

Work Sample for Future Games

For my work sample that I'm going to use to apply to Future Games I've decided to create a boss battle set in an arena. Why I've decided to do that is because I want to add interesting mechanics and interactions between the player character and the boss. Just having the one boss fight will drastically increase the quality and I can focus on making it dynamic and interesting. The game is going to be created in the Unity engine with C# and it will be a 2d game.

On the last page of this PDF I will include links to all project files, the finished game and to a video showing the game in action. I will also show screenshots of my code throughout this work sample PDF. The screenshots of the scripts will not be completed scripts and will be worked on over time during this project. The completed scripts will be available on the last page in my project files. I'll comment on lines of code so that readers of this can understand my thought process more in-depth.

The first thing I'm going to create is the player character and the arena in Photoshop, I do this because having some of the visual elements present in Unity really helps me visualize how I'll set everything up.

The next step for me is to give the character a player controller and I will be making my own script from scratch for that. For my character's X axis movement I like to call the horizontal axis from Unity itself. To give my character velocity I get the "Rigidbody2D" and create a public float "speed" and adjust that value inside of Unity.

```
private void Movement(float horizontal)
{
    rb2d.velocity = new Vector2(horizontal * speed, rb2d.velocity.y); }
```

This is how I get him to move on the X axis. So now that he moves left and right I start on the animations. I'm gonna animate everything using the skeleton animator inside of Unity. I created animations for running, jumping, sliding, idling and attacking. Which are the basics we need but I might change or remove things if needed.

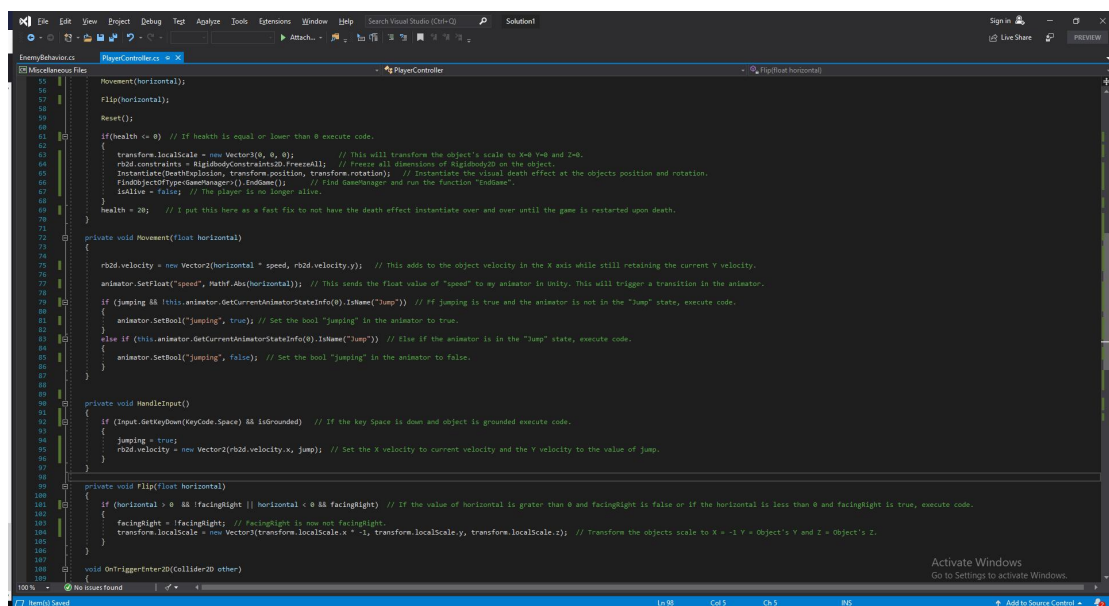
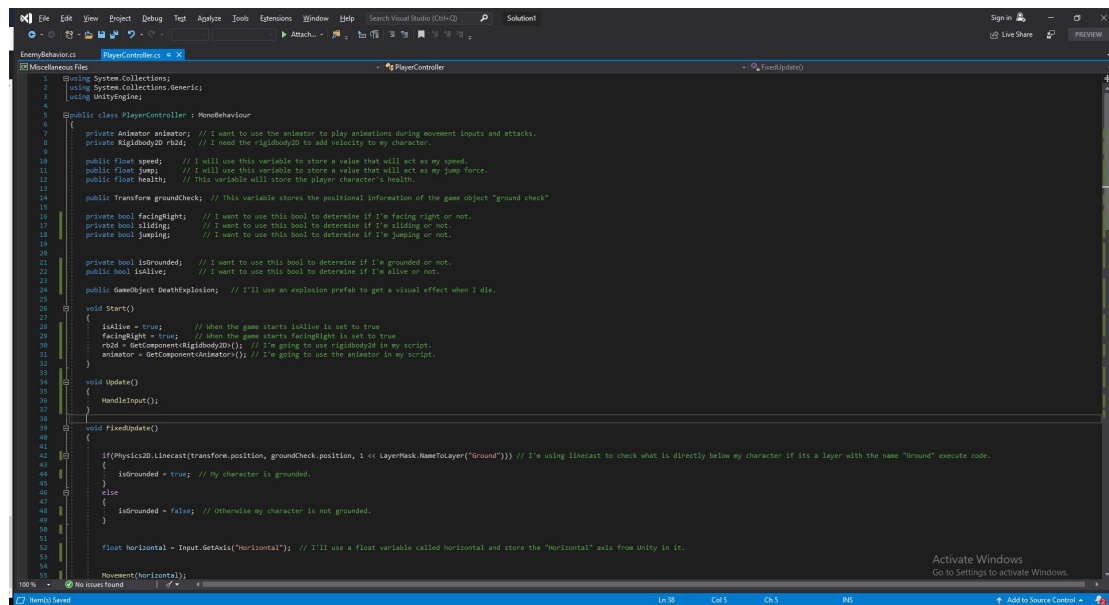
I have to get the animator component into my script for me to be able to access it from the script. I then declare three boolean variables. "attack, sliding and jumping". I do that so I can use "if statements" to trigger the different movement options. For the jump however I want to add an additional bool "isGrounded" I will use that to restrict various code from being able to be executed when the character isn't grounded so we use that to prohibit jumps, attacks and slides while the character is not grounded. In the "if statements" I also tell the script to play the animations if the conditions are met.

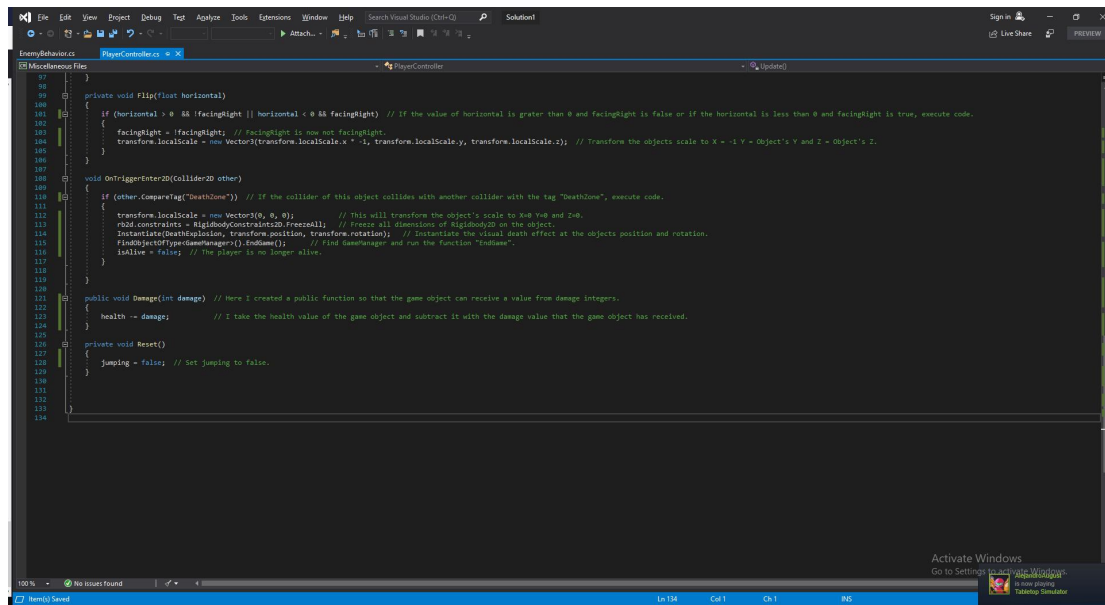
For the jump I'll not call on the Y axis from Unity but just add velocity to the characters Y axis. Like this:

```
if (Input.GetKeyDown(KeyCode.Space) && isGrounded)
{
    jumping = true;
    rb2d.velocity = new Vector2(rb2d.velocity.x, 15); }
```

I think It's simpler to do so.

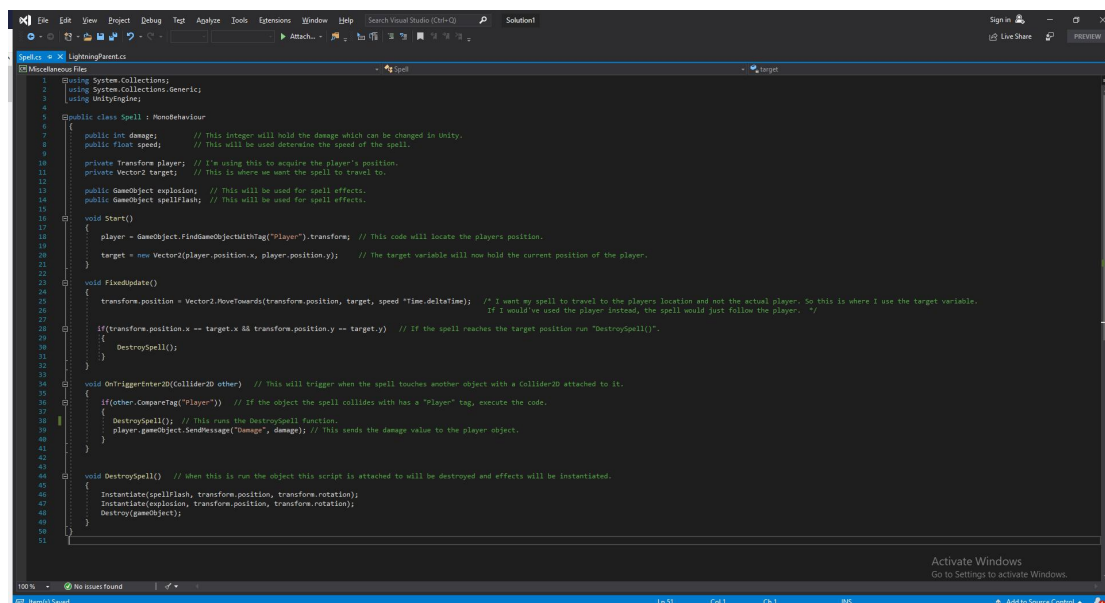
Now I've gotten the base of the player controller done. I'm gonna showcase the code in screenshots so it doesn't take up too much space in the PDF.





I now want to start working on the boss character so again I created his design in Photoshop and imported it into Unity for visual aid. First thing I want to code is some of my boss character's behavior and I will do so in a script called "EnemyBehavior". First and foremost I want to make the boss follow the player character but at the same time not get too close! My boss is going to try to stay in the mid range because he is going to be a spell caster and use different spells from mid range. I will not show screenshots of the enemy behavior script as it's a very long one. Instead look through the project files to see it.

After I create some simple follow and retreat code I now want my boss to be able to shoot his first spell which is going to be a fireball. I will put the spawning of the spell in the enemy behavior script but the actual fireball will be created in a "Spell" script. I will also use the Unity particle system to give the fireball some particles when it is destroyed. This is the finished script.

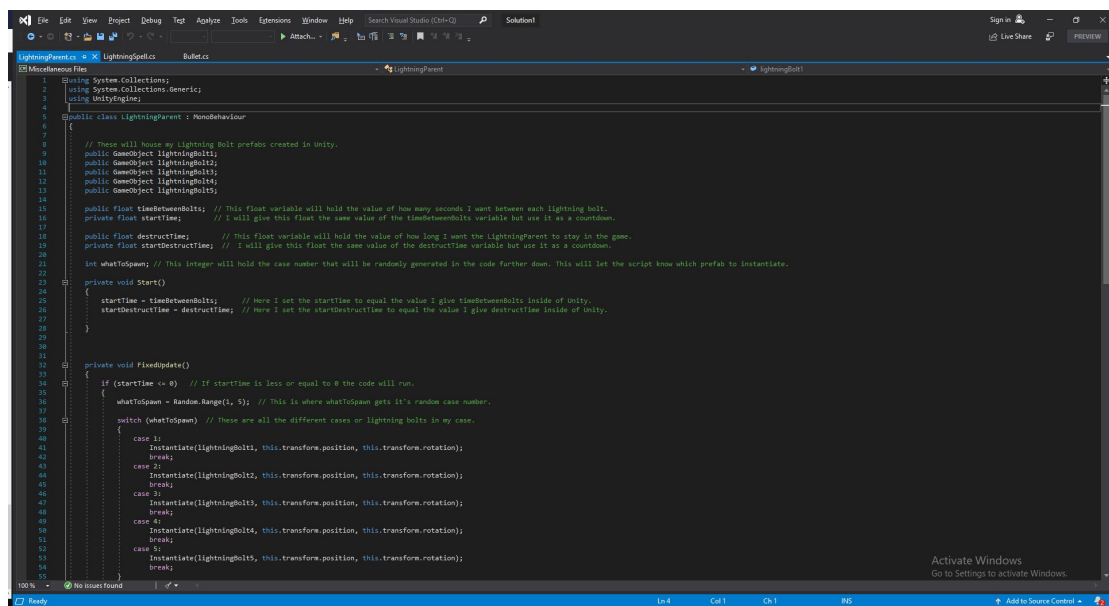


I have a great idea for the next attack for my boss and the idea I have is to make the boss teleport away and then throw lightning bolts onto the platform and have the player try to dodge these lightning bolts!

My idea is to have the enemy boss create an invisible game object that will have a script attached to it that spawns lightning bolts in random order. Why I decided to have a game object house the script to throw lightning bolts is because I want the boss to “teleport” away by changing the scale on him to 0 on X, Y and Z which could lead to some potential issues. I feel like it’s also easier to keep track of everything if I don’t put all code regarding the boss in one script.

After I’ve created all the visuals for the lightning bolts I start making the “lightning parent” script for my empty game object which will spawn the random lightning bolts that I want. My idea is to have five different lightning bolt prefabs in Unity that all have a different spawn point and target point and to make them randomized I just use an array and instantiate a random lightning bolt prefab. The lightning parent will grab a random lightning bolt and the lightning bolts themselves will hold the starting and target positions.

These are the finished lightning parent and the lightning bolt scripts.



```
1 using System.Collections;
2 using System.Collections.Generic;
3 using UnityEngine;
4
5 public class LightningParent : MonoBehaviour
6 {
7
8     // These will house my lightning bolt prefabs created in unity.
9     public GameObject lightningbolt1;
10    public GameObject lightningbolt2;
11    public GameObject lightningbolt3;
12    public GameObject lightningbolt4;
13    public GameObject lightningbolt5;
14
15    public float timeBetweenBolts; // This float variable will hold the value of how many seconds I want between each lightning bolt.
16    private float starttime; // I will give this float the same value of the timeBetweenBolts variable but use it as a countdown.
17
18    public float destructTime; // This float variable will hold the value of how long I want the lightningparent to stay in the game.
19    private float startDestructTime; // I will give this float the same value of the destructTime variable but use it as a countdown.
20
21    int whatToSpawn; // This integer will hold the case number that will be randomly generated in the code further down. This will let the script know which prefab to instantiate.
22
23    private void Start()
24    {
25        starttime = timeBetweenBolts; // Here I set the starttime to equal the value I give timeBetweenBolts inside of unity.
26        startDestructTime = destructTime; // Here I set the startDestructTime to equal the value I give destructTime inside of unity.
27    }
28
29
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31
32    private void FixedUpdate()
33    {
34        if (starttime <= 0) // If starttime is less or equal to 0 the code will run.
35        {
36            whatToSpawn = Random.Range(1, 5); // This is where whatToSpawn gets it's random case number.
37
38            switch (whatToSpawn) // These are all the different cases or lightning bolts in my case.
39            {
40                case 1:
41                    Instantiate(lightningbolt1, this.transform.position, this.transform.rotation);
42                    break;
43                case 2:
44                    Instantiate(lightningbolt2, this.transform.position, this.transform.rotation);
45                    break;
46                case 3:
47                    Instantiate(lightningbolt3, this.transform.position, this.transform.rotation);
48                    break;
49                case 4:
50                    Instantiate(lightningbolt4, this.transform.position, this.transform.rotation);
51                    break;
52                case 5:
53                    Instantiate(lightningbolt5, this.transform.position, this.transform.rotation);
54                    break;
55            }
56
57            starttime = timeBetweenBolts;
58        }
59    }
60 }
```

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```

11 private void FixedUpdate()
12 {
13     if (startTime <= 0) // If startTime is less or equal to 0 the code will run.
14     {
15         whatToSpawn = Random.Range(1, 5); // This is where whatToSpawn gets it's random case number.
16         switch (whatToSpawn) // These are all the different cases or lightning bolts in my case.
17         {
18             case 1:
19                 Instantiate(lightningBolt1, this.transform.position, this.transform.rotation);
20                 break;
21             case 2:
22                 Instantiate(lightningBolt2, this.transform.position, this.transform.rotation);
23                 break;
24             case 3:
25                 Instantiate(lightningBolt3, this.transform.position, this.transform.rotation);
26                 break;
27             case 4:
28                 Instantiate(lightningBolt4, this.transform.position, this.transform.rotation);
29                 break;
30             case 5:
31                 Instantiate(lightningBolt5, this.transform.position, this.transform.rotation);
32                 break;
33         }
34         startTime = timeBetweenBolts; // After a random lightning bolt has been chosen the timer resets by setting the startTime back to the timeBetweenBolts.
35     }
36     else // This code is running if the startTime is not less or equal to 0.
37     {
38         startTime -= Time.deltaTime; // This takes the value of startTime and subtracts it by how much time has passed.
39         if (startTime <= 0) // If startTime is less or equal to 0 then run the code.
40         {
41             DestroyLightningParent(); // Run the DestroyLightningParent function.
42         }
43         else // This code is running if the startTime is not less or equal to 0.
44         {
45             startTime -= Time.deltaTime; // This takes the value of startTime and subtracts it by how much time has passed.
46         }
47     }
48 }
49
50 private void DestroyLightningParent()
51 {
52     Destroy(gameObject); // When this is run the game object that holds this script will be destroyed.
53 }

```

```

7 public int damage; // This integer will store the damage which can be changed in Unity.
8 public float speed; // This will be used to determine the speed of the spell.
9
10 public Transform lightningPoint; // This variable will store the position of the spawn point of the lightning bolt. I will set it in Unity.
11 public Transform lightningTarget; // This variable will store the position of the target point of the lightning bolt. I will set it in Unity.
12 private Vector3 target; // This variable will store the information from lightningTarget.
13
14 private Transform player; // This variable will store the position of the player.
15
16 // These will be used for spell effects.
17 public GameObject lightningExplosion;
18 public GameObject lightningFlash;
19 public GameObject lightningRain;
20
21 void Start()
22 {
23     player = GameObject.FindGameObjectWithTag("Player").transform; // The player variable is now storing the transform information of the game object "Player"
24     target = new Vector3(lightningTarget.position.x, lightningTarget.position.y); // The target variable is now storing the X and Y position of our target.
25     this.transform.position = lightningPoint.position; // The position of this game object (lightning bolt) is now set to the position of the lightningPoint game object.
26     GameObject.Find("Lightningwand").transform.localScale = new Vector3(1, 1, 1); // Find the game object "Lightningwand" and give it the Vector3 dimensions x = 1, y = 1 and z = 1.
27     GameObject.Find("Lightningwand").transform.position = new Vector3(transform.position.x, transform.position.y - 45); // Find the game object "Lightningwand" and give it this game object's X and Y position.
28     Instantiate(lightningFlash, transform.position, transform.rotation); // Spawn the lightningFlash game object at this game object's position and rotation.
29     Instantiate(lightningRain, transform.position, transform.rotation); // Spawn the lightningRain game object at this game object's position and rotation.
30 }
31
32 void FixedUpdate()
33 {
34     transform.position = Vector3.MoveTowards(transform.position, target, speed * Time.deltaTime); // Move this game object towards the position of the target at the speed variable value set in Unity.
35     if (transform.position.x == target.x && transform.position.y == target.y) // If the spell reaches the target position run the code.
36     {
37         DestroySpell(); // run the DestroySpell function.
38     }
39 }
40
41 void OnTriggerEnter2D(Collider2D other) // This will trigger when the spell touches another object with a Collider2D attached to it.
42 {
43     if (other.CompareTag("Player")) // If the object the spell collides with is a player, run the code.
44     {
45         DestroySpell(); // run the DestroySpell function.
46         player.gameObject.SendMessage("Damage", damage); // This sends the damage value to the player object.
47     }
48 }
49
50 void DestroySpell()
51 {
52     GameObject.Find("Lightningwand").transform.localScale = new Vector3(0, 0, 0); // Find the game object "Lightningwand" and give it the Vector3 dimensions x = 0, y = 0 and z = 0.
53     Instantiate(lightningExplosion, transform.position, transform.rotation); // Spawn the lightningExplosion game object at this game object's position and rotation.
54     Instantiate(lightningFlash, transform.position, transform.rotation); // Spawn the lightningFlash game object at this game object's position and rotation.
55     Destroy(gameObject); // destroy this game object.
56 }

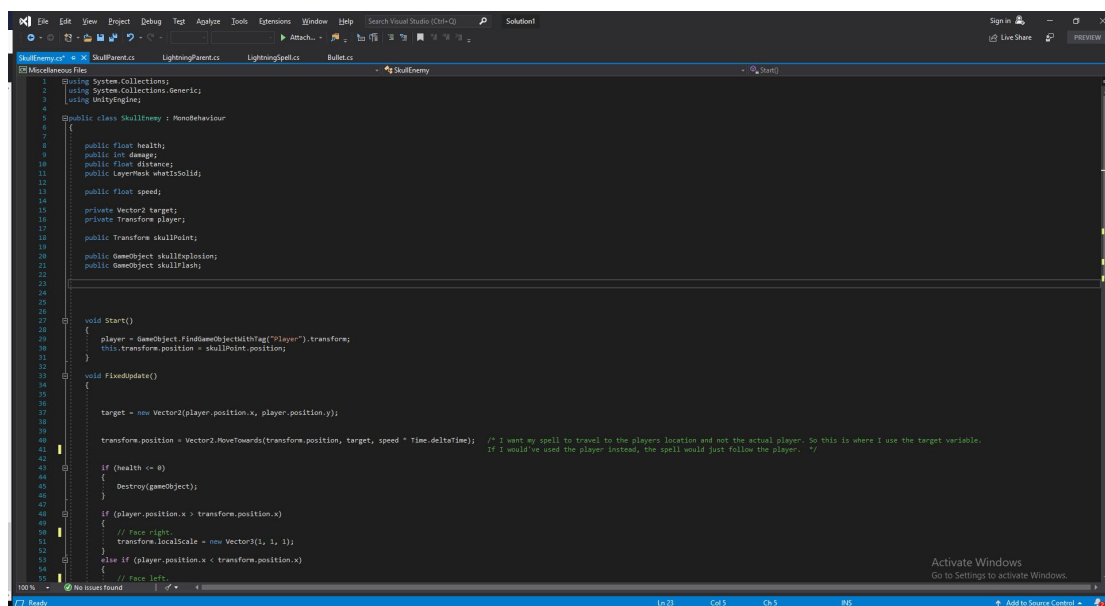
```

Now the fight is more dynamic! I got projectiles flying horizontally and a phase where lightning bolts travel vertically all over the the platform! The bolts are even random which makes it even more dynamic. To make the player aware of where the bolts are gonna strike I've made a phantom hand that pops up in the sky where the bolt is going to strike. The goal was to give the player a visual aid so that the bolts aren't unfair.

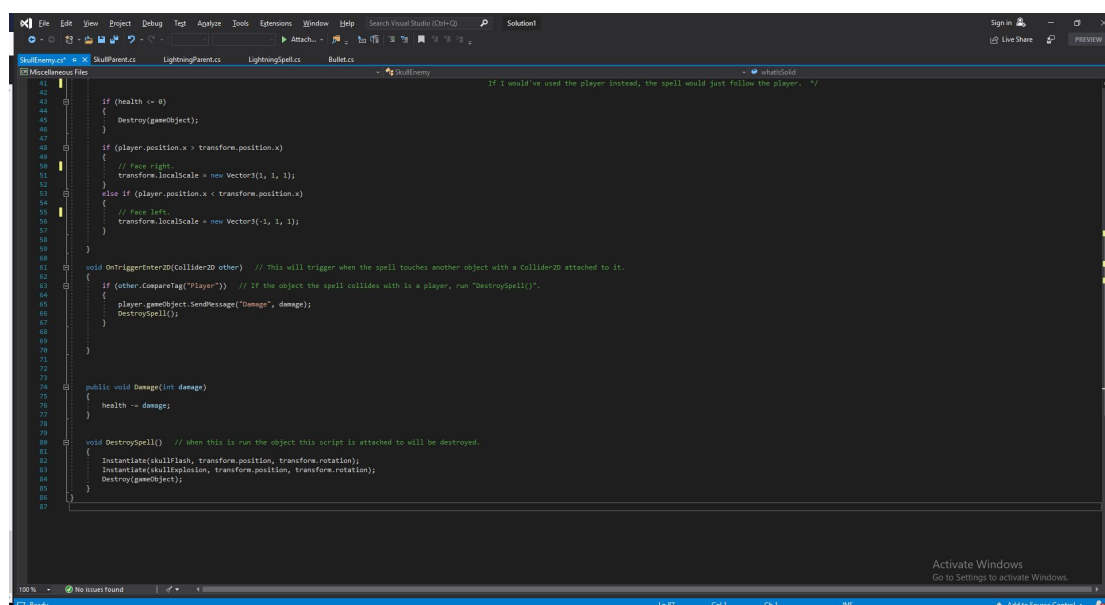
I want one more mechanic in the boss fight to make it a real challenge! All bosses should pose a challenge to the player! My idea now is to add some flying minions that also have health and if they come into contact with the player the player dies. I feel like that should make the fight even more fun which is my goal here.

I will code these minions in a very similar way I did with the lightning bolts. I want to create a game object from the boss that will act as a spawner of the minions. So the boss will after a set amount of time create the spawner that will in turn spawn the minions. I also want the minions to come from different angles that's where I'll put in some random number generation like in the lightning parent script. You could think of the minions as a mixture of the lightning bolt and the boss script. It will be random, it will target the player and it will travel towards its target just like the lightning bolt but it will at the same time have a hurtbox and have a health value just like the boss.

I've decided the minions to look like flying flaming skulls as I've been going for a very demonic and fiery theme with this game. So the skull parent script will look almost identical to the lightning parent script so instead of showing both the skull parent and the skull enemy script I'll just show the skull enemy script which is the code for my flying minions.



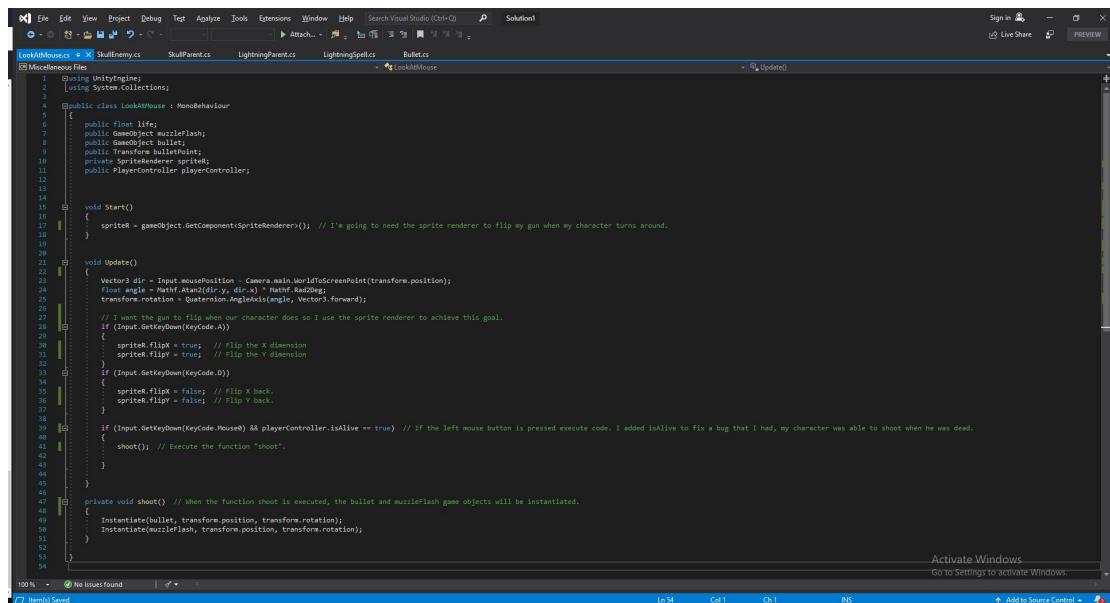
```
1 using System.Collections;
2 using System.Collections.Generic;
3 using UnityEngine;
4
5 [public class SkullEnemy : MonoBehaviour]
6 {
7     public float health;
8     public int damage;
9     public float distance;
10    public LayerMask whatIsSolid;
11
12    public float speed;
13
14    private Vector2 target;
15    private Transform player;
16
17    public Transform skullPoint;
18
19    public GameObject skullExplosion;
20    public GameObject skullFlash;
21
22
23
24
25
26
27    void Start()
28    {
29        player = GameObject.FindObjectOfType<Player>().transform;
30        this.transform.position = skullPoint.position;
31    }
32
33    void FixedUpdate()
34    {
35
36        target = new Vector2(player.position.x, player.position.y);
37
38        transform.position = Vector2.MoveTowards(transform.position, target, speed * Time.deltaTime); /* I want my spell to travel to the players location and not the actual player. So this is where I use the target variable.
39                                                                                                     If I would've used the player instead, the spell would just follow the player. */
40
41        if (health <= 0)
42        {
43            Destroy(gameObject);
44        }
45
46        if (player.position.x > transform.position.x)
47        {
48            // face right
49            transform.localScale = new Vector3(1, 1, 1);
50        }
51        else if (player.position.x < transform.position.x)
52        {
53            // face left
54        }
55    }
56
57    No issues found
```



```
42
43
44    if (health <= 0)
45    {
46        Destroy(gameObject);
47    }
48
49    if (player.position.x > transform.position.x)
50    {
51        // face right
52        transform.localScale = new Vector3(1, 1, 1);
53    }
54    else if (player.position.x < transform.position.x)
55    {
56        // face left
57        transform.localScale = new Vector3(-1, 1, 1);
58    }
59
60
61    void OnTriggerEnter2D(Collider2D other) // This will trigger when the spell touches another object with a collider2D attached to it.
62    {
63        if (other.CompareTag("Player")) // If the object the spell collides with is a player, run "DestroySpell()".
64        {
65            player.gameObject.SendMessage("Damage", damage);
66            DestroySpell();
67        }
68    }
69
70
71
72
73    public void Damage(int damage)
74    {
75        health -= damage;
76    }
77
78
79    void DestroySpell() // When this is run the object this script is attached to will be destroyed.
80    {
81        Instantiate(skullFlash, transform.position, transform.rotation);
82        Instantiate(skullExplosion, transform.position, transform.rotation);
83        Destroy(gameObject);
84    }
85
86
87
```

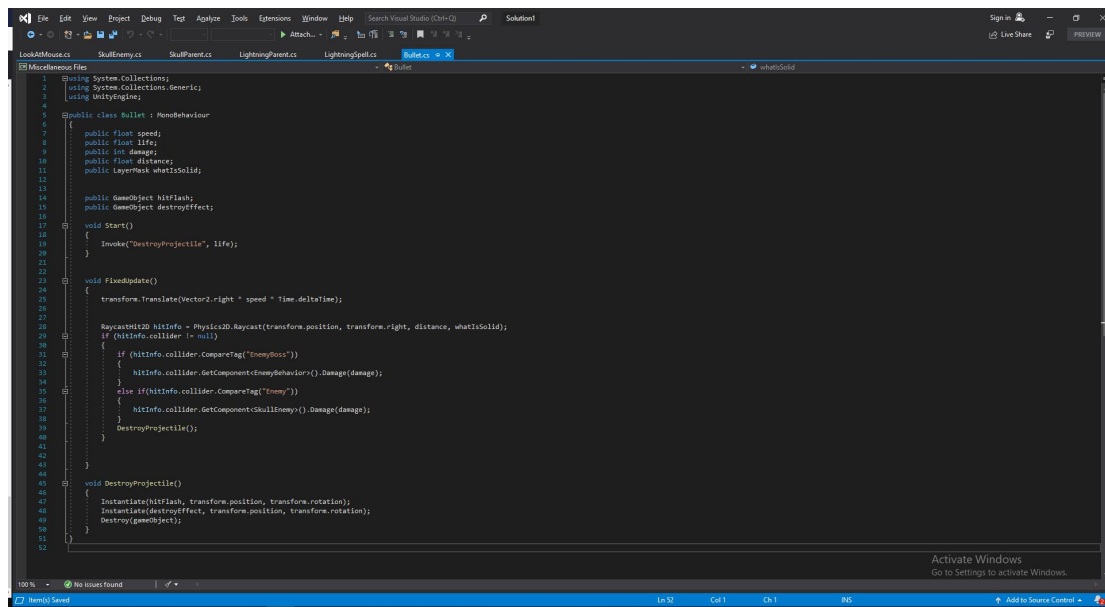

Now I consider my boss character done! I have several layers to the boss character in terms of gameplay and I now have to add things like a menu when you start the game. A cutscene when you start the game, some UI elements and a way for my character to attack! I'm going to use a ranged combat system for my player character because I started coding a melee system but I thought it felt sluggish and just didn't feel good for my game. This game is more suited to having a ranged combat system for the player and so I'll do that. I'm going to edit my players photoshop project file and remove his hand and sword. I'm going to create a new hand with a pistol attached, add it to Unity and give the gun a script of its own. The gun will aim where my mouse is and shoot whenever I click the mouse button. I was considering using a cooldown mechanic for the shooting like I have been using for my boss spells but it just feels better being able to shoot as fast as you can click with your hand.

This is the gun script called "LookAtMouse" because the main function of this script is to make the gun follow the mouse.



```
1 using UnityEngine;
2 using System.Collections;
3
4 public class LookAtMouse : MonoBehaviour
5 {
6     public float life;
7     public GameObject muzzleFlash;
8     public GameObject bullet;
9     public Transform bulletHit;
10    private SpriteRenderer sprite;
11    public PlayerController playerController;
12
13
14
15    void Start()
16    {
17        sprite = gameObject.GetComponent(); // I'm going to need the sprite renderer to flip my gun when my character turns around.
18    }
19
20    void Update()
21    {
22        Vector3 dir = Input.mousePosition - Camera.main.WorldToScreenPoint(transform.position);
23        float angle = Mathf.Atan2(dir.y, dir.x) * Mathf.Rad2Deg;
24        transform.rotation = Quaternion.AngleAxis(angle, Vector3.forward);
25
26        // I want the gun to flip when our character does so I use the sprite renderer to achieve this goal.
27        if (Input.GetKeyDown(KeyCode.A))
28        {
29            sprite.flipX = true; // flip the X dimension
30            sprite.flipY = true; // flip the Y dimension
31        }
32        if (Input.GetKeyDown(KeyCode.D))
33        {
34            sprite.flipX = false; // flip X back
35            sprite.flipY = false; // flip Y back
36        }
37
38        if (Input.GetKeyDown(KeyCode.Mouse0) && playerController.isAlive == true) // If the left mouse button is pressed execute code. I added isAlive to fix a bug that I had, my character was able to shoot when he was dead.
39        {
40            shoot(); // execute the function "shoot".
41        }
42
43
44
45    private void shoot() // when the function shoot is executed, the bullet and muzzleFlash game objects will be instantiated.
46    {
47        Instantiate(bullet, transform.position, transform.rotation);
48        Instantiate(muzzleFlash, transform.position, transform.rotation);
49    }
50
51
52
53
54
```

This is the bullet script.



The bullet script functions very similarly to previous scripts I've written so I will not add any comments to the lines of code.

Now everything is working and we have an actual fully functional boss fight! I'm quickly just going to add an HP bar for the boss so the player can keep track of how close to dead the boss is.

The easiest thing to do between the cutscene and the main menu is the main menu, I'm going to add two buttons in a canvas, one for starting the game and one for quitting it. Here I'll actually have to create a new scene and use the scene management that's built into Unity to be able to switch between different scenes in the game.

When using scene management in Unity it's pretty easy to load the next scene. You just get the active scene and then add a +1 to it to get the next scene in line. This is how you would write it.

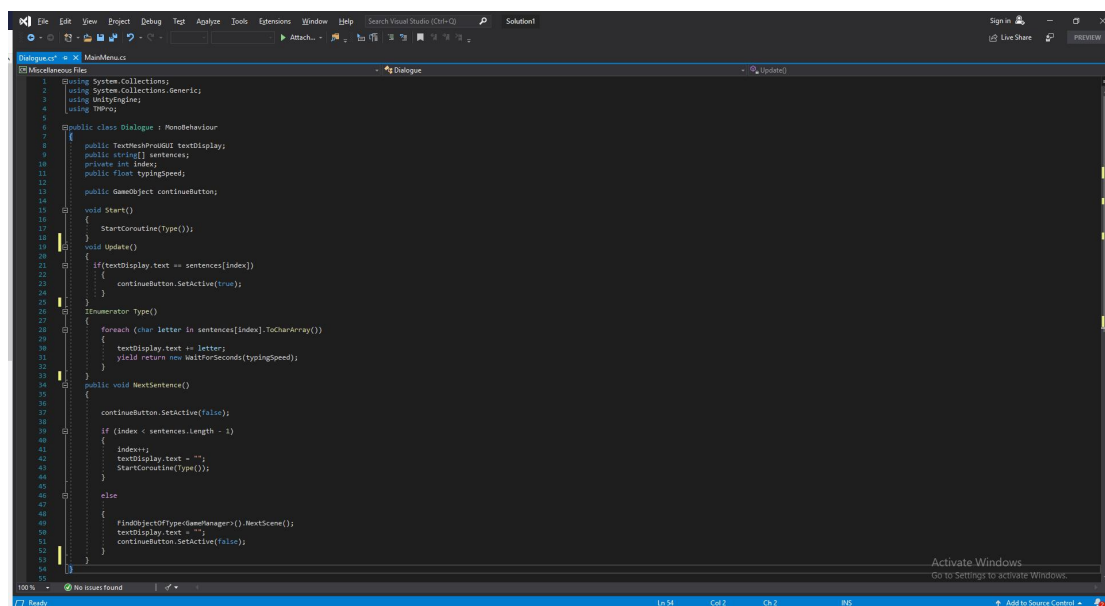
```
public void PlayActive()
{
    SceneManager.LoadScene(SceneManager.GetActiveScene().buildIndex + 1);
}
```


Very easy to remember after you do it once. The code to actually quit the game is even easier. You just tell it to quit the application, like this.

```
public void Quit()  
{  
    Application.Quit(); }  
}
```

I had a lot of issues actually coding the cutscene in my game. I wanted a simple text of dialogue under the characters and have the player hit enter to proceed to the next line of text. I've never done a dialogue system before so this was a huge challenge that I didn't anticipate would be as troublesome as it was. I spent a few days trying out ideas I had and tweaking things but I couldn't get it to work. I could get the text actually displaying in the game using a public string array. But the player could just spam enter to get through the text and several other issues popped up during this process.

I actually looked for help online for this one and someone pointed out to me that I could use "IEnumerator" and a coroutine to get things working. He helped me write this code so I won't pretend that I did it all alone. This is definitely above my skill level. The dialogue script ended up like this.



With this running we have a fully functional game with menus, a cutscene and the actual gameplay! It's been a long project but I'm very satisfied with the end result. I wish I had more time so that I could develop different bosses and areas, maybe even an overworld. But with the time I had I'm more than happy with it! Like I said I'm going to include links to all project files and a link to a video on the last page!

Finished game:

<https://drive.google.com/open?id=1PXvyn0gm1NSAPD05Aik8dEJKK4afDbGI>

Project files:

<https://drive.google.com/open?id=14huPj-1xh9Y9o5MI-5vbM1zGVQW51it1>

Youtube video showcasing the game:

<https://www.youtube.com/watch?v=8Hm1A0U0eHc&feature=youtu.be>