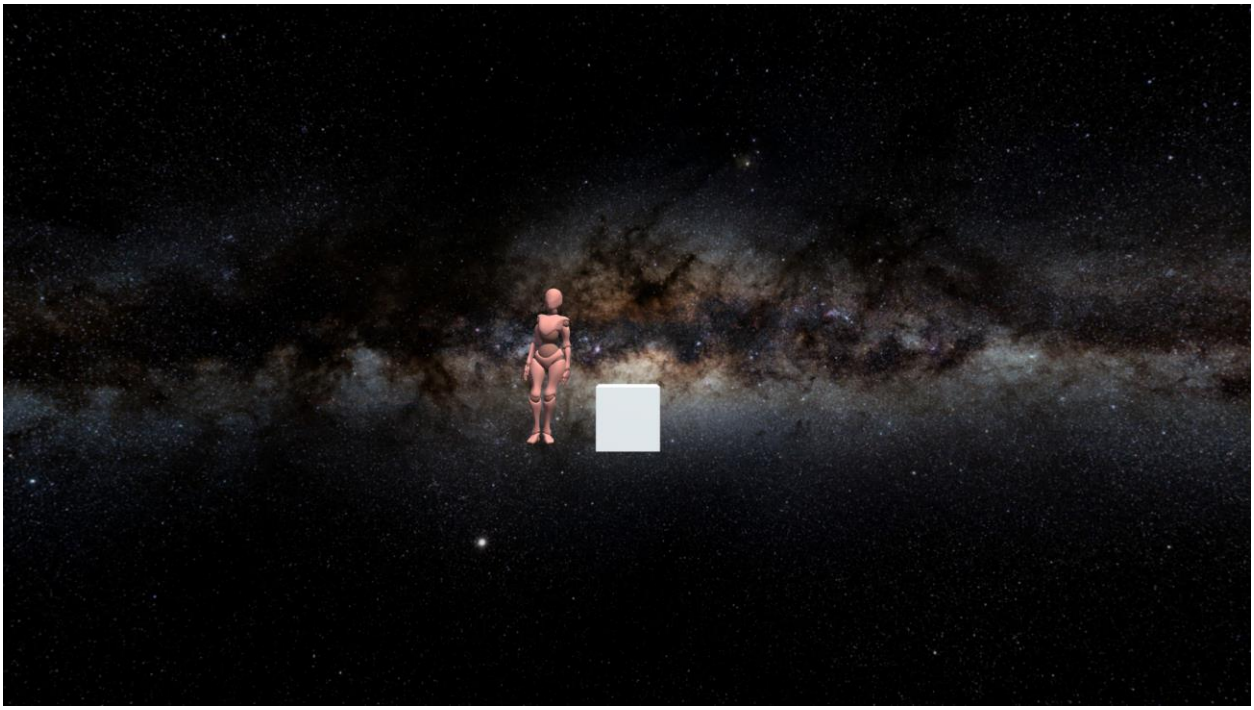


There is now a MilkyWay folder in Assets. Place this folder in another folder named Resources, since the code will rely on this directory. Attach the Change Skybox component to an object with the following script:

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class ChangeSkybox : MonoBehaviour
{
    private Material defaultSkybox;
    private Material milkywaySkybox;

    // Start is called before the first frame update
    void Start()
    {
        defaultSkybox = RenderSettings.skybox;
        milkywaySkybox = Resources.Load("MilkyWay/Material/MilkyWay", typeof(Material)) as Material;
    }

    // Update is called once per frame
    void Update()
    {
        if (Input.GetKeyDown("return"))
        {
            if(RenderSettings.skybox.name == "Default-Skybox")
            {
                RenderSettings.skybox = milkywaySkybox;
            }
            else
            {
                RenderSettings.skybox = defaultSkybox;
            }
        }
    }
}
```

During each update, pressing the return key will cause the rendered to toggle between the default and the Milky Way skybox.

Result:



h. Mouse click picks up an object or creates (instantiates) an object in a scene

Attach to the cube and sphere a Mouse Drag component with the following script:

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class MouseDrag : MonoBehaviour
{
    private Camera cam;
    private bool drag;

    // Start is called before the first frame update
    void Start()
    {
        cam = Camera.main;
        drag = false;
    }

    // Update is called once per frame
    void Update()
    {
        if (drag) {
            Vector3 screenCoord = Input.mousePosition;
            float camDist = this.transform.position.z - cam.transform.position.z;
            Vector3 worldCoord = cam.ScreenToWorldPoint(new Vector3(screenCoord.x, screenCoord.y, camDist));
            this.transform.position = worldCoord;
        }
    }

    void OnMouseDown()
    {
        drag = true;
    }

    void OnMouseUp()
    {
        drag = false;
    }
}
```

By holding LMB on the object, the drag property will be true. During the update, the mouse screen coordinates are converted into world coordinates, and the object's position is set accordingly. Note that this only works for a stationary camera perspective with image plane orthogonal to the Z-axis. In the case of a moving camera, axis rotation needs to be accounted for.

Result: