Unity Advanced 3D Tutorial

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1. 👋 Intro

This is a **advanced 3D tutorial**. Hopefully you have seem my previous Unity 3D tutorial or are fairly familiar with Unity 3D because I am assuming you are aware of familiar Unity 3D concepts. In addition I will start in a project that has implemented the things in Unity 3D tutorial. The aim of this tutorial is to show the lesser known things in Unity but can be quite useful to know or implement. This tutorial will implement a horror game with a 2D game embed inside the 3D game.

If you want to follow along, clone from the repo at the start tag to get the beginning of the project, or skip to whichever selection you want by cloning at the corresponding tag. There you will find a simple project with movement and a scene as shown below

You can start it off and play with it at the start to get a feel of the scene.

* Note, the lighting is set up right now so you can see the how scene is and can navigate is easily, but the final version will revert back to a darker mood

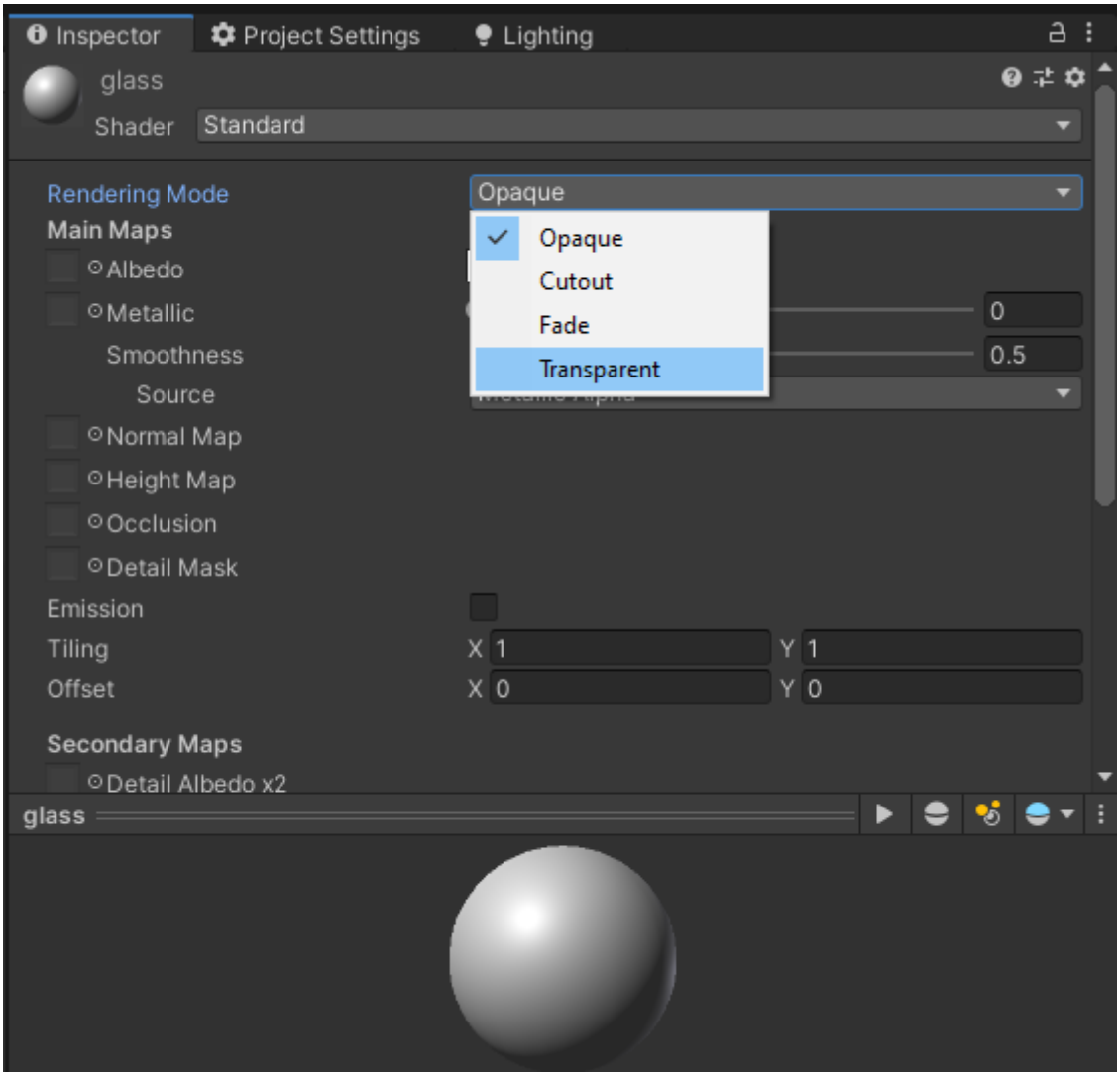
2. 🎨 Materials

Materials in Unity are very simple and can range from a glassy like surface to a flat paint like material

To create your first material:

1. Right click in the project window (preferably in Assets->Materials)
2. Go to Create->Material
3. Name it
4. You have now created your first material!! 🎉

   Follow the next few steps to get a glass like material
5. Change Rendering Mode to **Transparent**



6. Click the white color in the **Albedo** section and change the **Alpha** to 0 for a clear glass look (the closer you are to zero, the clearer the glass)
7. Close the popup
8. Changing the smoothness with impact how reflective the glass is which a number closer to 1 being more reflective and 0 being not at all reflective

Some other options for the materials are:

- Metallic - is a metal or not (please do either 1 or 0 then change the smoothness to effect it because real items are either metallic or not metallic and for better results)
- Normal map - the "baked" map the is actually an illusion for depth (works well if not close by)
- Height map - displacement map for the material (like the normal map but better for close ups)
- Emission - if it emits light or not
- Reflections - if it reflects light to other surfaces

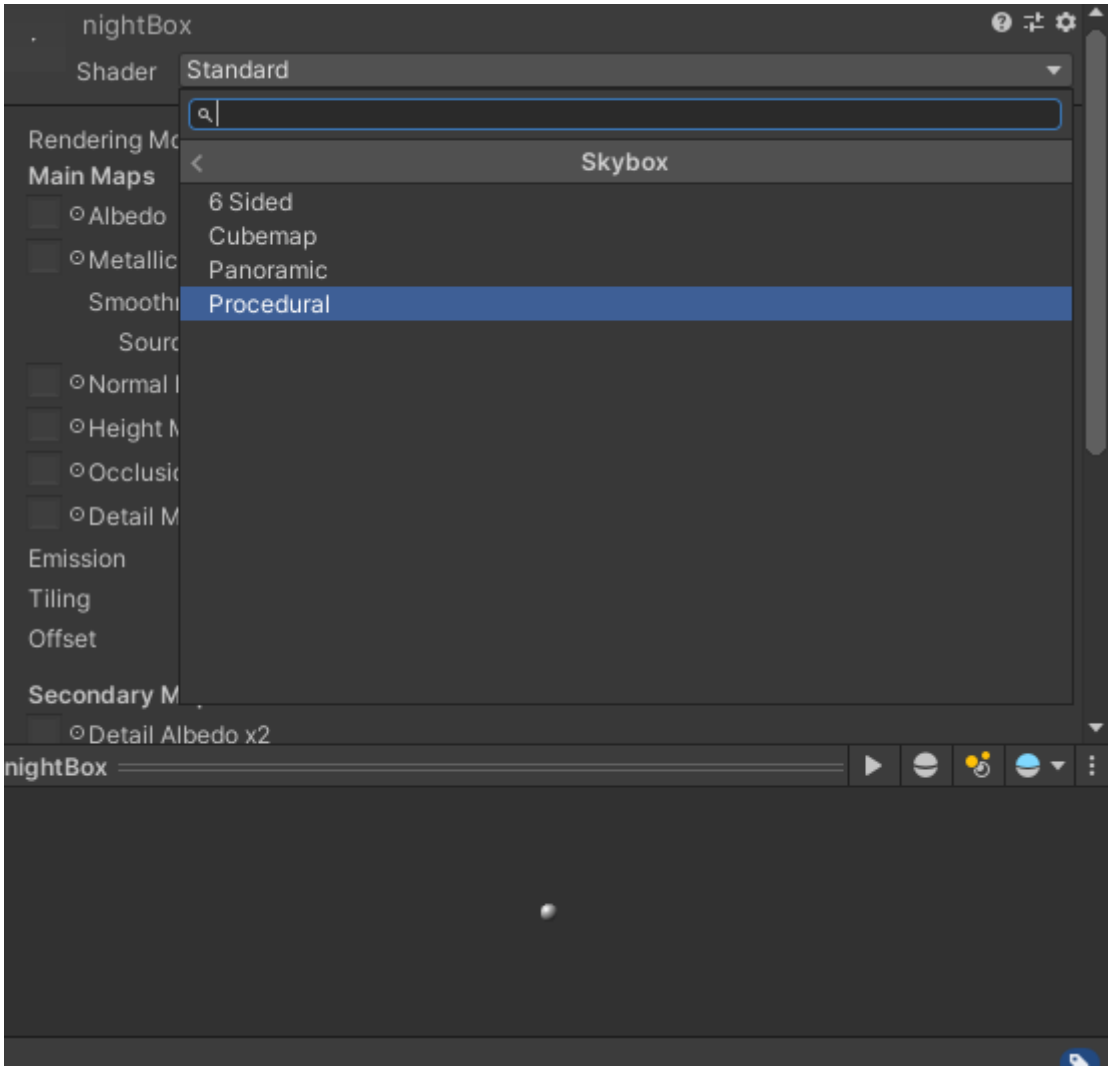
After a material is made, simply drag the material to the object you want applied (can be done to the scene or in the hierarchy). We will apply the glass texture to the second window to the right in the house.

Skybox

Next we will do a skybox, although it will actually be a nightbox. Skybox contain your world and is present as the sky in a default new 3D project. For this tutorial, we remake the skybox presently in the scene

1. In materials folder, do another Create->Material

2. Call it nightBox
3. Select the **Shader** and change it to Skybox->Procedural



4. Now you can change
    - The sun size
    - Time of day with **Atmosphere Thickness**
    - "**Ground**" color
    - Sky tint

To apply these changes to the current scene:

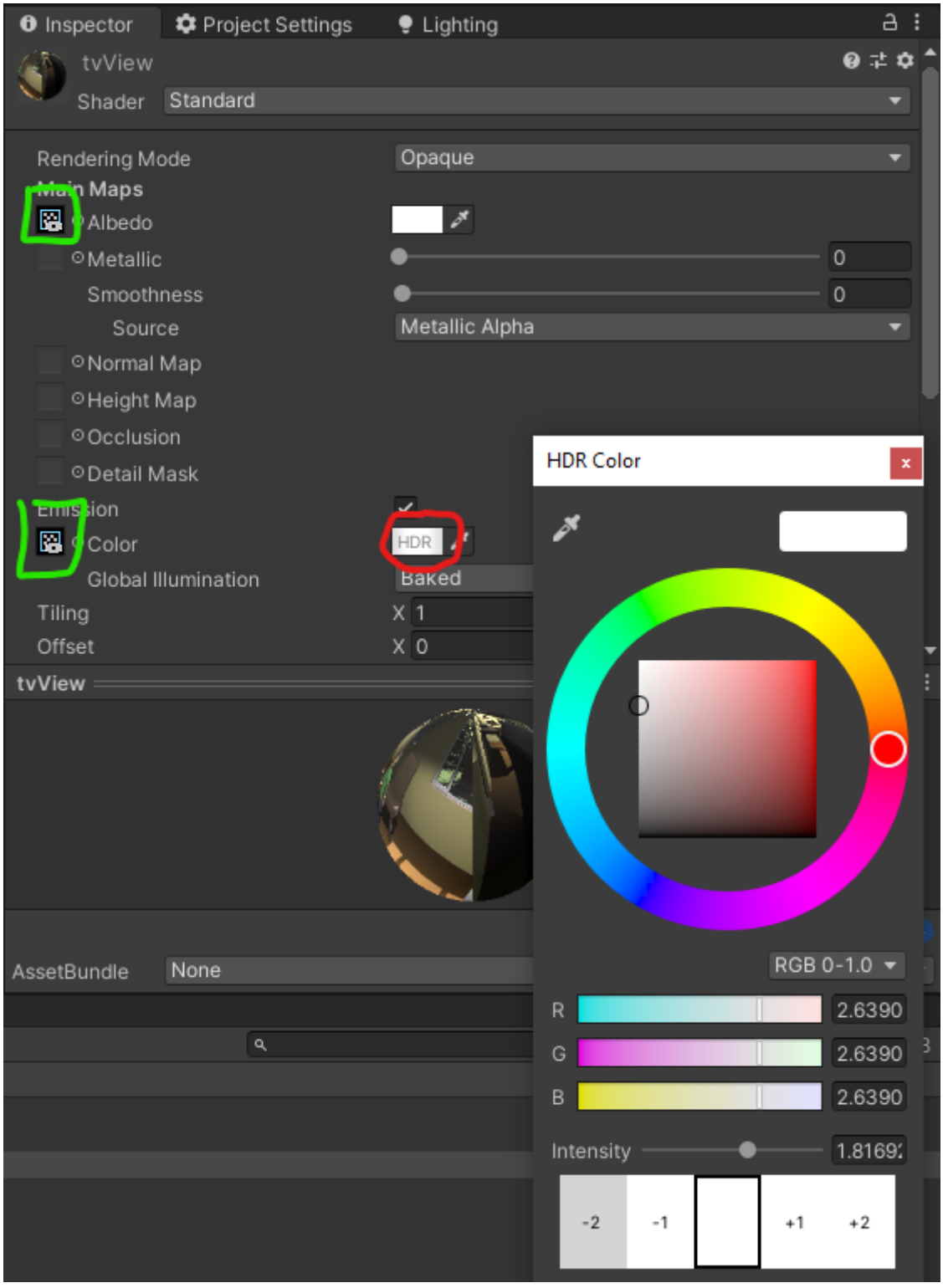
1. Go to your Lighting window (Window->Rendering->Lightning Setting)
2. Environment->Skybox Material
3. Select the newly created nightBox

3. Textures

Next we will implement a rendered texture. Think of this as a television screen that broadcasts from a camera live!

1. Create->Rendered Texture in your texture folder (I named it tv)
2. Change size to 1520x1000
3. Create new material called *tvView*
4. Drag the tv texture to the **Albedo** box (see the green box in the image below)

5. Drag the material onto the object to apply the screen (in my case it will be the brown part of the TV screen)
6. Select the unity camera the captures the action to be rendered (this is the one right bay the blue camera on the top left of the starting position)
7. Go to **Target Texture** and change to the tv
8. If the screen is too dark, enable emissions and drag the tv texture into the Emission's Color box
9. To change the brightness, click on the color box (see red circled)



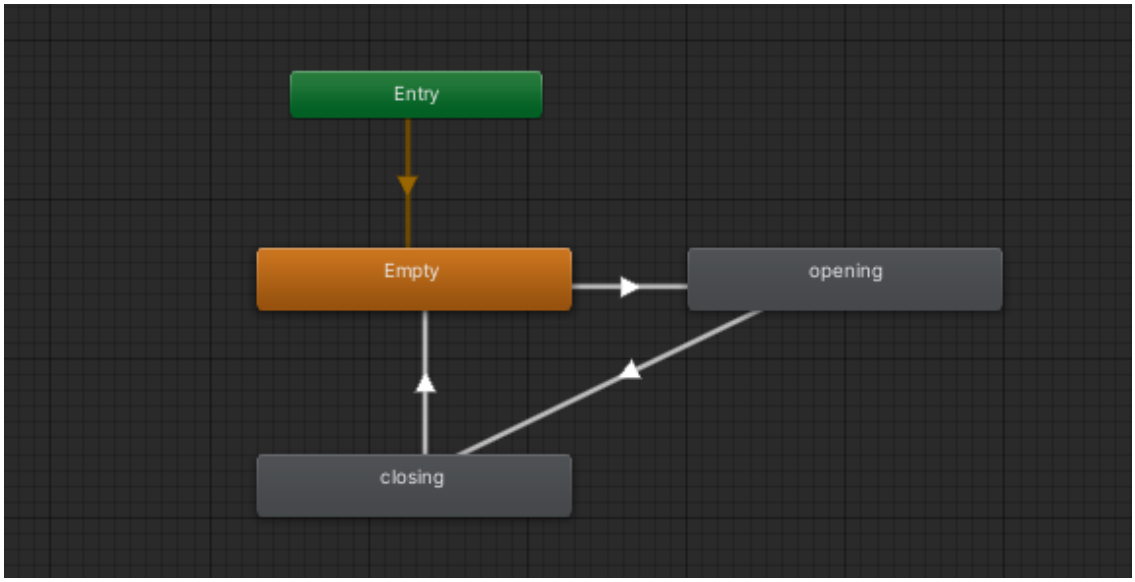
10. The intensity correlates to how much brighter the image is. The color is the tint on the screen

4. 👇 Interactive Objects

In this part we will make several changes such that the game is more interactive. This includes opening drawers/doors, picking up objects. In addition we will be starting the embed 2D game with added a screen when you view the screen.

The first step is opening the cabinet

1. Create a new animation controller
2. Open the animator and add a bool of openCabinet
3. Right click in the animator tab and do Create State->Empty and name it empty
4. Drag in the open and close cabinet animations
5. Connect the open, close and empty into a triangle of the form Empty->opening->closing (see below)



6. Set the Empty->opening transition to openCabinet = true, opening->closing tranisiton to false and double check to see if closing->Empty has the *Has Exit Time* checkbox checked

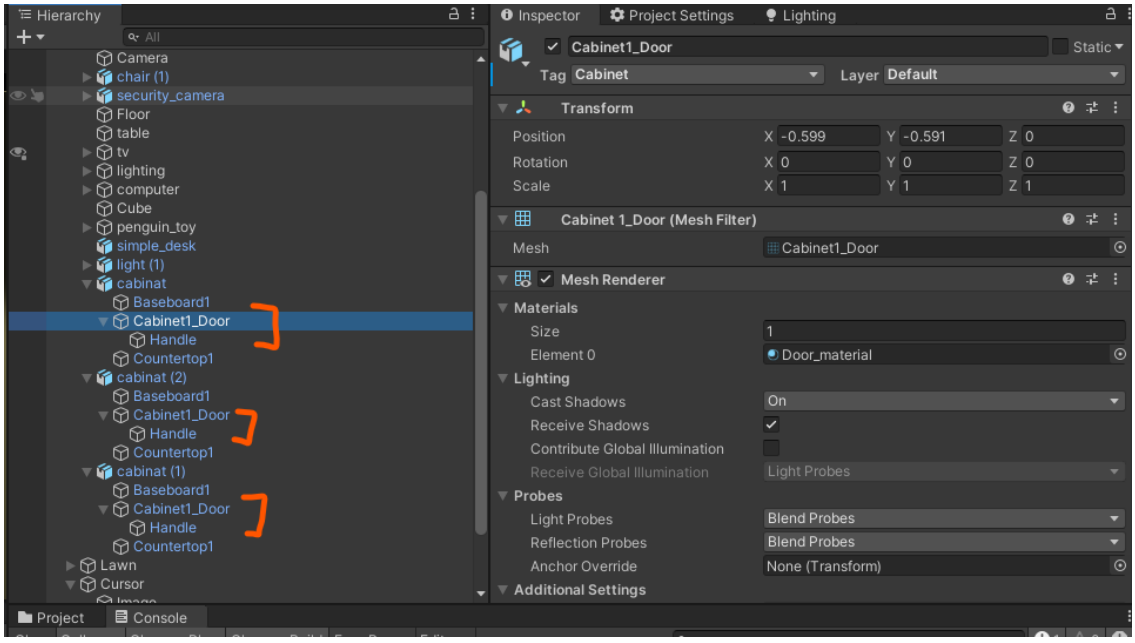
   Resource: https://www.youtube.com/watch?v=dEpH6-vwxYY

   Now we have an animation for opening and closing the cabinet, we need to open the cabinet when we view and click a button. This can be done via recasting from the camera
7. First add the *eToOpen* sprite to the scene (probably above the cursor) and disable it for now
8. Create an empty SelectionManager that houses the script for toggling the selection
9. In the script do

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

public class select : MonoBehaviour
{
    RaycastHit hit;
    public GameObject UIDisplay;
    public string cabinetTag = "Cabinet";
    public float maxDistance = 2.0f;

    void Update()
    {
        var ray = Camera.main.ScreenPointToRay(Input.mousePosition);
```

```
        var cameraTransform = Camera.main.GetComponent<Transform>();
        Debug.DrawRay(cameraTransform.position, cameraTransform.forward *
maxDistance, Color.green);
        if (Physics.Raycast(ray, out RaycastHit hit, maxDistance)) {
            Transform selection = hit.transform;

            if (selection.CompareTag(cabinetTag)) {
                var selectionRenderer = selection.GetComponent<Renderer>();

                if (selectionRenderer != null) {
                    // show UI element
                    UIDisplay.SetActive(true);
                }
            } else {
                UIDisplay.SetActive(false);
            }
        }
    }
}
```

10. Create a `Cabinet` layer and added the Cabinet layer to the three cabinets door and handle components (see below)

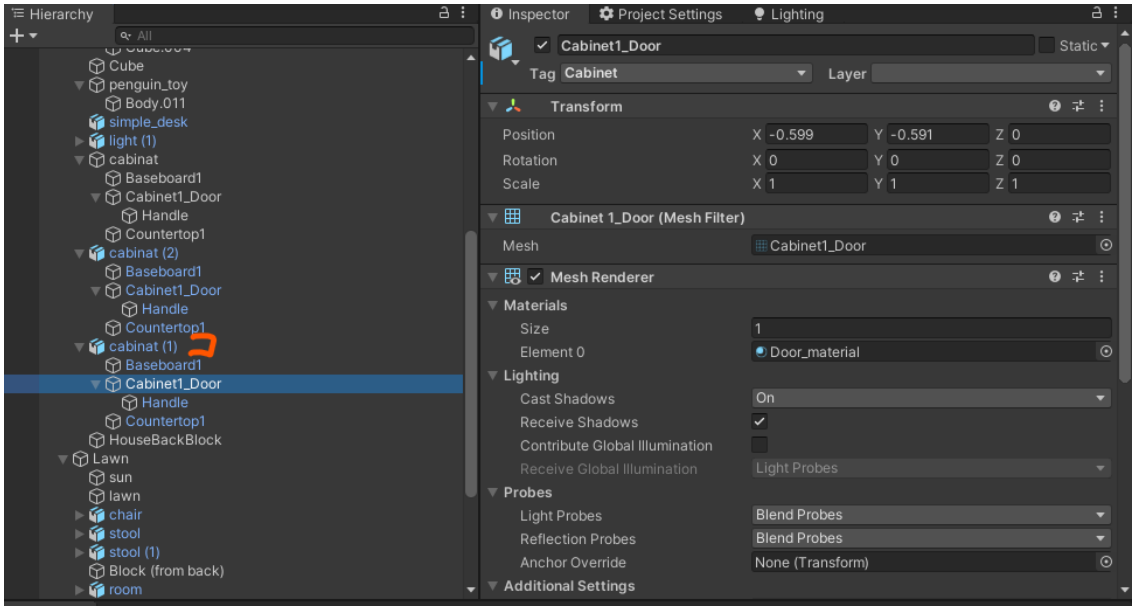


11. Now you can preview the feature and should see that it works
12. Now we want to add checks for when the user presses E and such that it opens
13. If we want to trigger the animate with `e` key, update select to the follow:

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

public class selectCabinet : MonoBehaviour
{
    RaycastHit hit;
    public GameObject UIDisplay;
    public string cabinetTag = "Cabinet";
    public float maxDistance = 2.0f;
```

```
    void Update()
    {
        var ray = Camera.main.ScreenPointToRay(Input.mousePosition);
        var cameraTransform = Camera.main.GetComponent<Transform>();
        // Debug.DrawRay(cameraTransform.position, cameraTransform.forward *
maxDistance, Color.green);
        if (Physics.Raycast(ray, out RaycastHit hit, maxDistance)) {
            Transform selection = hit.transform;

            if (selection.CompareTag(cabinetTag)) {
                var selectionRenderer = selection.GetComponent<Renderer>();

                if (selectionRenderer != null) {
                    if (Input.GetKeyDown(KeyCode.E)) {
                        // get selection
                        var sectionAnimator = selection.parent;
                        // animate cabinet
                        sectionAnimator.GetComponent<Animator>
().SetBool("openCabinet", true);
                        // set tag to opened cabinet
                        selectionRenderer.gameObject.tag = "OpenCabinet";
                    } else {
                        // show UI element
                        UIDisplay.SetActive(true);
                    }
                }
            } else {
                UIDisplay.SetActive(false);
            }
        } else {
            UIDisplay.SetActive(false);
        }
    }
}
```

14. Make sure you attach the animator component to the main model (see the red marker below) then tag only the door part of the model



** Make sure the object you are applying the raycast to has a collider!!

Now we can open the cabinet, we can do something similar to above with the screen and the password note

1. Drag in passcode png (onto a cube with the right dimensions (try 0.3x0.637)) into the scene and move the to the tree in the back and make sure it's not within the back block/cube (in Lawn->*Block (from back)*), otherwise change the back block to not be intercepting
2. The script we use to do the action can be the same one as the previous one
3. To make the popup for the passcode note, do a new hidden UI image object that is the same as the passcode we dragged in during step 1
4. Now change the script to the following (OR you can drag in another script and change the values there, but there maybe performance hits)

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

public class select : MonoBehaviour
{
    RaycastHit hit;
    public GameObject UIDisplay;
    public GameObject UINoteDisplay;
    public string cabinetTag = "Cabinet";
    public string noteTag = "Note";
    public float maxDistance = 2.0f;

    void Update()
    {
        var ray = Camera.main.ScreenPointToRay(Input.mousePosition);
        var cameraTransform = Camera.main.GetComponent<Transform>();
        Debug.DrawRay(cameraTransform.position, cameraTransform.forward *
maxDistance, Color.green);
        if (Physics.Raycast(ray, out RaycastHit hit, maxDistance)) {
            Transform selection = hit.transform;

            if (selection.CompareTag(cabinetTag)) {
                var selectionRenderer = selection.GetComponent<Renderer>();

                if (selectionRenderer != null) {
                    // show UI element
                    UIDisplay.SetActive(true);
                }
            } else if (selection.CompareTag(noteTag)) {
                var selectionRenderer = selection.GetComponent<Renderer>();
                if (selectionRenderer != null) {
                    UINoteDisplay.SetActive(true);
                }
            } else {
                UIDisplay.SetActive(false);
                UINoteDisplay.SetActive(false);
            }
        }
    }
}
```

5. Now you may want to added a fade in fade out and that can be done if you follow this tutorial, but since this is a scary game, no transitions will be needed 😈

We can do the same thing with the computer screen but show a different animated screen for that

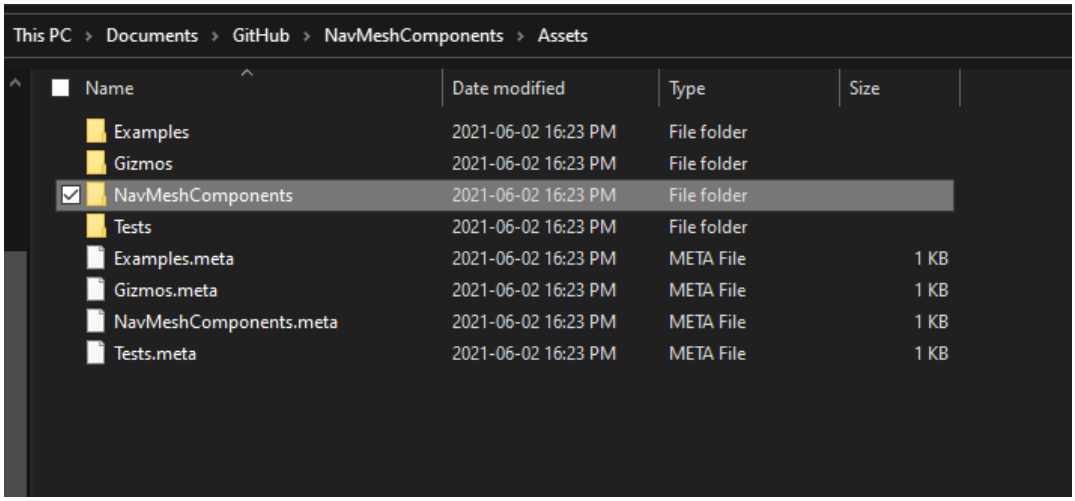
To see how you do a video in Unity, use this tutorial: https://www.youtube.com/watch?v=p7iXEZGx2Mc

Resource: https://www.youtube.com/watch?v=_yf5vzZ2sYE

5. 🤖 AI

This section will begin implementation of some simple AI. This AI will follow the player if it is outside.

1. Drag in the ghost model into the lawn (or just start in start-AI tag) into a empty object
2. Add a *Nav Mesh Agent* to the ghost's parent (empty)
3. Change the options for the Nav Mesh Agent
    - Most of the options are obvious but here are some non obvious ones
    - Base offset (collision base offset)
    - Acceleration - How fast the AI accelerates
4. Add a capsule collider to the top parent along with a rigid body. Set the collider to be about the same as the nav mesh and the rigid body has *Is Kinematic* checked
5. Add the NavMeshComponents into the project
    1. Go to the link and clone the repo
    2. Copy the NavMesComponents (in Assets) into the project file



6. Create a new empty gameobject and drag in the *NavMeshSurface*
7. Include the necessary layers and click bake to get the generated surface that the AI can walk on
8. Create a new AI script
9. Paste in the following script

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

```
public class ghostAI : MonoBehaviour
{
    public float lookRadius = 10f;
    public float timeBetweenAttacks = 2f;
    public Vector3 walkPoint;
    bool walkPointSet;

    Transform target;
    public NavMeshAgent ghost;

    public GameObject player;
    public Vector3 distanceToPatrolPoint ;

    // Start is called before the first frame update
    void Start()
    {
        target = player.transform;
    }

    // Update is called once per frame
    void Update()
    {
        float distance = Vector3.Distance(target.position,
transform.position);

        if (distance < lookRadius) {
            ghost.SetDestination(target.position);
            // face target when aggro
            FaceTarget();
        } else {
            // if outside range, patrol
            Patrol();
        }
    }

    void FaceTarget() {
        Vector3 direction = (target.position -
transform.position).normalized;
        Quaternion lookRotation = Quaternion.LookRotation(new
Vector3(direction.x, 0, direction.z));
        transform.rotation = Quaternion.Slerp(transform.rotation,
lookRotation, Time.deltaTime * 5f);
    }

    /**
    * draws debug sphere for sight
    */
    void OnDrawGizmos() {
        Gizmos.color = Color.red;
        Gizmos.DrawWireSphere(transform.position, lookRadius);
    }

    private void Patrol() {
        //
        if (!walkPointSet) {
            SearchWalkPoint();
        }
```

```
        if (walkPointSet) {
            ghost.SetDestination(walkPoint);
        }

        distanceToPatrolPoint = transform.position - walkPoint;

        if (distanceToPatrolPoint.magnitude < 4f) {
            walkPointSet = false;
        }
    }
    private void SearchWalkPoint() {
        // search for suitable random place to walk to
        float randomZ = Random.Range(-lookRadius, lookRadius);
        float randomX = Random.Range(-lookRadius, lookRadius);

        RaycastHit hit;

        walkPoint = new Vector3(transform.position.x + randomX,
transform.position.y, transform.position.z + randomZ);

        if (Physics.Raycast(walkPoint, -transform.up, out hit, 2f) &&
hit.transform.tag == "Lawn") {
            walkPointSet = true;
        }
    }
}
```

10. Make sure you have the lawn saved to the lawn layer
11. Now we need to set the attack for the enemy
12. For this tutorial, the player only has 1 life so after they get attacked, the player is forced to restart
13. For this we will be using something similar to the pause menu in the first 3D tutorial since we want to pause after hit and to restart the level
14. See the Game Over section to find out how to set up the game over UI screen, otherwise update the script with the following

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

public class ghostAI : MonoBehaviour
{
    public float lookRadius = 10f;
    public float attackRadius = 1f;
    public float timeBetweenAttacks = 2f;
    public Vector3 walkPoint;
    bool walkPointSet;

    Transform target;
    public NavMeshAgent ghost;

    public GameObject player;
    public GameObject killScreen;
    private Vector3 distanceToPatrolPoint;
```

```
    // Start is called before the first frame update
    void Start()
    {
        target = player.transform;
    }

    // Update is called once per frame
    void Update()
    {
        float distance = Vector3.Distance(target.position,
transform.position);

        if (distance < attackRadius) {
            // kill player
            killScreen.SetActive(true);
            Time.timeScale = 0f;
        } else if (distance < lookRadius) {
            ghost.SetDestination(target.position);
            // face target when aggro
            FaceTarget();
        } else {
            // if outside range, patrol
            Patrol();
        }
    }

    void FaceTarget() {
        Vector3 direction = (target.position -
transform.position).normalized;
        Quaternion lookRotation = Quaternion.LookRotation(new
Vector3(direction.x, 0, direction.z));
        transform.rotation = Quaternion.Slerp(transform.rotation,
lookRotation, Time.deltaTime * 5f);
    }

    /**
    * draws debug sphere for sight
    */
    void OnDrawGizmos() {
        Gizmos.color = Color.green;
        Gizmos.DrawWireSphere(transform.position, lookRadius);
        Gizmos.color = Color.red;
        Gizmos.DrawWireSphere(transform.position, attackRadius);
    }

    private void Patrol() {
        //
        if (!walkPointSet) {
            SearchWalkPoint();
        }
        if (walkPointSet) {
            ghost.SetDestination(walkPoint);
        }

        distanceToPatrolPoint = transform.position - walkPoint;

        if (distanceToPatrolPoint.magnitude < 4f) {
```

```
            walkPointSet = false;
        }
    }
    private void SearchWalkPoint() {
        // search for suitable random place to walk to
        float randomZ = Random.Range(-lookRadius, lookRadius);
        float randomX = Random.Range(-lookRadius, lookRadius);

        RaycastHit hit;

        walkPoint = new Vector3(transform.position.x + randomX,
transform.position.y, transform.position.z + randomZ);

        if (Physics.Raycast(walkPoint, -transform.up, out hit, 2f) &&
hit.transform.tag == "Lawn") {
            walkPointSet = true;
        }
    }
}
```

15. Add the kill screen UI as the gameover screen

Resource: https://www.youtube.com/watch?v=UjkSFoLxesw

6. 💻 Embed 2D Game

7. ✨ Effects

Fog

Rain

Lightning

Game Over Screen

8. 🪀 Odds and Ends

Flashlight

License

Music is inspired by Kano - Another Life and remixed by Torchkas in the VLDC9 - Abstract.
Instrumental remake is made by me and I hereby give it the following license