ANALYSIS

Project title: TBD

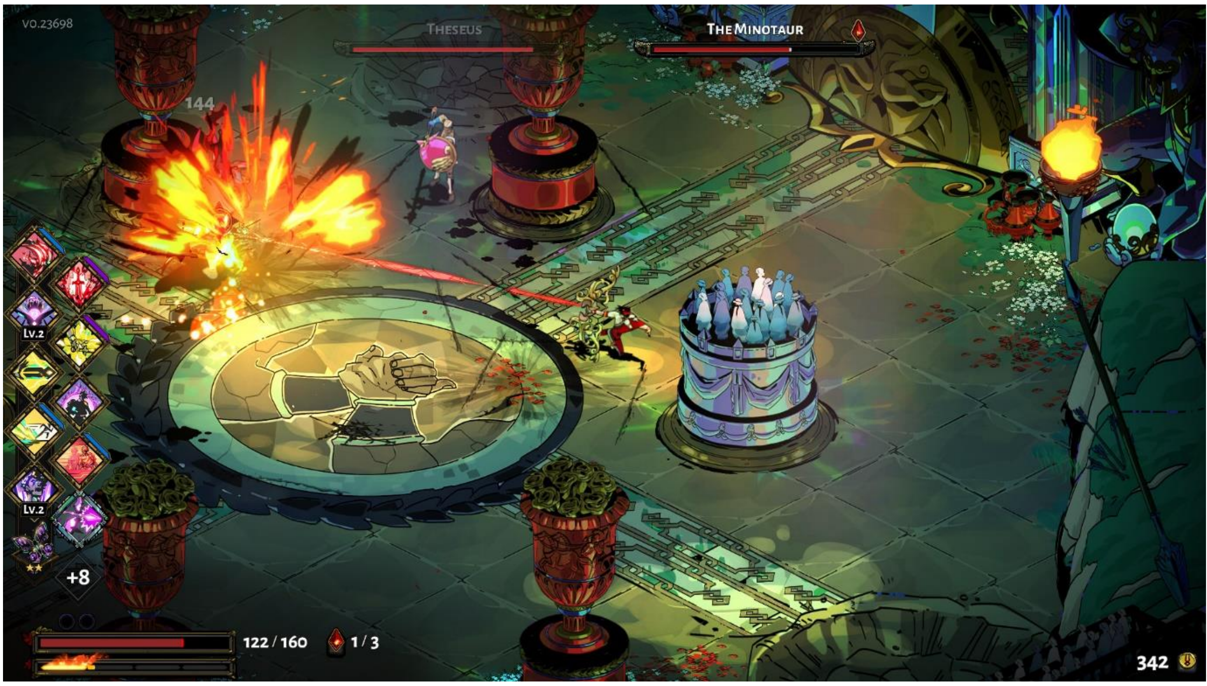
My project will be a 2D side on rougelite in which you battle through procedurally generated rooms trying to reach a final boss. What will set it apart from the other games of this genre will be how you acquire your permeant upgrades as they will be obtained by raising your affinity with the various NPCs that will be littered throughout the game. The game will include a multitude of different bosses of increasing difficulty as you progress through the world. The game would also include a separate area accessed outside of the combat section where you can talk to the NPCs and build up your relationships as well as your build. I believe that this is a promising idea as it would allow for an easier base game that would allow for building harder mechanics on top of the base. To improve the game more characters could be added, or each character could be given longer stories.

There will also be enemies in the rooms that will increase in difficulty the further into the world you get. Which the player will have to defeat before they can progress to the next room.

The game will be developed in unity and developed for PC and so I will be using keyboard input

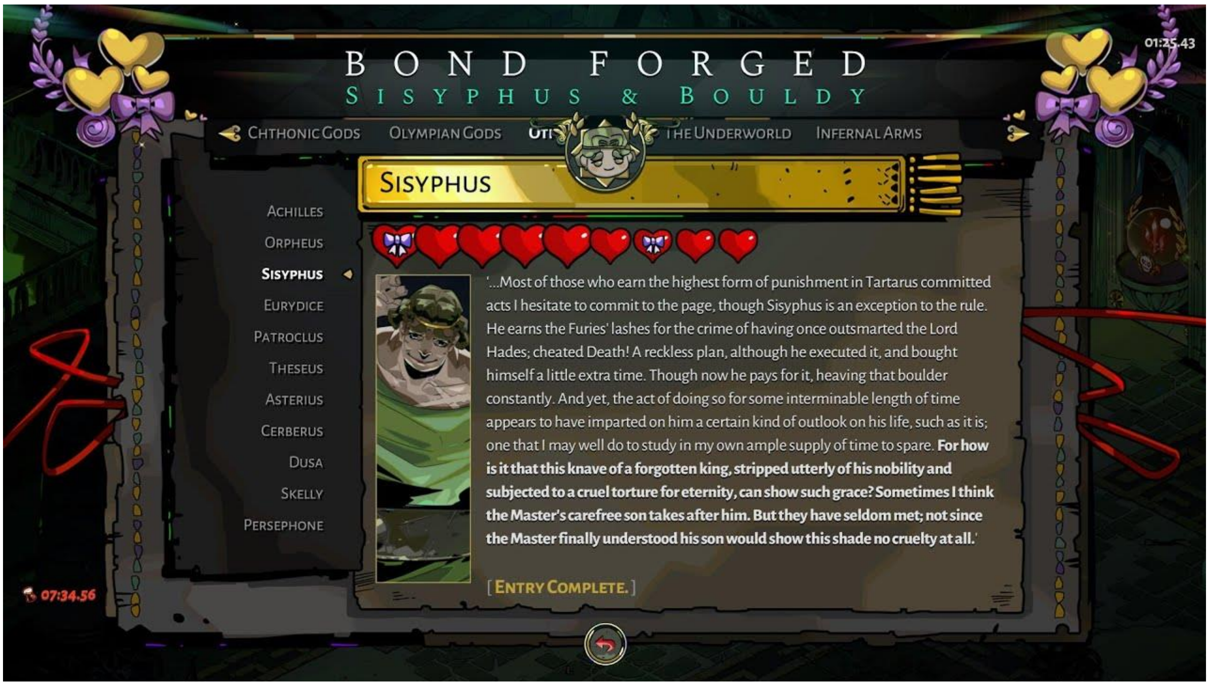
Inspiration

1. Hades



(image from hades steam page)

(Hades guide: The Trial of the Gods)



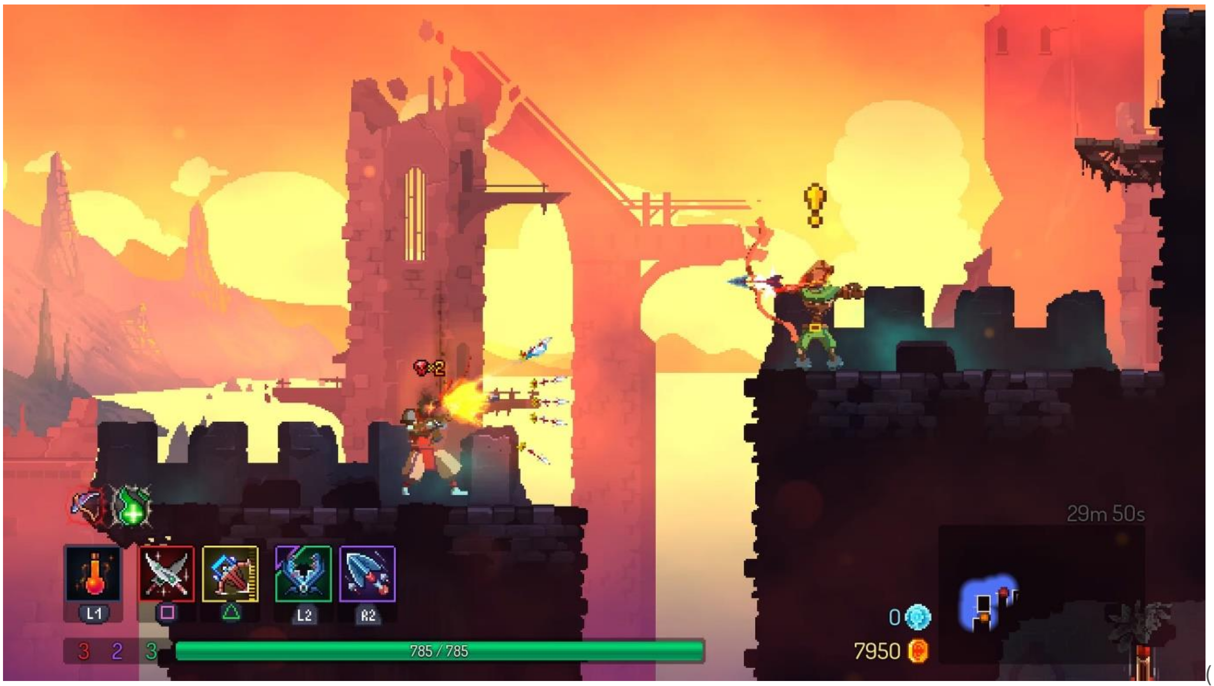
'...Most of those who earn the highest form of punishment in Tartarus committed acts I hesitate to commit to the page, though Sisyphus is an exception to the rule. He earns the Furies' lashes for the crime of having once outsmarted the Lord Hades; cheated Death! A reckless plan, although he executed it, and bought himself a little extra time. Though now he pays for it, heaving that boulder constantly. And yet, the act of doing so for some interminable length of time appears to have imparted on him a certain kind of outlook on his life, such as it is; one that I may well do to study in my own ample supply of time to spare. **For how is it that this knave of a forgotten king, stripped utterly of his nobility and subjected to a cruel torture for eternity, can show such grace? Sometimes I think the Master's carefree son takes after him. But they have seldom met; not since the Master finally understood his son would show this shade no cruelty at all.'**

[ENTRY COMPLETE.]

(HADES - BOND FORGED)

What I want to use	What I will not be carrying forward
I like the level select of hades as it allows for customisability in you run and allows you to choose how the run turns out	I don't want to use the top-down isometric view of the game as it would be harder for me to reproduce and more time consuming
I like the intractability of most of the non-enemy NPCs as it helps build the world around you and makes you feel more included in the story	I also don't like the combat system of the game as for all non-boss enemy's the strategy is to hit them repeatedly as they get stun locked and cannot react leaving little room for improvement in the repeated gameplay
I will be copying over the keepsake system as it is the perfect representation of what I would like the upgrade system of my game to be like	I disliked the fact that only one item is used to build an increase your affinity with each NPC as it makes the relationships feel repetitive

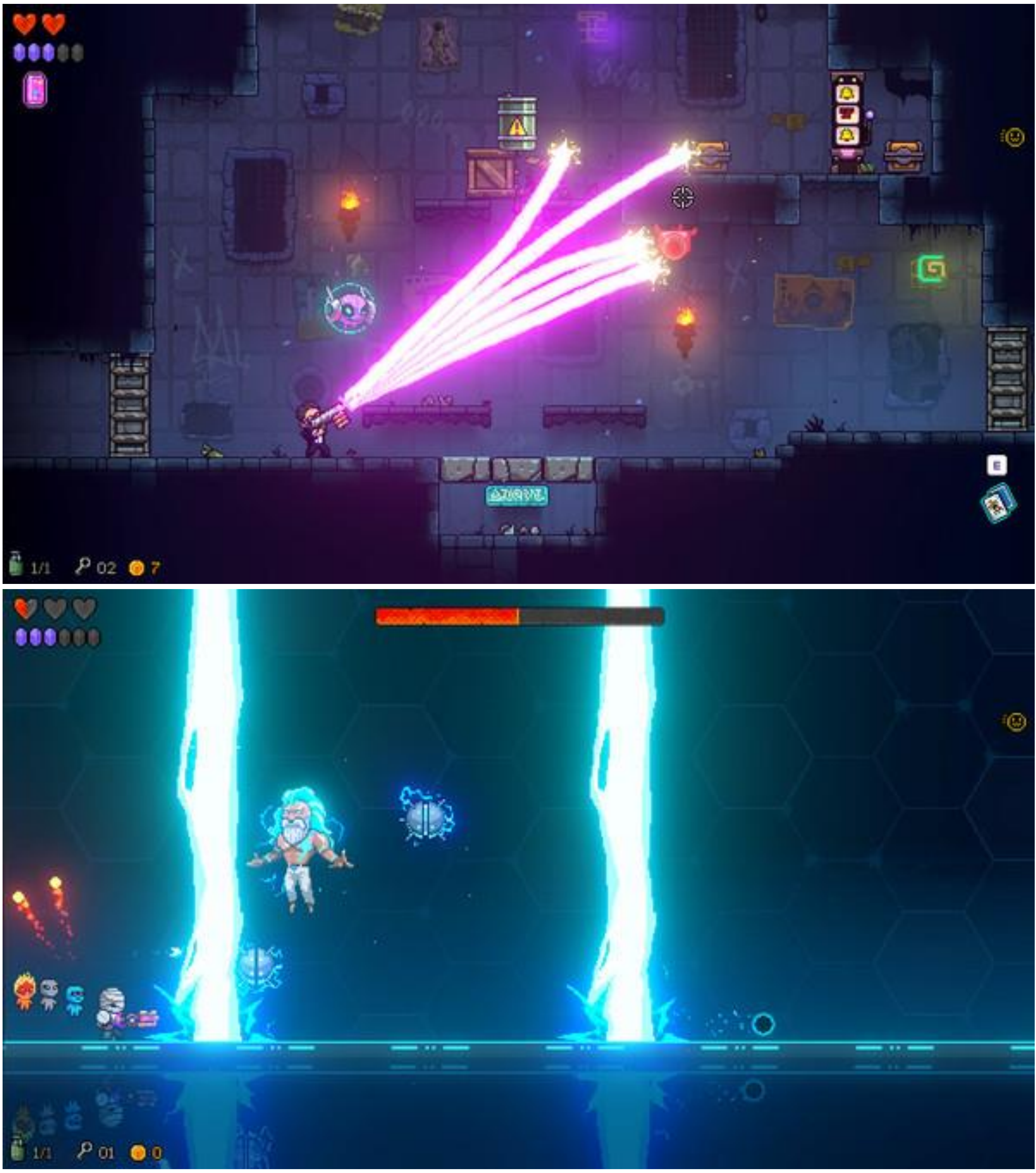
2. Dead cells



(‘Dead Cells’ is a fun way to spend some of your midsummer leisure time - The Washington Post)

What I want to use	What I will not be carrying forward
One of the things I will be using from this game is their 2D side on perspective as it allows me to work more comfortably with the game engine	One of the things I won't be using from dead cells is the map layout as it leaves the whole map open and revisit able at any time and would require the map to not loop back on itself
Another thing I liked about dead cells is the ability to upgrade your weapons during the run or even swap them out for different ones all together	Another thing I won't be bringing over is map unlocks that you get between runs as I want all the map to be accessible from your first run without not realising you aren't able to access a place.
I also liked the fluid movement of dead cells and the way you can smoothly rush between enemy encounters feels exceptionally good and I want to include something like it.	I also won't be using the secondary ability's as it complicates the combat and control scheme as well as not being the friendliest for new players and less experienced players

3. neon abyss



(neon abyss on steam)

What I want to use	What I will not be carrying forward
I like the way the rooms are linked together and the way you flesh out the map as you progress	I don't like the use of ranged weapons as it makes the game feel less smooth in its combat
I like the boss fights that are at the end of each level as they are challenging and exiting	I will not be using the art design as it isn't the kind of atmosphere I want in my game.
I like the variety of rooms that you can encounter as it adds a lot of uniqueness to each run.	I will not be taking inspiration from the multitude of locked items that aren't

	accessible without keys or bombs as they are annoying

STAKEHOLDERS

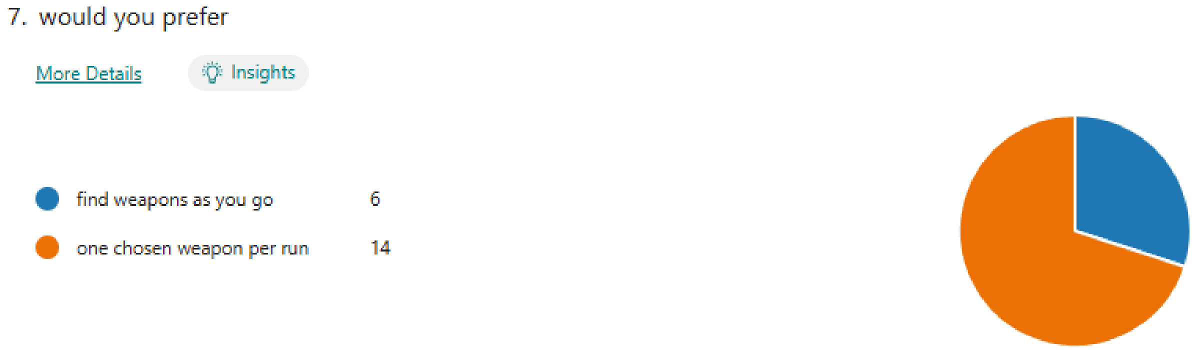
My stakeholders are gamers aged between 16 and 25 of all genders. Specifically aimed at gamers who have played games of the same genre and enjoyed them as well as those who enjoy the story of a game over just focusing on the combat. However, the game isn't limited to these players and could be used by older users as well. This would be well suited to this game as it allows players to relax after a day of studying or working by destressing in a relaxing story-based game or for more experienced players to let out some of their stress on beating up enemies. I will be involving my stakeholders in both my initial design plans by asking them questions on what they would like to see in the game and after development during testing to see what they would like to see improved and which bits of the game they enjoy.

Requirements

Feature	Sub-feature	explanation	justification	importance
levels	At least 2 unique levels each with unique enemies	Level designs that are separate to each other	To reduce repetitiveness and increase playtime multiple levels would be exiting for the players	necessary
	Doors in each room	Doors that lead to the next room	To stop players from blitzing through a level and then being underpowered you won’t be able to progress until you’ve completed your current room	necessary
	Different rewards for each room	Depending on what you want you can go there first	Allows the user to have some choice in what they build and can open ideas for more intricate rooms and rewards and makes each run different to increase replay ability	necessary

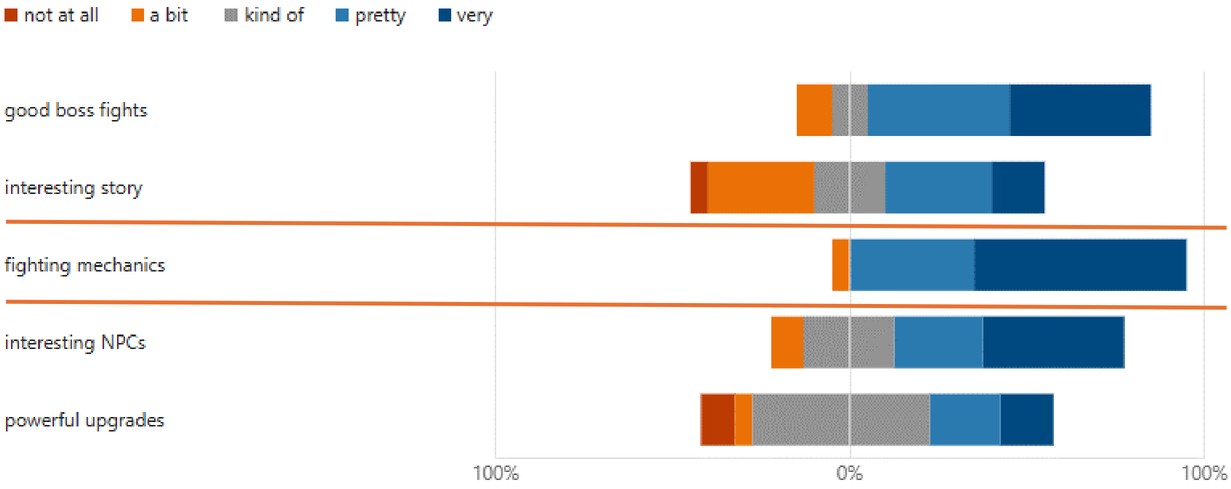
Main menu	Saving/loading saves	Allows player to keep their save between sessions. Multiple slots	Increases player retention and allows for less repetitive gameplay. Also helps with testing as you can edit your save to test out certain parts.	necessary
	Settings button	To allow changing to the settings	Allows me to add accessibility options if I get the opportunity as well as changing the volume of the game	desired
	Quit game button	Closes the program	Allows the player to close the game safely without breaking anything unlike alt+f4	necessary
Tutorial	NPC interaction	Teaches you the basics of talking to the NPCs	To ease the player into the game smoothly to increase enjoyment and understanding of the mechanics	desired
	Enemy fighting	Teaches you the basics of combat		
	Movement	Teaches you the movement controls		

weapons	At least 4 unique weapons	Weapons with different move sets	This increases replay ability and allows for different builds	necessary
	Weapons selection at start of run	Choose one weapon from the 4 to use for that run	Let's you decide how you want to play without having to rely on luck to give you the weapons you want. My stakeholders prefer this over the other option as well	necessary
	normal and special attacks	The ability to use either a normal or a special attack	Allows for more dynamic combat and an enhanced combat system which was a big point in the feedback that I got from my stakeholders	desired



7. would you prefer

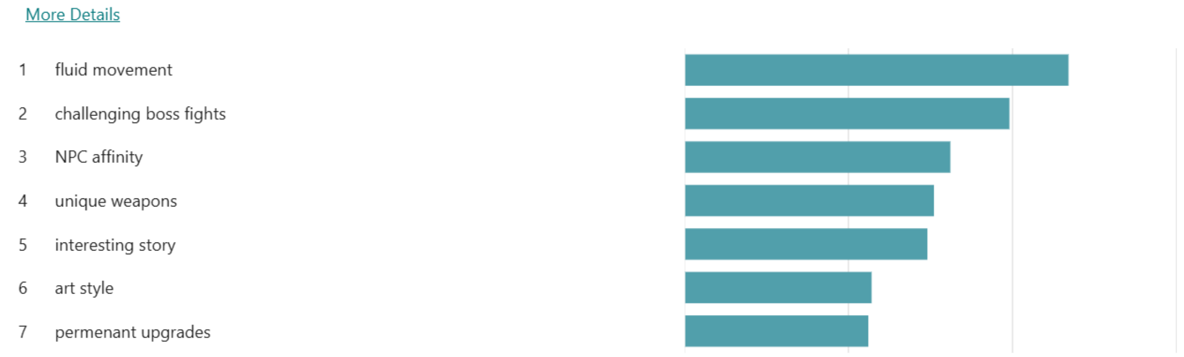
●	find weapons as you go	6
●	one chosen weapon per run	14



NPCs	NPC affinity levels	Shows how much an NPC likes you.	This will be used to allow for permanent upgrades between	necessary

			runs. It was also well received in my user feedback.	
	At least 5 different NPCs	Each with their own name and personality	This gives the game more of a choice element and allows for a more unique experience and increased replay ability.	necessary
	NPC rewards	Upgrades for your character based on affinity levels	This incentivises you to talk to the NPCs and get more invested in the story and for the people who are more invested in the combat aspects of the game gives them a chance to experience the other side	necessary
	Different questlines	Allows you to complete goals on runs to level up affinity	This would be needed to allow for personalised NPC interactions and would allow you to get more invested in the characters and the story	desired

5. which of these mechanics are most important to you



More Details

1 fluid movement

2 challenging boss fights

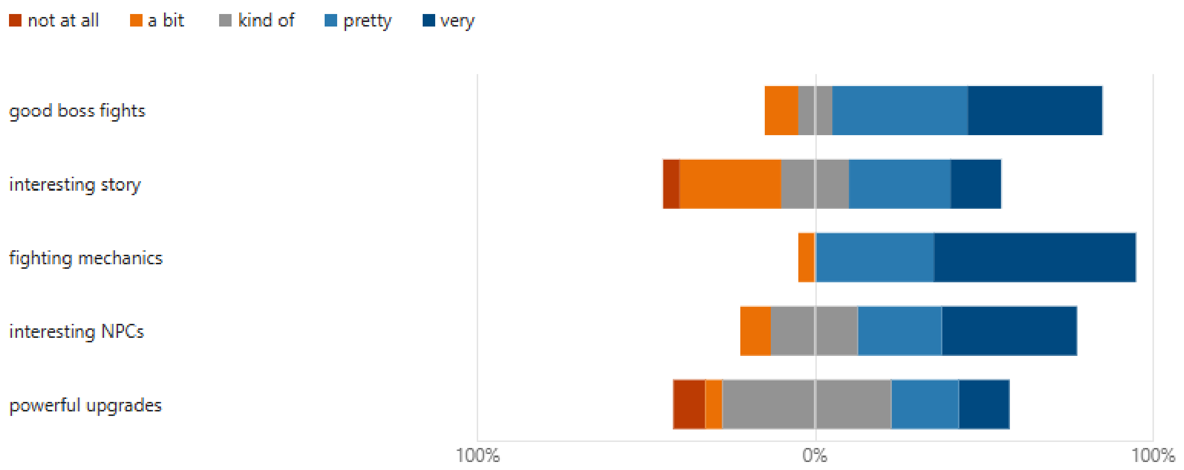
3 NPC affinity

4 unique weapons

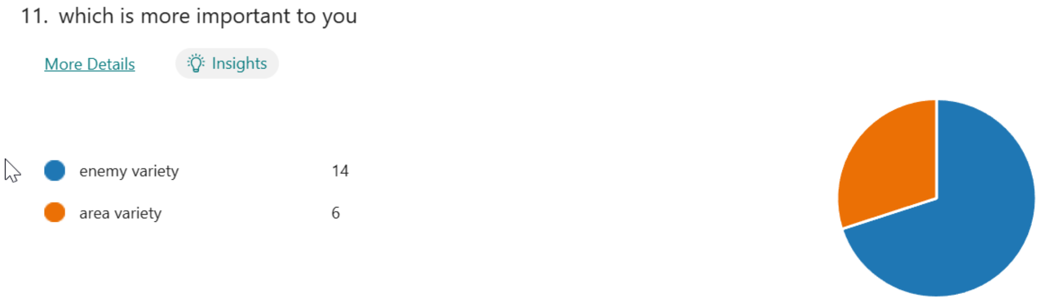
5 interesting story

6 art style

7 permenant upgrades



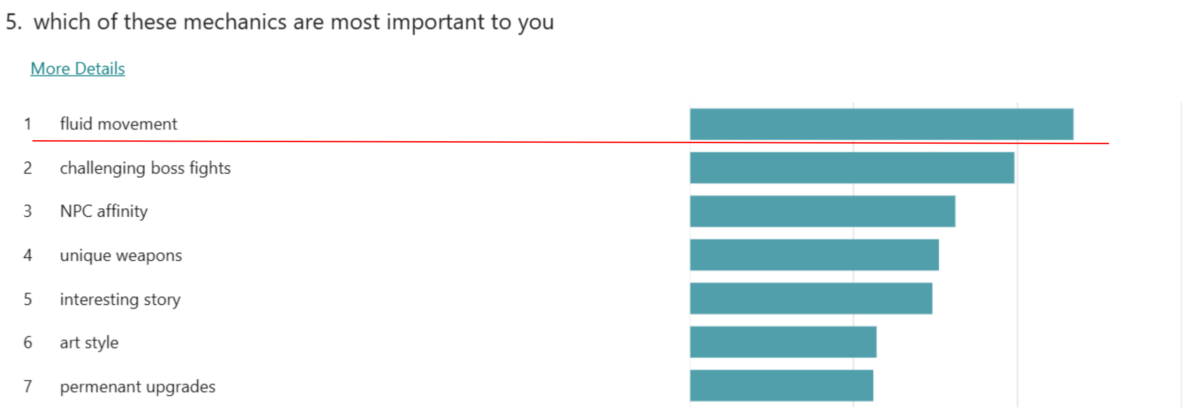
Enemies	Attacks	Would be used to damage the player	Allows for a sense of danger and accomplishment for clearing the rooms	necessary
	Take damage	So that they can be killed	Allows satisfying feedback for the user's actions	necessary
	Have loot	Drop items or currency used for upgrades	Allows for more variance between the enemies and give better rewards for more challenging foes	desired
	Have at least 4 unique types	Each with different sprites and attacks	Players wanted this over level variety and so I will focus more on multiple enemies over levels	necessary



11. which is more important to you

More Details Insights

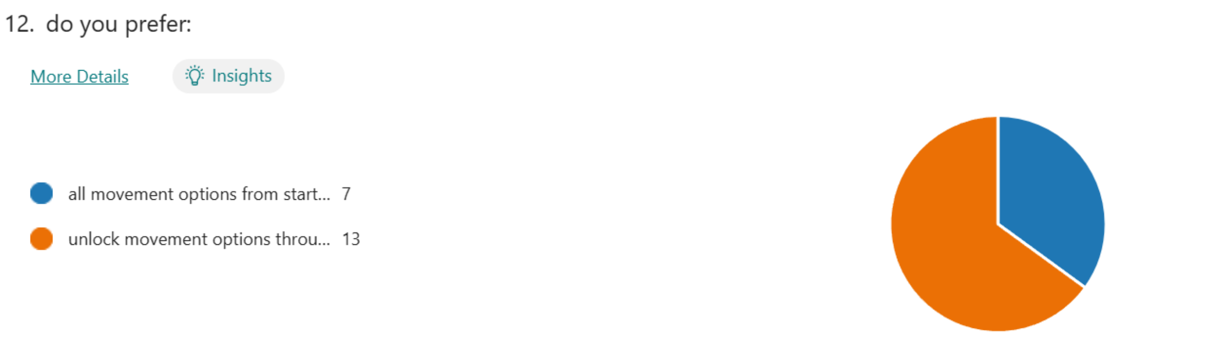
● enemy variety	14
● area variety	6



5. which of these mechanics are most important to you

More Details

1	fluid movement
2	challenging boss fights
3	NPC affinity
4	unique weapons
5	interesting story
6	art style
7	permenant upgrades



12. do you prefer:

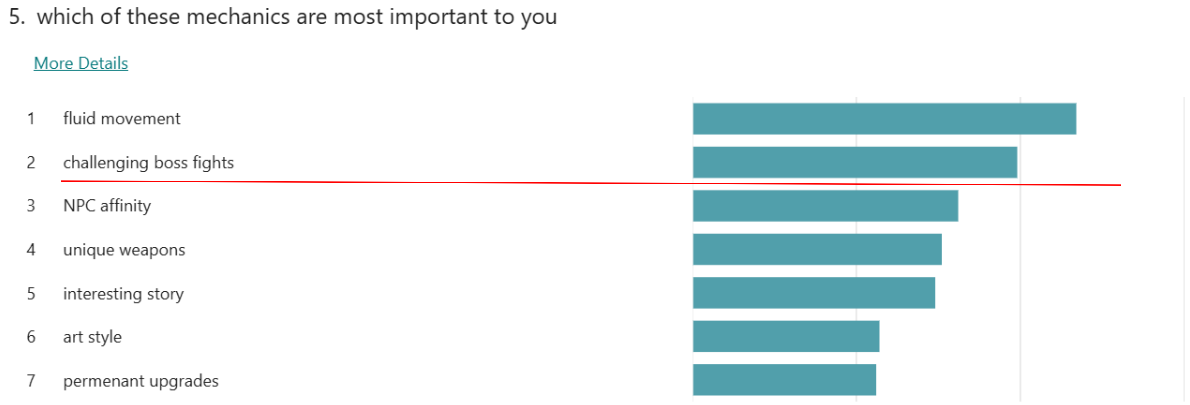
More Details

● all movement options from start... 7

● unlock movement options throu... 13

movement	Make movement fluid	Allow smooth transitions between movement options	Gives the game a more polished feeling and was top of the list of things my target audience wanted	necessary
	Have unlockable upgrades	Ability to acquire new movement options like a double jump or a dash	Allows for a sense of achievement for exploring the game and adds incentive for the players to keep playing. Was preferred over having all of them at the beginning by my stakeholders	necessary
	dodge	Used to evade enemy attacks	Gives more variety to the combat and makes it more engaging as well as adding more depth to boss fights and enemies moves	necessary
Boss fights	Shows up at and of level	Final room at end of level	Adds an extra layer of challenge to the run and gives a substantial	necessary

			ultimate point to the run	
	Has unique move set	At least 4 different attacks	Allows the fights to be entertaining without boring the player and being too hard to remember	necessary
	challenging	Make sure the boss isn’t too easy	Gives a larger sense of accomplishment and was highly requested by my stakeholders	desired
	arena	Give the boss their own separate room	Adds more immersion to the fight and adds to r The user experience	desired
story	Cohesive storyline	Story points that flow into each other	Gives the player a reason to keep playing and had good responses on the stakeholder survey	desired
	Different game endings	Different outcomes based on the players actions	Adds to the replay ability and rewards players for doing their own thing and exploring	Optional



5. which of these mechanics are most important to you

More Details

1 fluid movement

2 challenging boss fights

3 NPC affinity

4 unique weapons

5 interesting story

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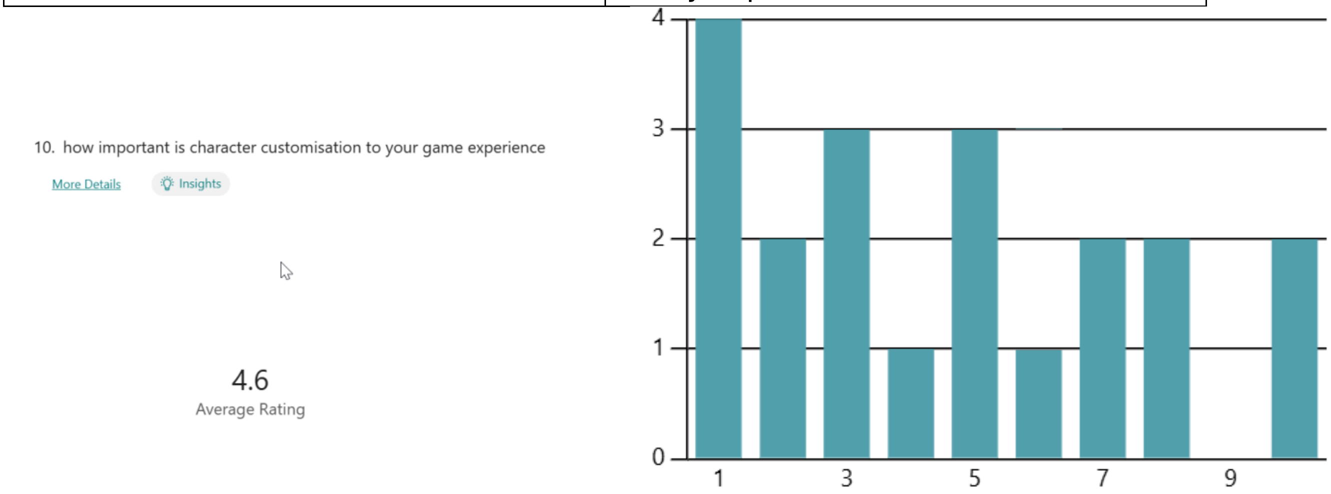
Limitations

limitation	explanation
Level designs	As my stakeholders were more interested in the enemy variety, I won't put too much work into creating lots of unique level designs only one or two as I'm focusing my time more on the enemies
Difficulty settings	Due to my stakeholders saying they want the game to be challenging I will not focus lots of time on making the bosses easier as they don't want that and I would have to make substantial changes to the enemies
Player customisation	As my stakeholders on average didn't really care about the player customisation and it would be extremely hard and time consuming to implement as I'm not a fast artist
multiplayer	As few of my genre of games include multiplayer or online features and these features would require a totally different type of game style, I have chosen not to implement them
Custom sprites and animations	As looks are not assessed and I'm not a particularly good or fast artist I will rely on free assets and won't add many personalised ones unless necessary or all my requirements have been met.



10. how important is character customisation to your game experience

4.6
Average Rating

My Success Criteria

criteria	explanation	justification

At least 2 unique levels each with unique enemies	Level designs that are separate to each other	To dissuade repetitiveness and increase playtime multiple levels would be exiting for the players
At least 4 unique weapons	Weapons with different move sets	This increases replay ability and allows for different builds
Enemies that you can fight for rewards and to progress	Hostile NPCs that will engage in combat with the player to give them a challenge	This will provide a challenge for the player allowing them to enjoy the game and provide a learning curve to the game to increase playtime
NPCs that you can talk to outside of combat	At least 4 different friendly NPCs that the player will help and be helped by over the course of the game	This is the main selling point of the game and so the game must have at least this much
An affinity system with the NPCs to unlock upgrades	A way to unlock new permanent upgrades by growing closer with the NPCs	This is also the main point of the game that sets it apart from other games of the same genre and so must be included. It also allows for the player to get immersed in something outside of combat
Have at least 4 unique enemies	Each with different sprites and attacks	Players wanted this over level variety and so I will focus more on multiple enemies over levels
One final boss	I big enemy with a custom move set and a challenging fight at the end of the level	This will provide a goal for the player and acts as a final point of the game showing that you have made it to the end of the game.
A playable character	A way for the user to interact with the game world	Otherwise, you couldn't play the game
Fluid movement	A system of movement that fells fluid and nice	Gives the game a more polished feeling and was top of the list of things my target audience wanted

Hardware & Software

Hardware

A computer with:

x86 or x64 architecture

DX10, DX11, DX12 or Vulkan capable GPUs

A keyboard and mouse and a screen

software

Windows 10 21H1 or higher

(unity, 2025)

Computational methods

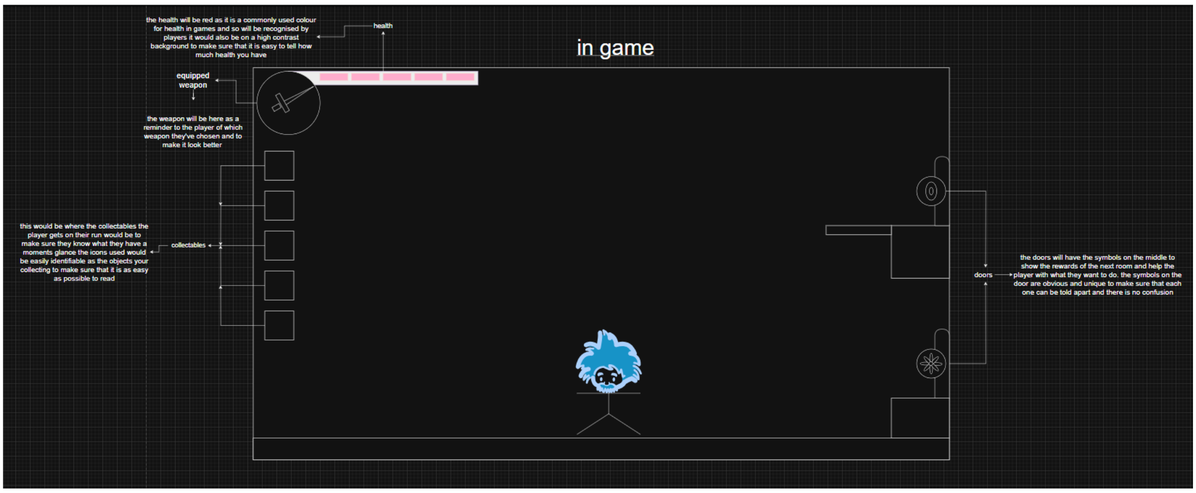
This project is suitable for computation as it uses multiple aspects of computational thinking:

As there will be many things happening at once and so my game will be running them concurrently, this will be used to allow the player and the enemies to be moved at the same time and allow them to interact with each other and the surrounding environment.

I will also be making use of abstraction to allow me to make sure that the game doesn’t has a working version before I move onto adding features that are integral to the game running but are important to the experience. In addition, using abstraction will allow me to develop faster as I can ignore unnecessary parts of a feature and focus first on the main problem like making sure, I have working enemies and attacks before I add the sprites for them. It will also be used to enhance the user experience as the user might not want to always see all parts of the GUI, and I could abstract away the parts that aren’t being used in that situation.

I will be using decomposition to help me with my problems as it will allow me to break the large problem down into smaller pieces to allow me to focus on each one at a time. I can also pair this with abstraction to break down the most important parts of the program and focus on solving those first. I could use it to keep breaking up the smaller problems to allow myself to plan out the whole problem before starting work on it and having to backtrack.

DESIGN



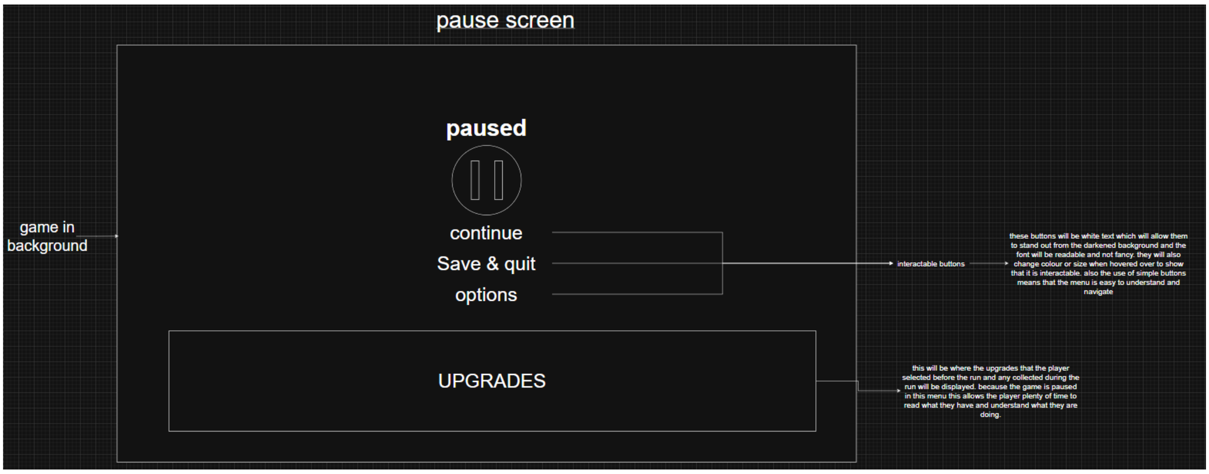
the health will be red as it is a commonly used colour for health in games and so will be recognised by players it would also be on a high contrast background to make sure that it is easy to tell how much health you have

the weapon will be here as a reminder to the player of which weapon they've chosen and to make it look better

this would be where the collectables the player gets on their run would be to make sure they know what they have a moments glance the icons used would be easily identifiable as the objects your collecting to make sure that it is as easy as possible to read

the doors will have the symbols on the middle to show the rewards of the next room and help the player with what they want to do. the symbols on the door are obvious and unique to make sure that each one can be told apart and there is no confusion

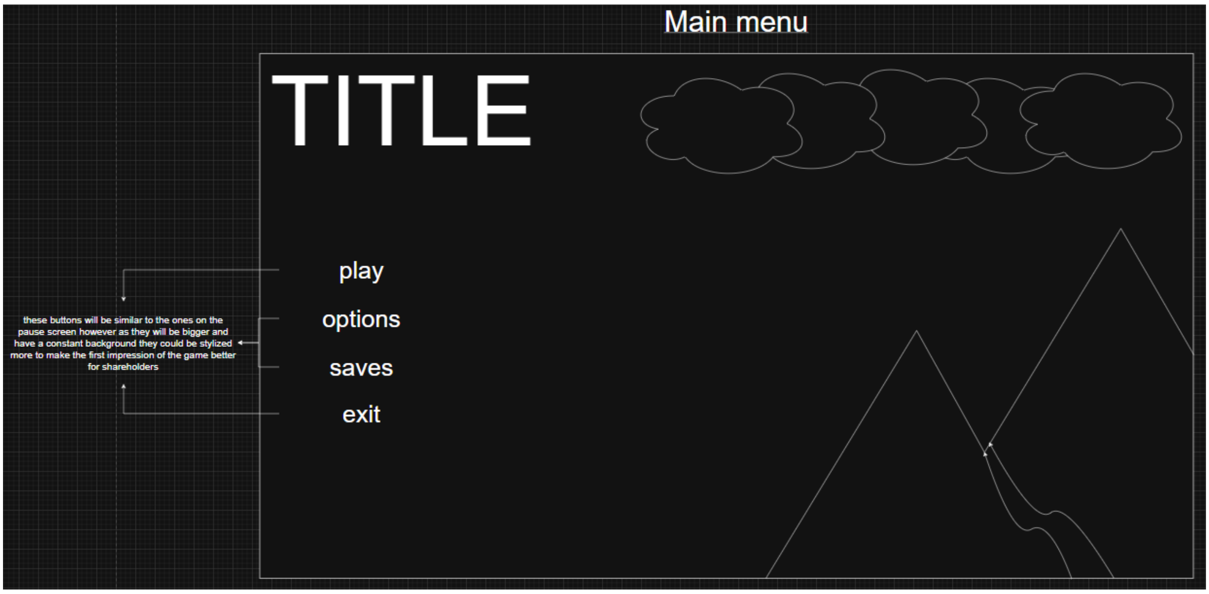
This is the screen for the main game. It has the players health and pickups on the left and is kept minimalistic to reduce distraction from the game with huge overbearing boxes and items. The circle in the top left shows the current weapon to help reduce confusion whilst not annoying the player



these buttons will be white text which will allow them to stand out from the darkened background and the font will be readable and not fancy. they will also change colour or size when hovered over to show that it is interactable. also the use of simple buttons means that the menu is easy to understand and navigate

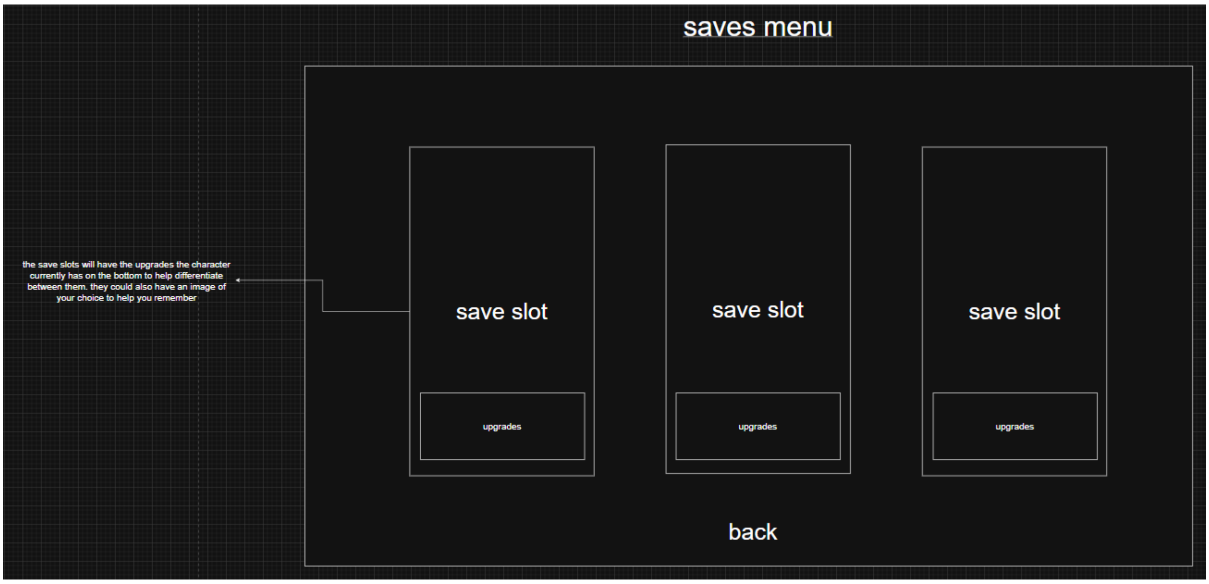
this will be where the upgrades that the player selected before the run and any collected during the run will be displayed. because the game is paused in this menu this allows the player plenty of time to read what they have and understand what they are doing.

This is the pause screen that will popup when the player presses escape which will pause the game and blurs the game in the background to accentuate the buttons. The buttons will be white text to help them stand out and at the bottom are the upgrades the player has aquired and equipped. There here to keep them out of the way whilst playing but easily accessible if the player wants to check them in a run.



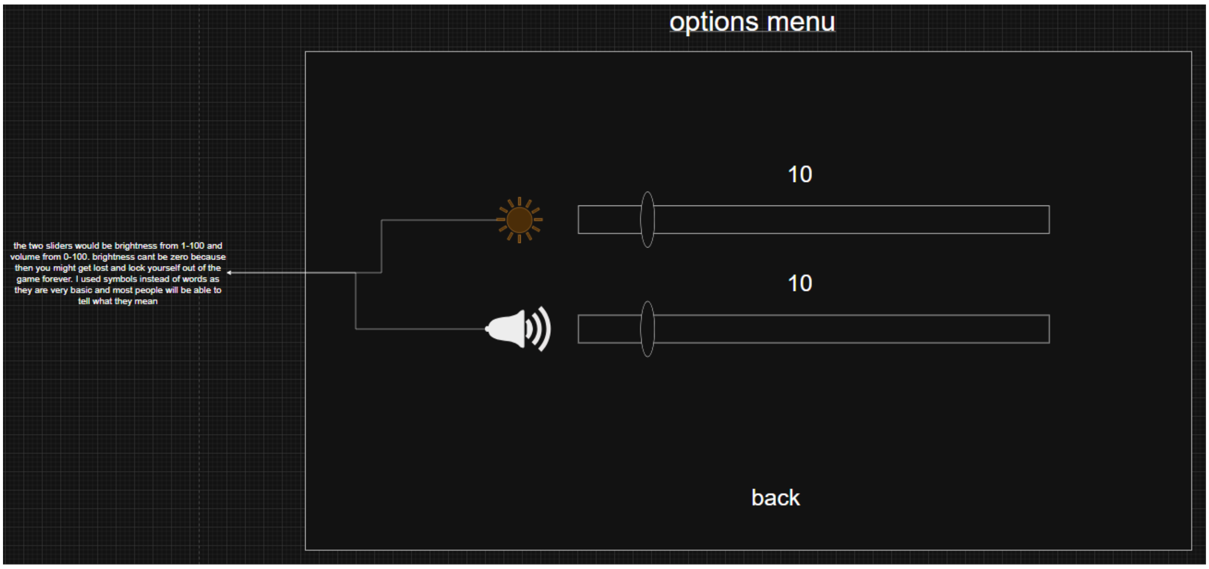
these buttons will be similar to the ones on the pause screen however as they will be bigger and have a constant background they could be stylized more to make the first impression of the game better for shareholders

This is the first menu the player will see when they boot into the game and the screen they see when they come back to the game. As so i will make sure that it looks good. I will have an image in the background and good-looking buttons for the options on the left. As well as the title on the top.



the save slots will have the upgrades the character currently has on the bottom to help differentiate between them. they could also have an image of your choice to help you remember

The game will have 3 save slots which will display major achievements and progress by showing them via images on the bottom of the slot.



the two sliders would be brightness from 1-100 and volume from 0-100. brightness cant be zero because then you might get lost and lock yourself out of the game forever. I used symbols instead of words as they are very basic and most people will be able to tell what they mean

This will be where the settings are and as there arent many it will only be one page with both on. Volume can go to zero to mute the game, but brightness can't as it would lock you out of the game forever.

Stages of development

Stage 1: player

In this stage I will create the player and the players movement. As they are both needed to test each other out this and stage 1 may have to be developed simultaneously this also means that these two must be developed together. They are the first two because everything else in the game is built off one of these two concepts. These first two stages should only take 1-2 weeks

Test	Expected outcome	Actual outcome	pass/fail
Pressing the a key	Move the player left		
Pressing the d key	Move player right		
Pressing jump key	Player jumps		
Pressing dash key	Player dashes		

Player animations	Player animations play at the right time and in the right order		

Stage 2: combat world

This is where I will create the world the player will be fighting in including the multiple rooms and transitions

Test	Expected outcome	Actual outcome	pass/fail
Generating the world	World generates with linked rooms		
Moving between rooms	Stepping into the transition moves you to the room linked to that transition		
Different rewards for each room	Each door has a different reward to all the others in the same room		

Stage 3: menus

This is where I will make the non-gameplay menus where the player can adjust volume or save their game. They will be made next as this allows me to save my progress for testing and will save lots of time in the long run. This should be working within a week or two

Test	Expected outcome	Actual outcome	pass/fail
Pressing the escape key	The pause menu will be displayed		
Pressing the options button in the pause menu	Open the options menu		
Pressing the return button in the pause menu	Un pause the game and close menu		
Pressing the save & quit button in the pause menu	Saves and returns the main menu		
Presing the exit button in the main menu	Closes the game safely		
Pressing the saves button in the main menu	Oppens the save menu		

Opening a new save	Create a new game assigned to this save slot and boot it.		
Opening a preexisting save	Load into the last saved version of this save.		

Stage 4: weapons

This is where I will create the weapons and attacks the player will use against the enemies, I would put these next as they relate to the combat section already produced and allows for the testing of the next two stages. These should take 2 weeks at most.

Test	Expected outcome	Actual outcome	pass/fail
Attack button pressed	Do a quick attack		
Attack button held	Do a heavy attack		

Stage 5: enemies

This is where the base enemies the player fights against during their run will be made including their attacks and what they will reward the player with for defeating them. I will develop these here as it feels best to complete one world before moving on to the other and are more important than will then allow the testing of upgrades for the weapons. These also should only take 2 weeks

Test	Expected outcome	Actual outcome	pass/fail
Enemies' movement	Enemies move		
Enemies' attacks	Enemies can attack and do deal damage		
Enemies AI	Enemies try to get close to player and do different attacks		

Stage 6: upgrades

This is where I will create the upgrades the player can equip and modifications the player can do to their weapons like higher damage but slower or less range. I would put this stage next as it is the last part of the combat world and isn't needed for any of the previous parts so won't be missed allowing for a smooth programming flow. These should be easier than the weapons so should on take 2-2.5 weeks

Test	Expected outcome	Actual outcome	pass/fail

Player picks an upgrade	Upgrade is added to possible upgrades		
Player uses upgrade	Upgrades affect is produced		
Player equips upgrade	Upgrade can now be used and is added to equipped upgrades		
Player removes upgrade	Upgrade can no longer be used and is unequipped		

Stage 7: non-combat world

This is where the world the player returns to after they fail a run and where they will acquire the upgrades from the NPCs that live there and be given quests to increase their friendship. This is being put next as it is needed for the NPCs to live in and so must be completed before them. This should only take 1 week as it's not very technical with little programming

Test	Expected outcome	Actual outcome	pass/fail
Going into the world			
Leaving the world			
Changing upgrades			

Stage 8: interactable NPC

This is where I will make the NPCs that reward you from your quests including their dialogue. This is second to last as it shouldn't be too hard and has multiple assets that require other stages to have been completed first to even start working on. This is another big portion of the game so should be given 2.5-3 weeks.

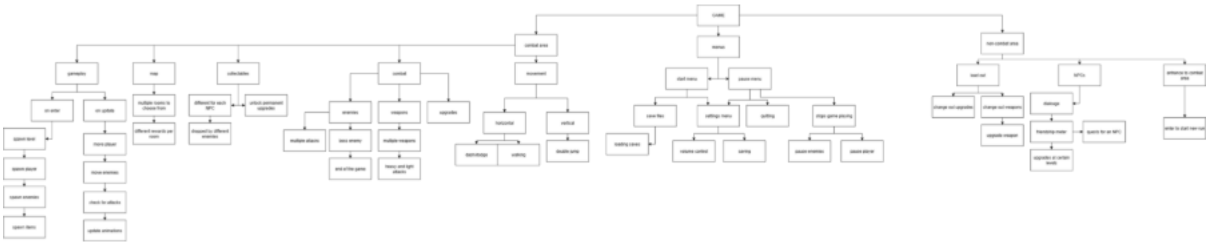
Test	Expected outcome	Actual outcome	pass/fail
Talking to NPC	Appropriate dialogue		
Getting quest from NPC	Quest is given and added to ongoing quests list		
Completing quest	Quest is removed from list and rewards are given		
Adding new NPC	New NPC now spawns when you go to the camp		
Becoming friends with NPC	NPC gives player an upgrade		

Stage 9: boss & ending

This is where I will make the final boss of the game that will have to be defeated to finish the game. This will include multiple attacks and phases. I am putting this last as it seems like it could be complicated and isn't completely necessary for any of the other stages. This could be hard and so should be given 1-1.5 weeks at is only one enemy

Test	Expected outcome	Actual outcome	pass/fail
Boss movement	boss moves		
Boss attacks	boss can attack and do deal damage		
boss AI	Boss trys to get close to player and do different attacks		

Structure diagram

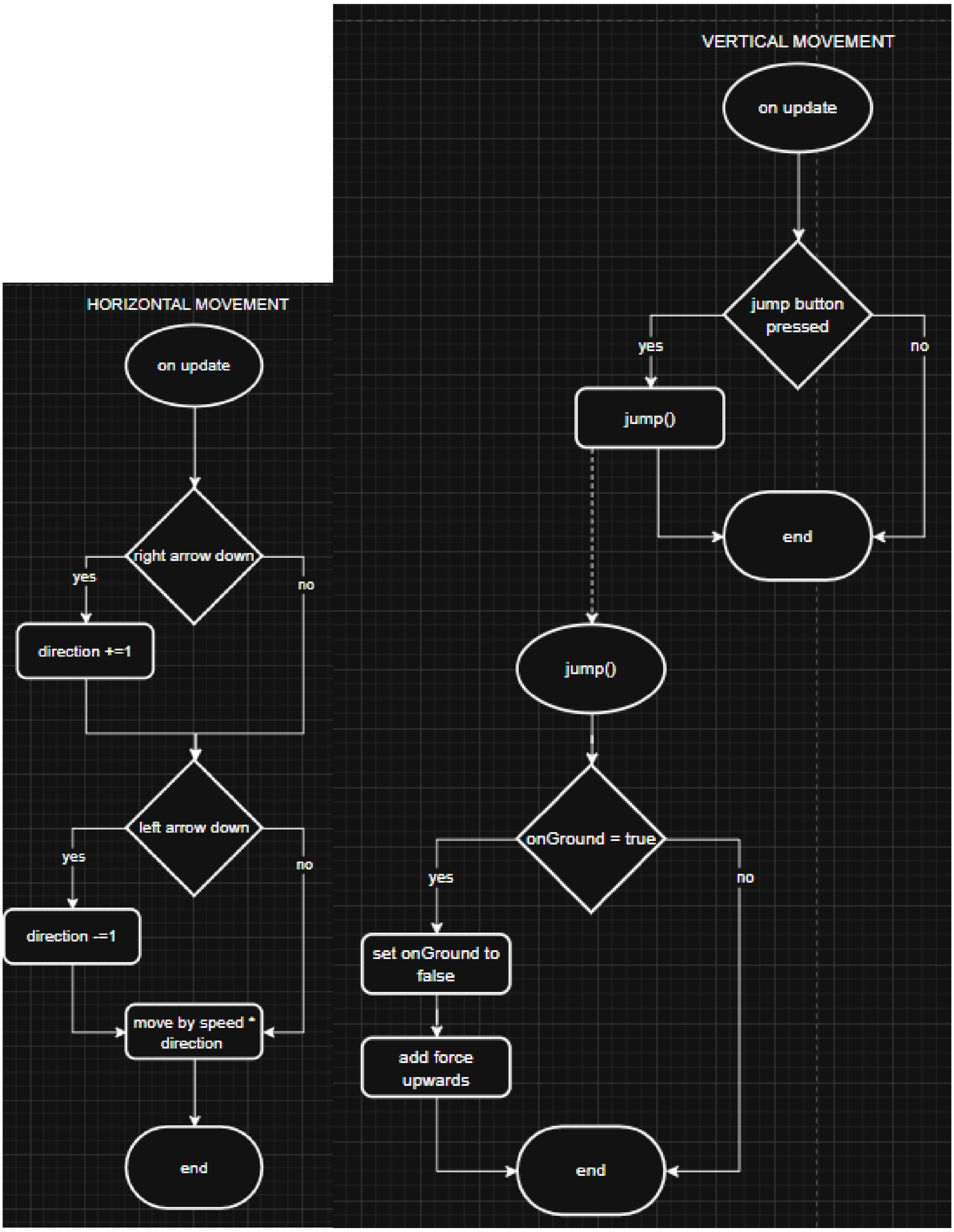


STAGE 1

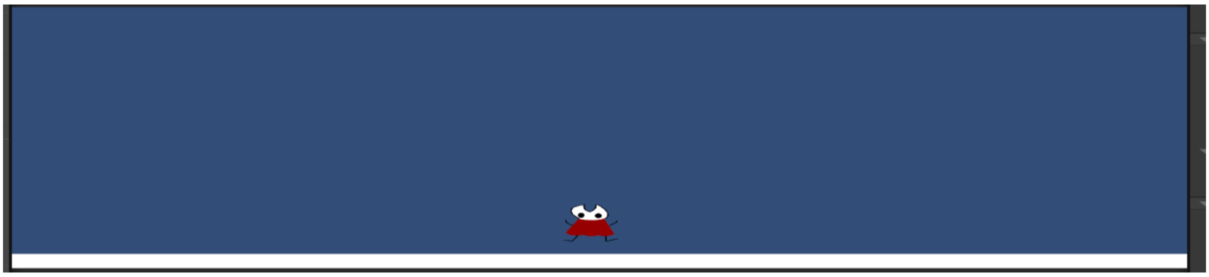
This is the stage in which I develop the players movement as without this there isn't anything else that could be done as the player is the centre of the whole game. I will add a player with a sprite that can be moved by the movement controls built into unity (w,a,s,d and arrow keys). Then the camera will be centred on the player so that they can never go off screen.

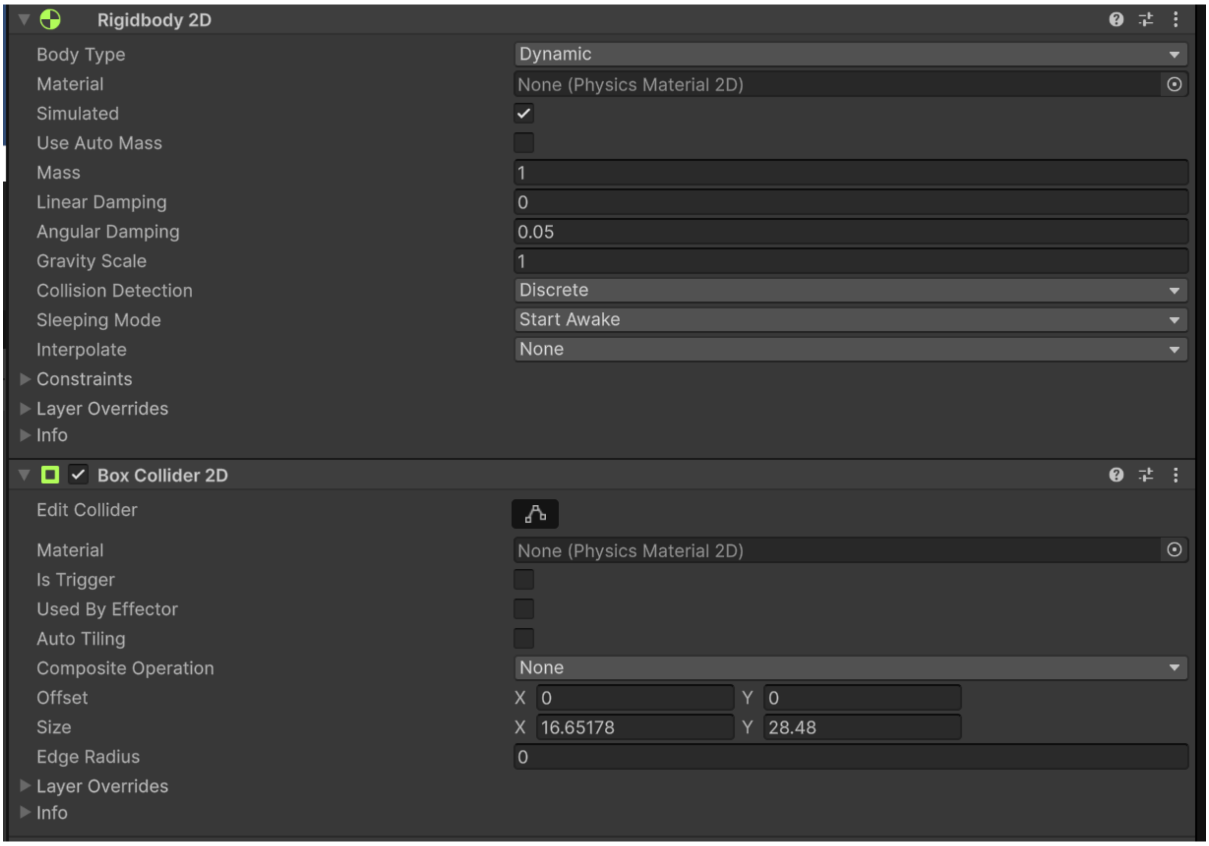
Player Class diagram
-moveDirection: int -Grounded: bool -speed: int
+setGrounded() -move() -jump()

Here are the flow charts for how the player will be moving around:



I started by adding the player sprites and a floor to stand on and giving them hitboxes so that they could interact. (sprites are temporary)





Rigidbody 2D

Body Type	Dynamic
Material	None (Physics Material 2D)
Simulated	☑
Use Auto Mass	□
Mass	1
Linear Damping	0
Angular Damping	0.05
Gravity Scale	1
Collision Detection	Discrete
Sleeping Mode	Start Awake
Interpolate	None

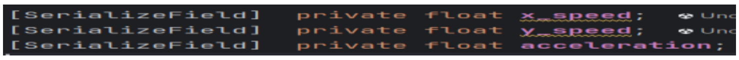
▶ Constraints
▶ Layer Overrides
▶ Info

☑ Box Collider 2D

Edit Collider	
Material	None (Physics Material 2D)
Is Trigger	□
Used By Effector	□
Auto Tiling	□
Composite Operation	None
Offset	X 0 Y 0
Size	X 16.65178 Y 28.48
Edge Radius	0

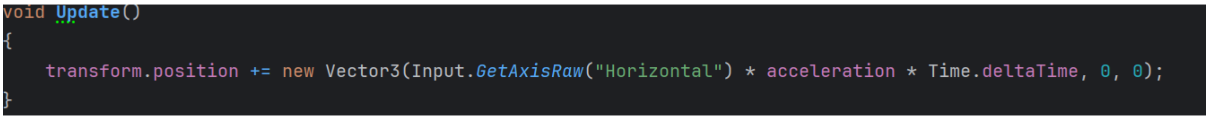
▶ Layer Overrides
▶ Info

I then added a script to the player and started by initialising the variable



```
[SerializeField]  private float x_speed;    Unc
[SerializeField]  private float y_speed;    Unc
[SerializeField]  private float acceleration;
```

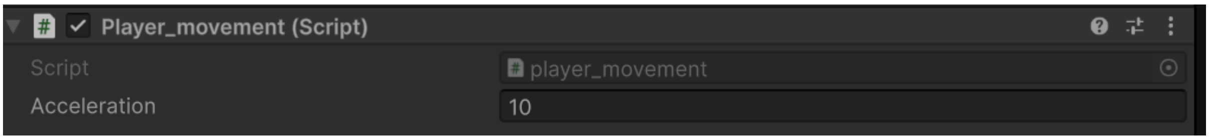
I then added this line for horizontal movement



```
void Update()
{
    transform.position += new Vector3(Input.GetAxisRaw("Horizontal") * acceleration * Time.deltaTime, 0, 0);
}
```

I used this code for movement as it is simple and works for multiple control schemes and so can be used by lots of people.

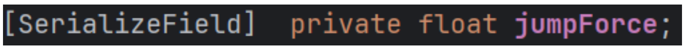
But when I tried to use it, I couldn't move. This was because when initialising acceleration, I forgot to give it a value meaning I was multiplying by zero which I fixed by giving it a value.



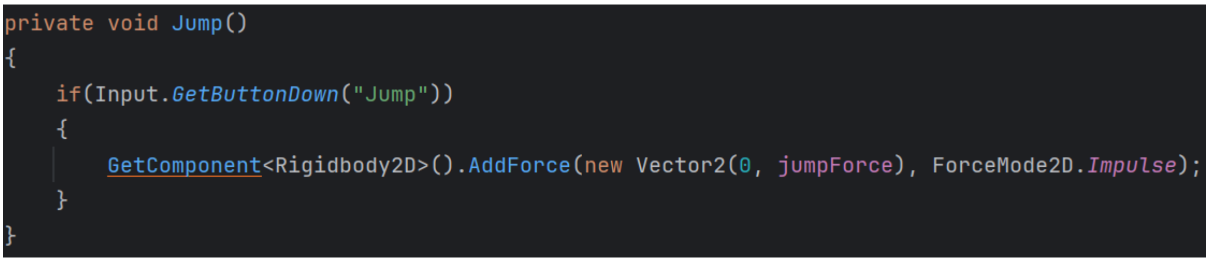
☑ Player_movement (Script)

Script	player_movement
Acceleration	10

After that I made the coroutine for jumping and added the variable jumpForce.

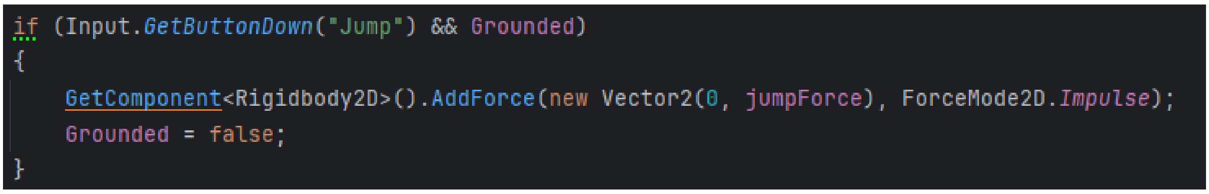


```
[SerializeField]  private float jumpForce;
```



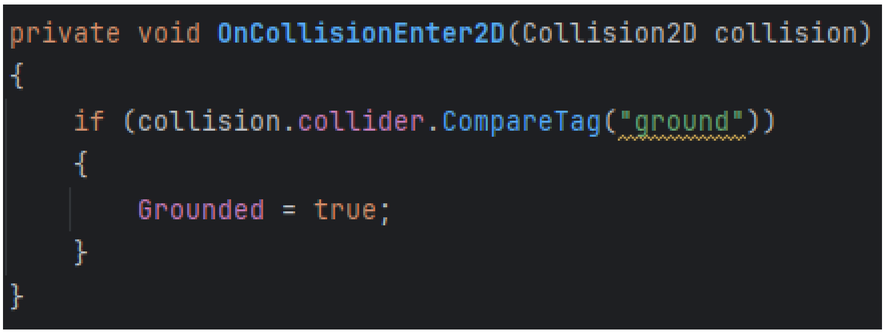
```
private void Jump()
{
    if(Input.GetButtonDown("Jump"))
    {
        GetComponent<Rigidbody2D>().AddForce(new Vector2(0, jumpForce), ForceMode2D.Impulse);
    }
}
```

The biggest problem was that you could jump anytime even in the air. I fixed this by adding a grounded variable that sets to true when on the ground.



```
if (Input.GetButtonDown("Jump") && Grounded)
{
    GetComponent<Rigidbody2D>().AddForce(new Vector2(0, jumpForce), ForceMode2D.Impulse);
    Grounded = false;
}
```

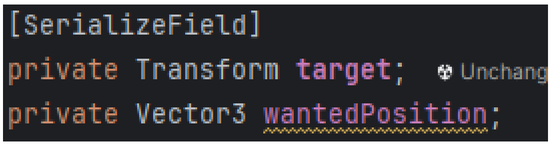
And code that sets grounded to true when you touch the ground. Ive done it this way so that in future any new ground can be made into floor just by adding a tag.



```
private void OnCollisionEnter2D(Collision2D collision)
{
    if (collision.collider.CompareTag("ground"))
    {
        Grounded = true;
    }
}
```

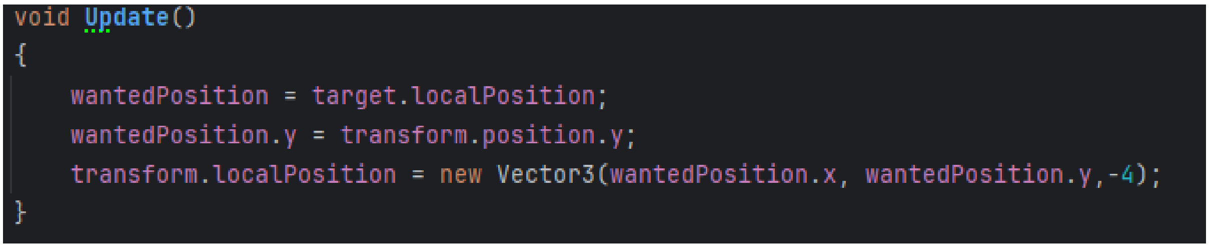
After that I wanted to make the camera follow the player so that they would always be in the centre of the screen.

I started by initialising the variables for what to follow and where to go.



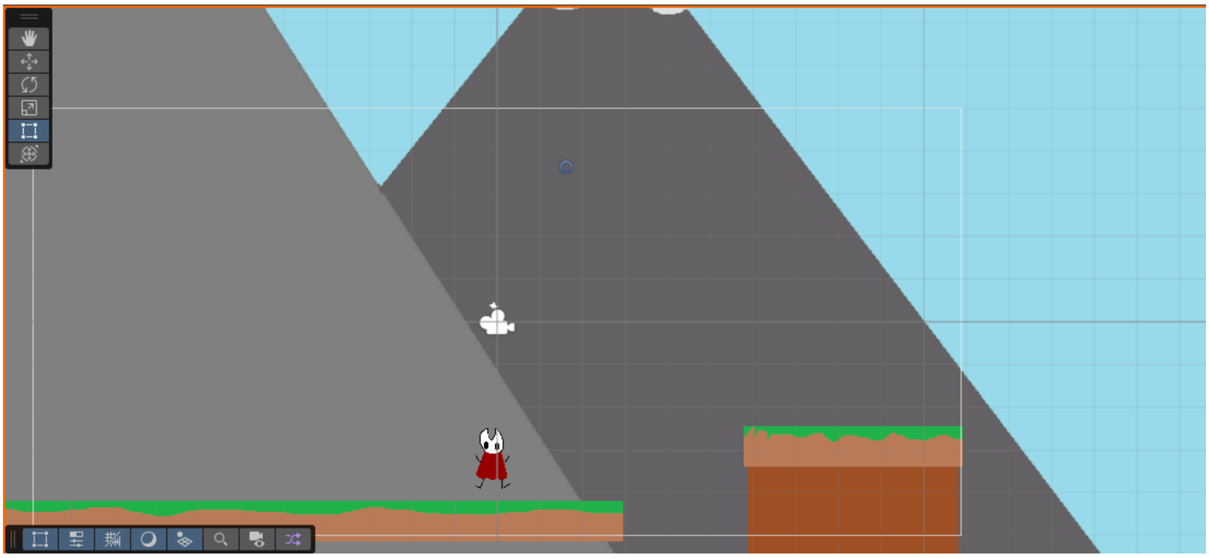
```
[SerializeField]
private Transform target;  Unchang
private Vector3 wantedPosition;
```

I then wrote code that gets the targets position and modifies it so that they look good in the camera. It then goes to the new position.

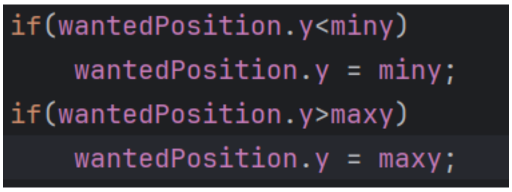


```
void Update()
{
    wantedPosition = target.localPosition;
    wantedPosition.y = transform.position.y;
    transform.localPosition = new Vector3(wantedPosition.x, wantedPosition.y,-4);
}
```

I then proceeded to add some ground and more sprites that I drew for testing



Next I wanted the camera to follow the player up and down but not show the areas under the ground platform i did this by adding limits to the y movement of the camera instead of locking it to one height



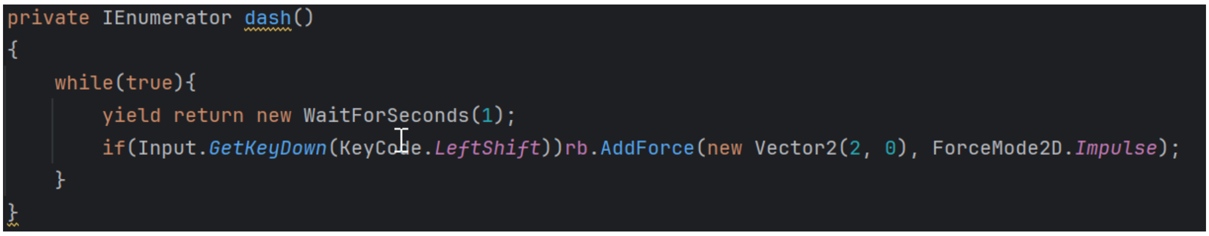
```
if(wantedPosition.y<miny)
    wantedPosition.y = miny;
if(wantedPosition.y>maxy)
    wantedPosition.y = maxy;
```

This sets the height of the camera to the minimum or maximum height if it overrides it.

Which works well.

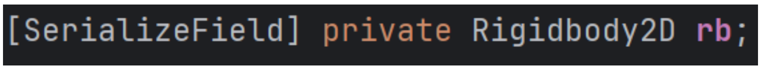
The last coding part of this phase was the dash. This would need to have a cooldown.

I tried to do this with a IEnumerator and the same code for jumping but that didn't work and would multiply the force each time you dashed for some reason

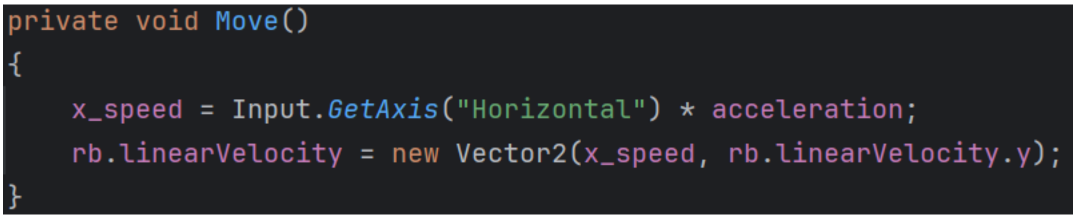


```
private IEnumerator dash()
{
    while(true){
        yield return new WaitForSeconds(1);
        if(Input.GetKeyDown(KeyCode.LeftShift))rb.AddForce(new Vector2(2, 0), ForceMode2D.Impulse);
    }
}
```

To fix this I made a new system for movement including x_speed and y_speed that would make it easier to do things like dashing in the future and allows you to control them separately.

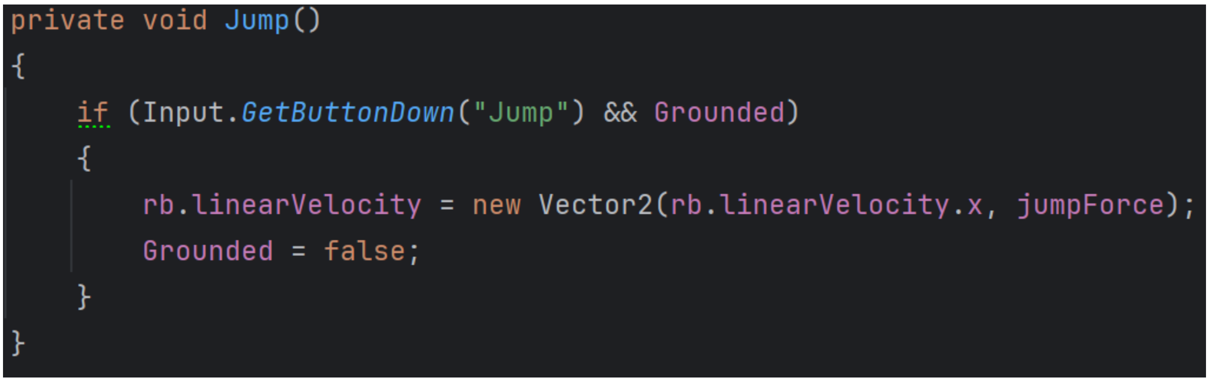


```
[SerializeField] private Rigidbody2D rb;
```



```
private void Move()
{
    x_speed = Input.GetAxis("Horizontal") * acceleration;
    rb.linearVelocity = new Vector2(x_speed, rb.linearVelocity.y);
}
```

Instead of moving the player in increments the new code will add a speed in one direction or the other.

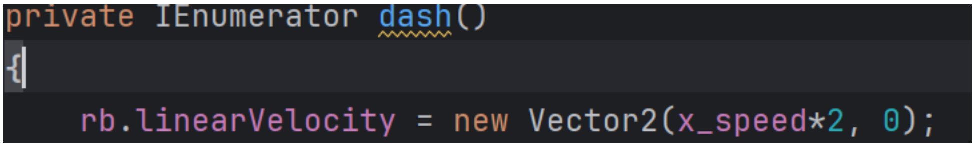


```
private void Jump()
{
    if (Input.GetButtonDown("Jump") && Grounded)
    {
        rb.linearVelocity = new Vector2(rb.linearVelocity.x, jumpForce);
        Grounded = false;
    }
}
```

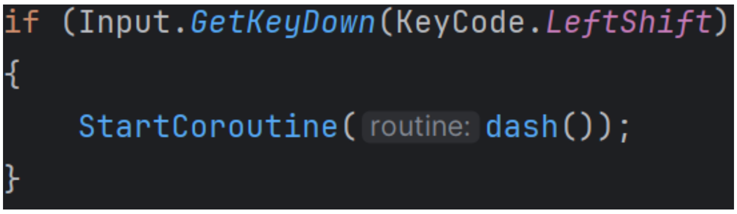
This is the same for jumping as the velocity is decreased by gravity.

Now its dashing time:

For dashing all I did was change the x velocity to 2 times the max speed

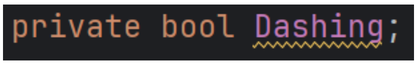


```
private IEnumerator dash()
{
    rb.linearVelocity = new Vector2(x_speed*2, 0);
```

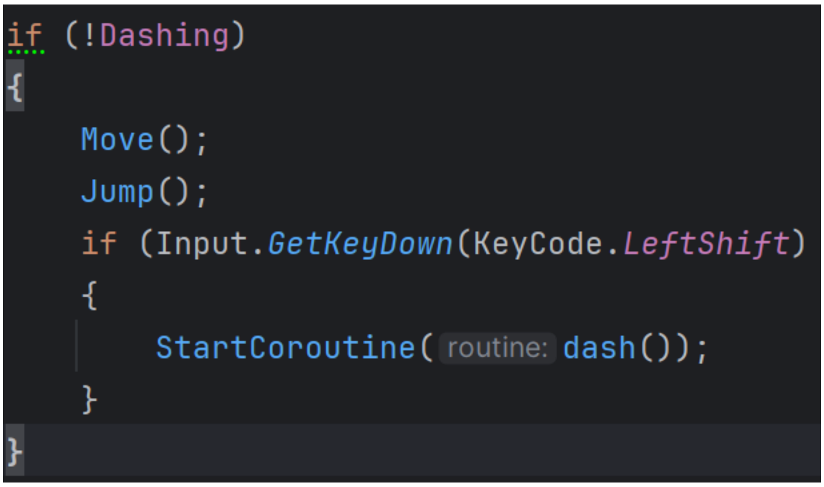


```
if (Input.GetKeyDown(KeyCode.LeftShift))
{
    StartCoroutine( routine: dash());
}
```

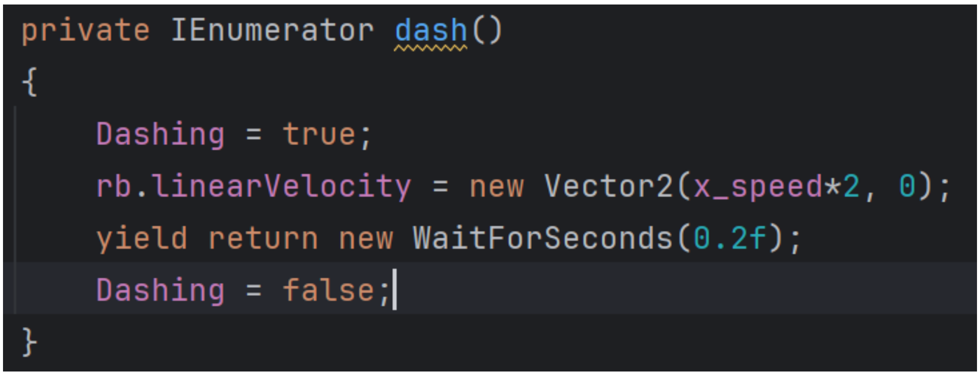
This didn't work because the frame after you dashed it would set the speed back to normal. I fixed this by only running the movement scripts if you weren't dashing as well as adding a timer for the dash.



```
private bool Dashing;
```

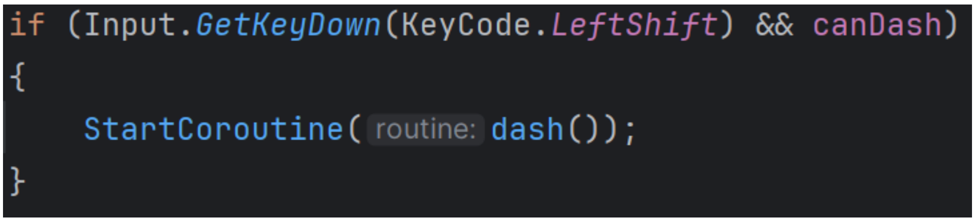


```
if (!Dashing)
{
    Move();
    Jump();
    if (Input.GetKeyDown(KeyCode.LeftShift))
    {
        StartCoroutine( routine: dash());
    }
}
```

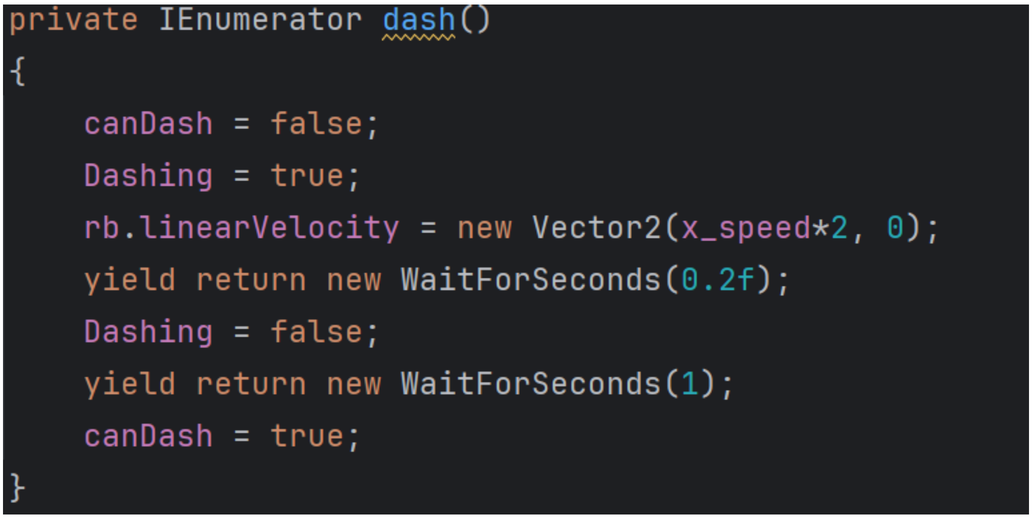


```
private IEnumerator dash()
{
    Dashing = true;
    rb.linearVelocity = new Vector2(x_speed*2, 0);
    yield return new WaitForSeconds(0.2f);
    Dashing = false;
}
```

After that I needed to add a cooldown to the dash which I did by adding a wait for one second and a can dash variable



```
if (Input.GetKeyDown(KeyCode.LeftShift) && canDash)
{
    StartCoroutine( routine: dash());
}
```



```
private IEnumerator dash()
{
    canDash = false;
    Dashing = true;
    rb.linearVelocity = new Vector2(x_speed*2, 0);
    yield return new WaitForSeconds(0.2f);
    Dashing = false;
    yield return new WaitForSeconds(1);
    canDash = true;
}
```

This makes the player wait one second before they can dash again.

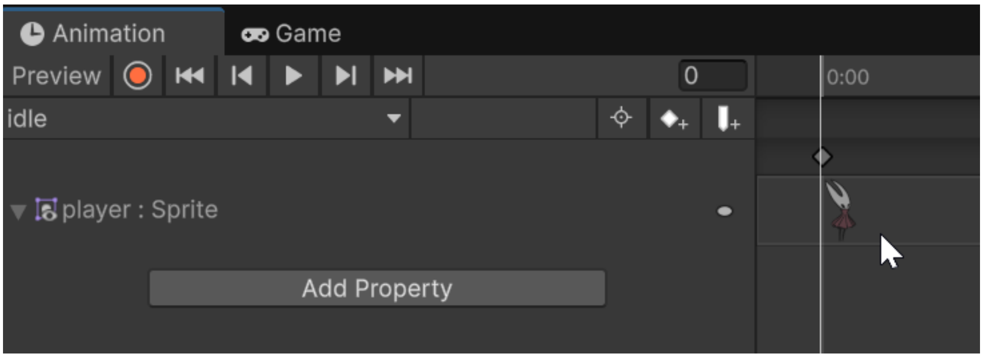
Finaly, I wanted to give it a floating effect and so as the player dashes, I removed the gravity of the player to make a straight dash.

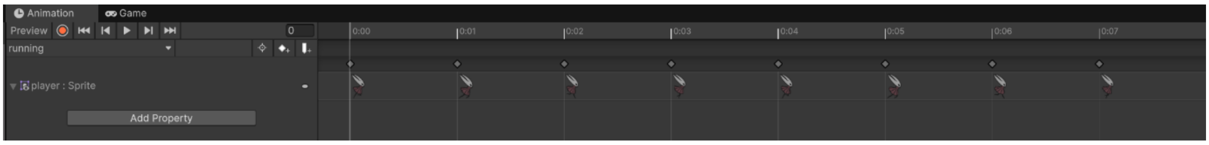
Now that the code was done, I needed to add animations:

For now, I will be using sprites from Hollow Knight: silksong

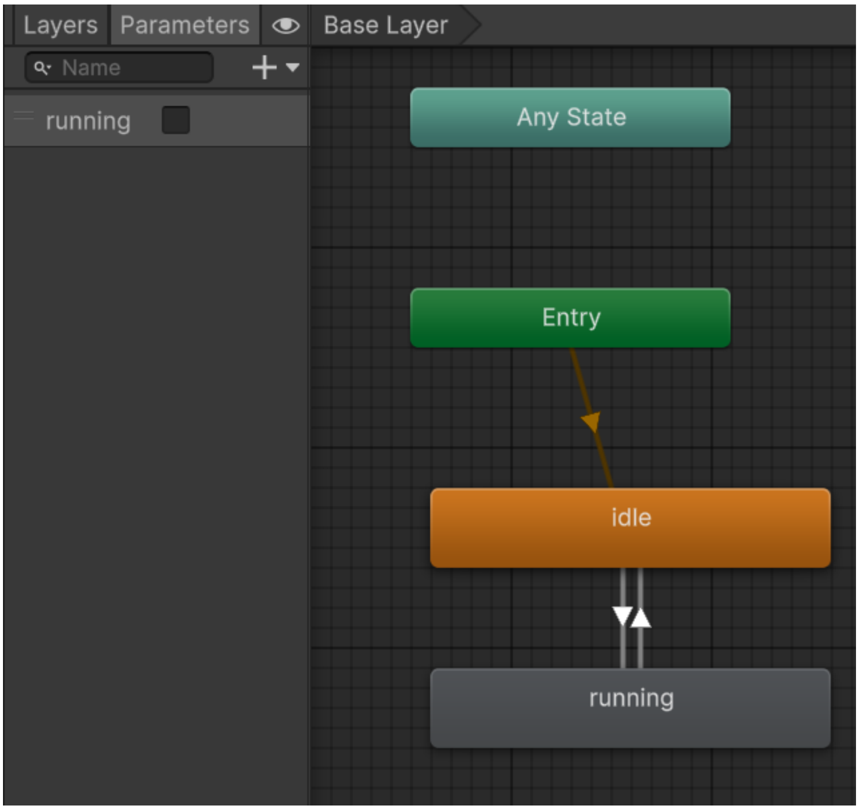
(cherry, 2025)

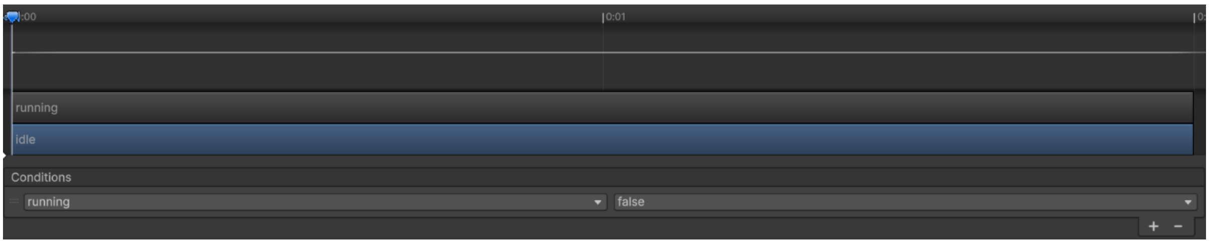
I made an idle and a running animation





Then I added the rules for switching between the two by making a new Boolean for animations called running

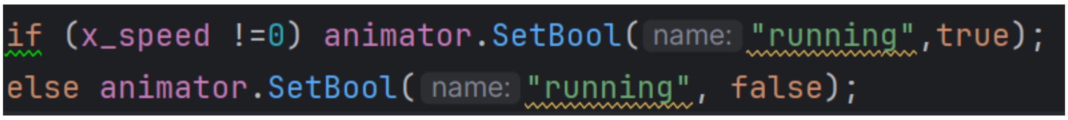




Conditions

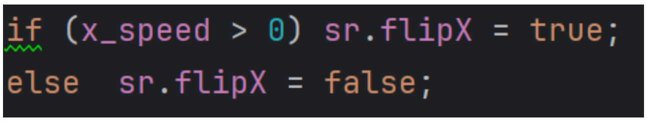
running false

Then in the code in added the conditions for switching between the two which is when the player has a speed attributed to them



```
if (x_speed !=0) animator.SetBool( name: "running",true);
else animator.SetBool( name: "running", false);
```

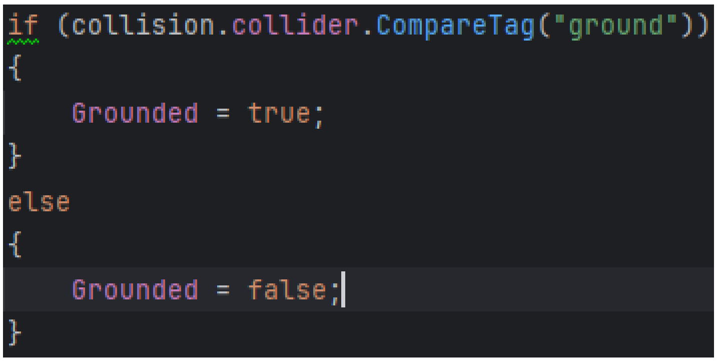
Then to flip the sprite I added an if statement for which way the character is moving



```
if (x_speed > 0) sr.flipX = true;
else  sr.flipX = false;
```

This was actually the wrong way round, so the player was constantly moving backwards. So, I flipped the bigger than sign to fix it.

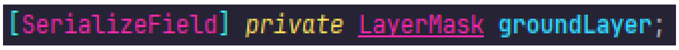
Next, I wanted to fix a bug in which if the player ran off a platform without jumping, they still counted as grounded, so I added this.



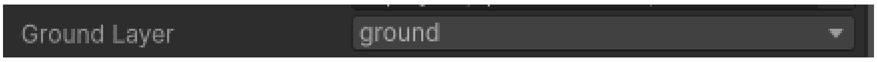
```
if (collision.collider.CompareTag("ground"))
{
    Grounded = true;
}
else
{
    Grounded = false;
}
```

After that I wanted to fix the collision with the ground activating even if the side or top of the player is touching the ground

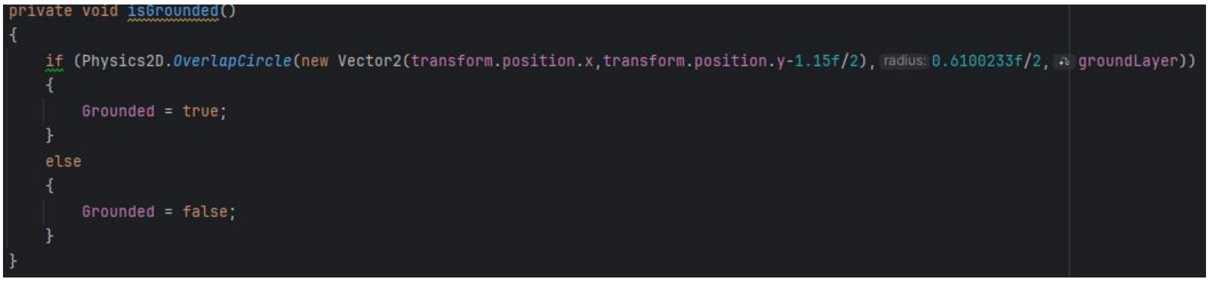
I first did this by using the Physics2D overlapCircle function which checks if a circle centred on a point, overlaps with an object of the specified layer. In my case this was the ground layer.



```
[SerializeField] private LayerMask groundLayer;
```



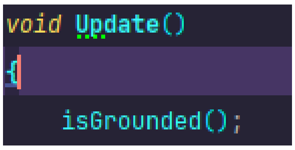
Ground Layer ground



```
private void isGrounded()
{
    if (Physics2D.OverlapCircle(new Vector2(transform.position.x,transform.position.y-1.15f/2), radius: 0.6100233f/2, groundLayer))
    {
        Grounded = true;
    }
    else
    {
        Grounded = false;
    }
}
```

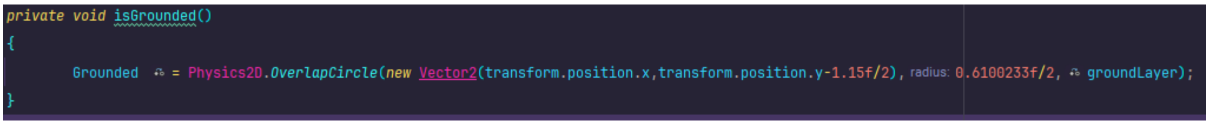
I set the radius of the circle to half the players width and the position of the circle to the bottom of the player this would return true if they overlapped and false if they didn't.

After this I ran isGrounded every update



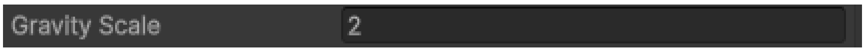
```
void Update()
{
    isGrounded();
```

I realised that the code could be simplified to use less time and look better so i moved it all onto one line.

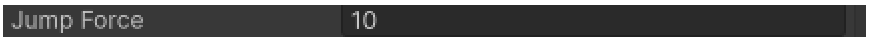


```
private void isGrounded()
{
    Grounded = Physics2D.OverlapCircle(new Vector2(transform.position.x,transform.position.y-1.15f/2), radius: 0.6100233f/2, groundLayer);
}
```

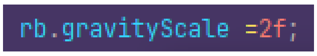
After that I wanted to make the jumping less floaty so double the gravity and added a bit to the jump power.



Gravity Scale 2

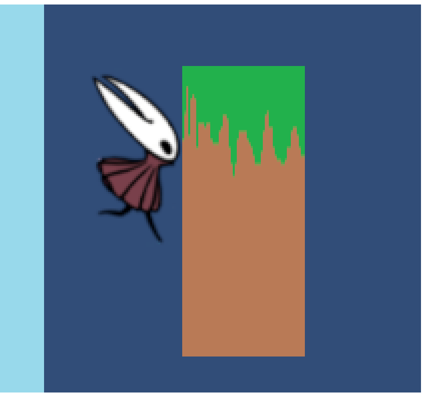


Jump Force 10



```
rb.gravityScale =2f;
```

My final problem was that if you ran into a wall, you wouldn't fall

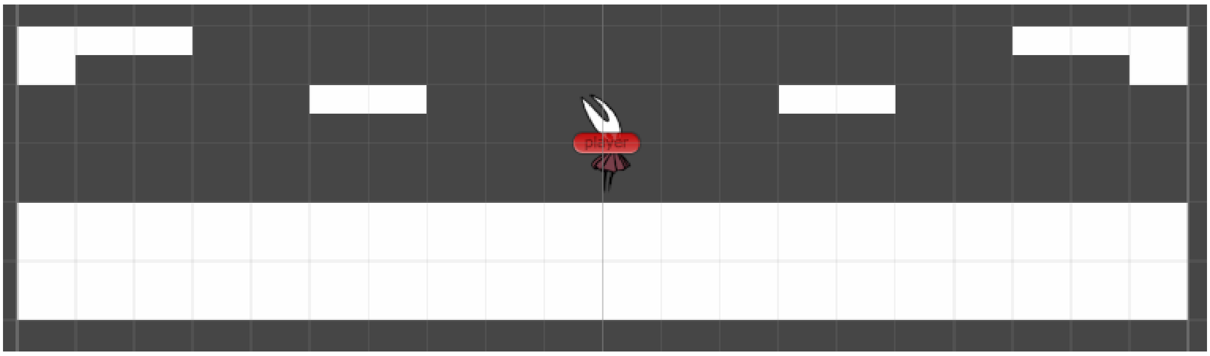


I fixed this by giving the player object no friction. I didn't initially know to do this so had to look it up. I found it here: (east_laugh, 2023)

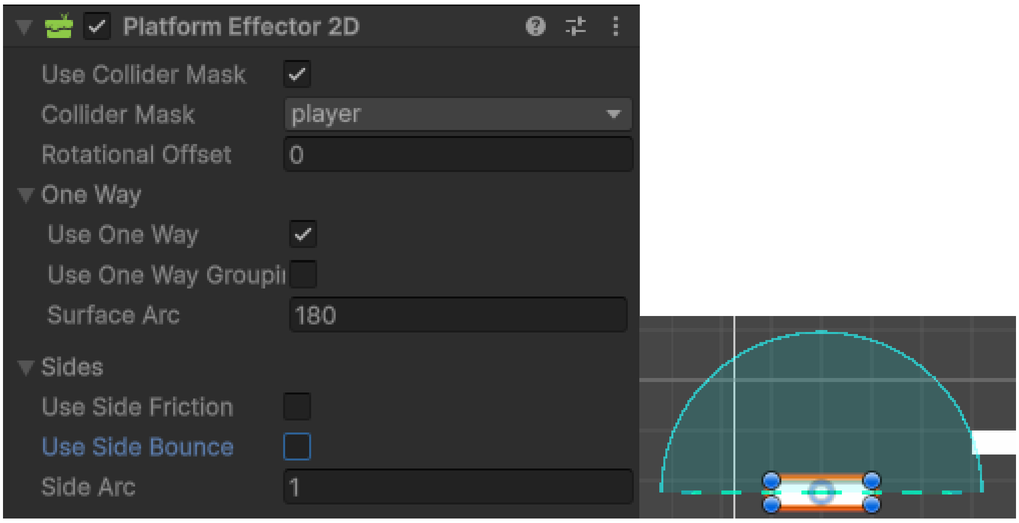
Test	Expected outcome	Actual outcome	pass/fail
Pressing the a key	Move the player left	Player moves left	pass
Pressing the d key	Move player right	Move player right	pass
Pressing jump key	Player jumps	Player jumps	pass
Pressing dash key	Player dashes	Player dashes	pass
Player animations	Player animations play at the right time and in the right order	Player animations play at the right time and in the right order	pass

STAGE 2

Next, I wanted to move onto the world now that the player can move around it. I started by creating multiple different rooms. This is so that later I can put them together to create random world generation.



I got to this point and when testing it out realised that the player can't walk through the platforms as they are ground objects. All the half boxes are platforms, and you can't go up through them. I am going to fix this using the built in unity platform effector 2D.



☑ Platform Effector 2D

Use Collider Mask ☑

Collider Mask player

Rotational Offset 0

One Way

Use One Way ☑

Use One Way Groupi □

Surface Arc 180

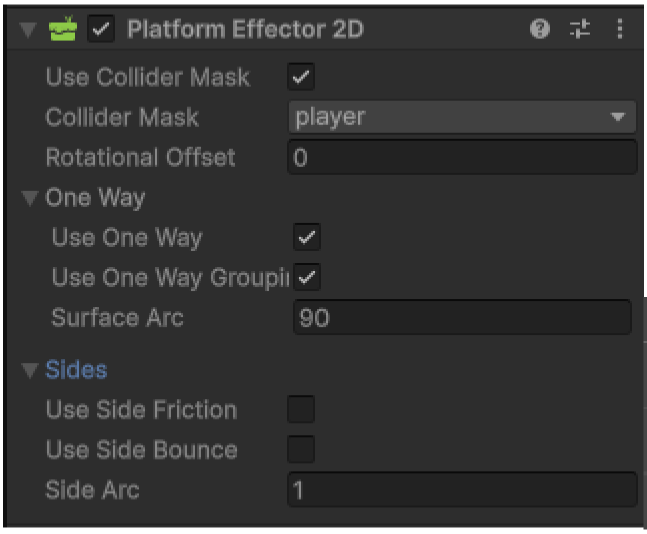
Sides

Use Side Friction □

Use Side Bounce □

Side Arc 1

however the player could not go through the platform when coming from the side. This was because the angle for stopping was set to 180 degrees. To fix this I made the surface arc 90 degrees.



Platform Effector 2D

Use Collider Mask ☑

Collider Mask: player

Rotational Offset: 0

One Way

Use One Way ☑

Use One Way Groupi ☑

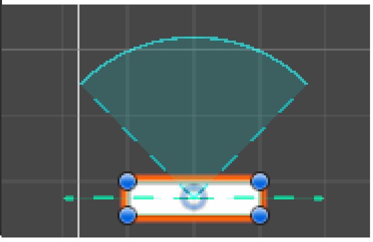
Surface Arc: 90

Sides

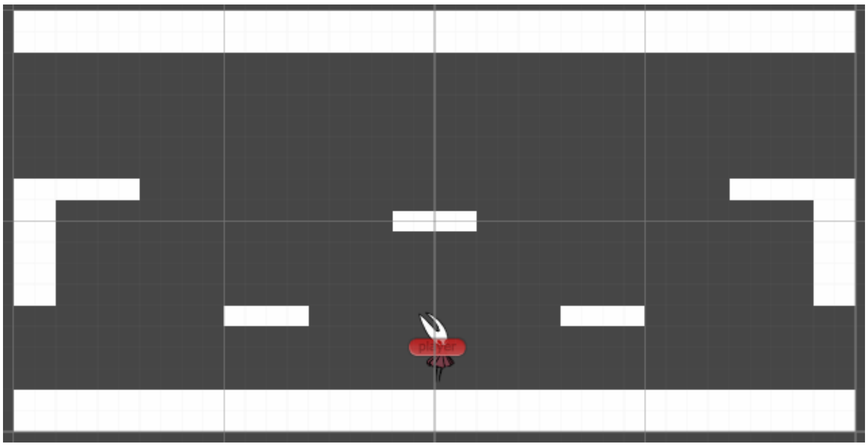
Use Side Friction □

Use Side Bounce □

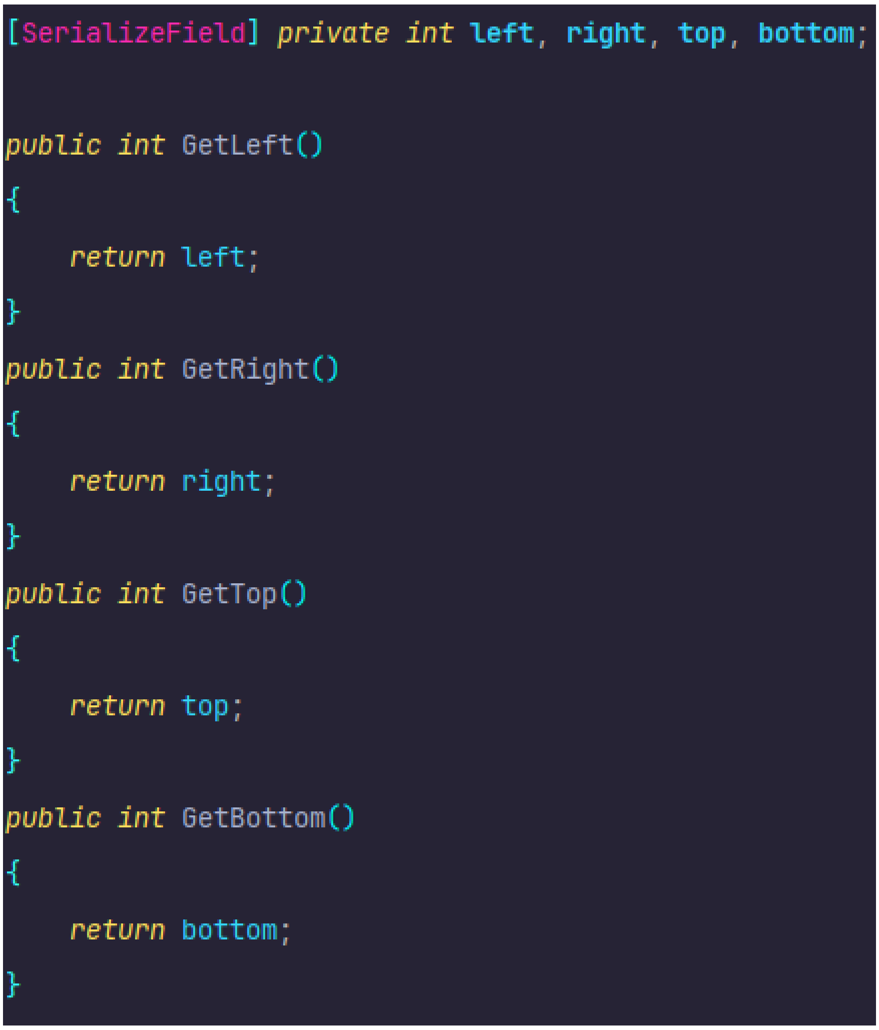
Side Arc: 1



After I had done this, I finished up on the room adding more walls and a ceiling.



However, I felt like during game play the camera going above or below the room or to the sides looked bad and so wanted to make the code that makes the camera follow the player be confined to the room's walls. I wanted to do this by giving each room its own variables that could be read by the camera as the rooms were going to be different sizes. This is what I came up with.

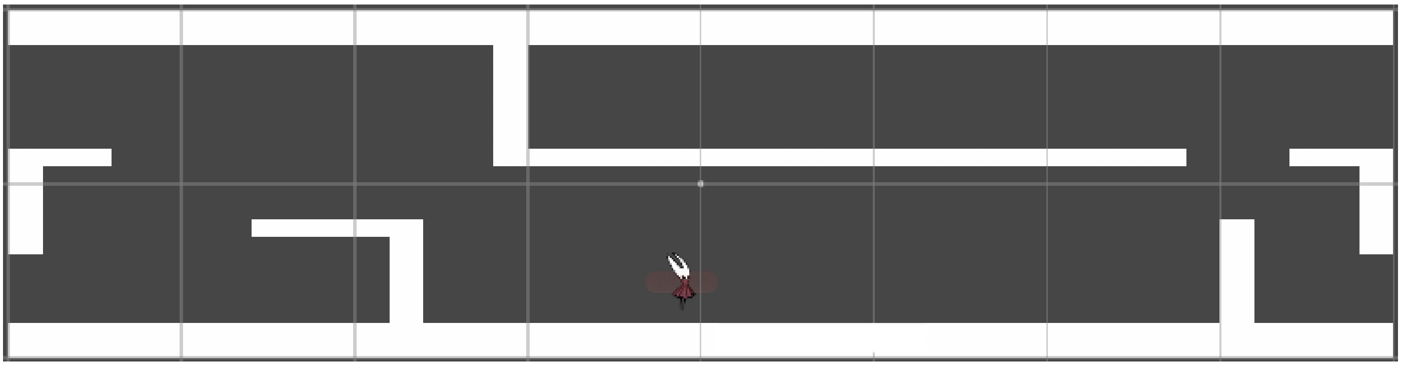


```
[SerializeField] private int left, right, top, bottom;

public int GetLeft()
{
    return left;
}
public int GetRight()
{
    return right;
}
public int GetTop()
{
    return top;
}
public int GetBottom()
{
    return bottom;
}
```

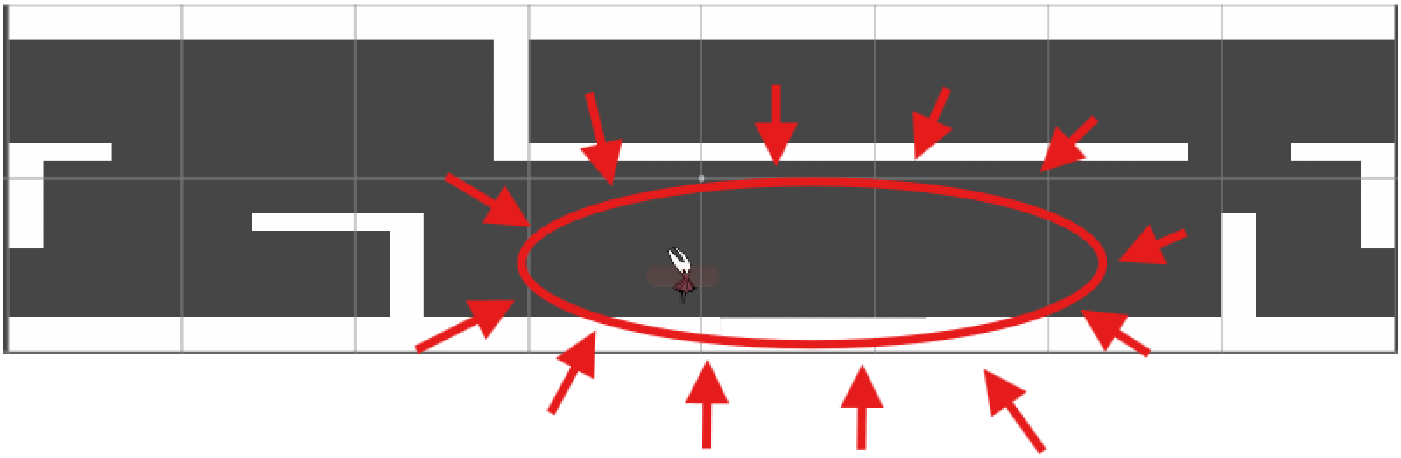
I did it this way as it seemed the simplest way and allows for easy inputs in the serialized field in the unity editor.

The next step was to make a room manager that would manage what room you're in and how the camera should act but to test this I was going to need more than one room for them to switch between. So, I started room 2 which I wanted to be longer to add more variety to the game.

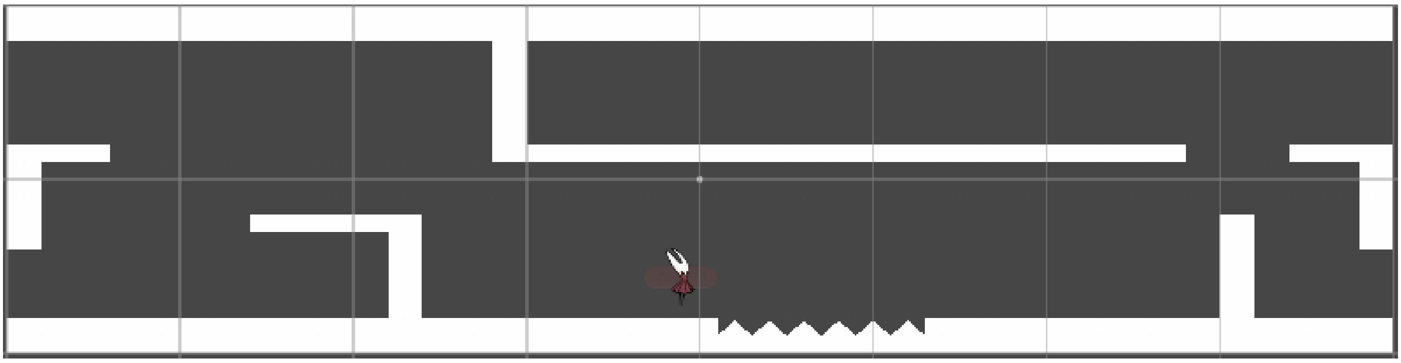
I ended up coming up with this design as I wanted to make a longer room.



However this part of the room felt a bit empty when running through it as it takes a long time



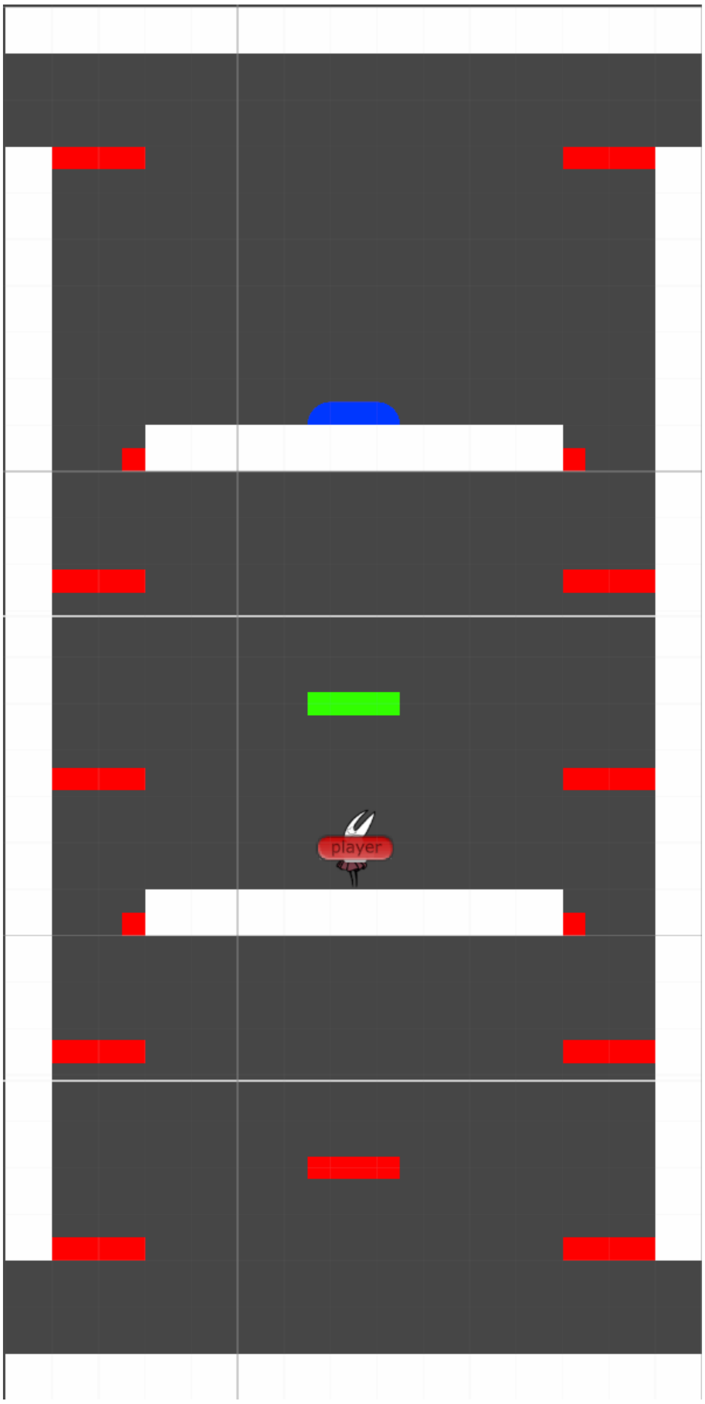
i decided add some spikes into this area to keep the player more alert and add a bit of variance to the level.



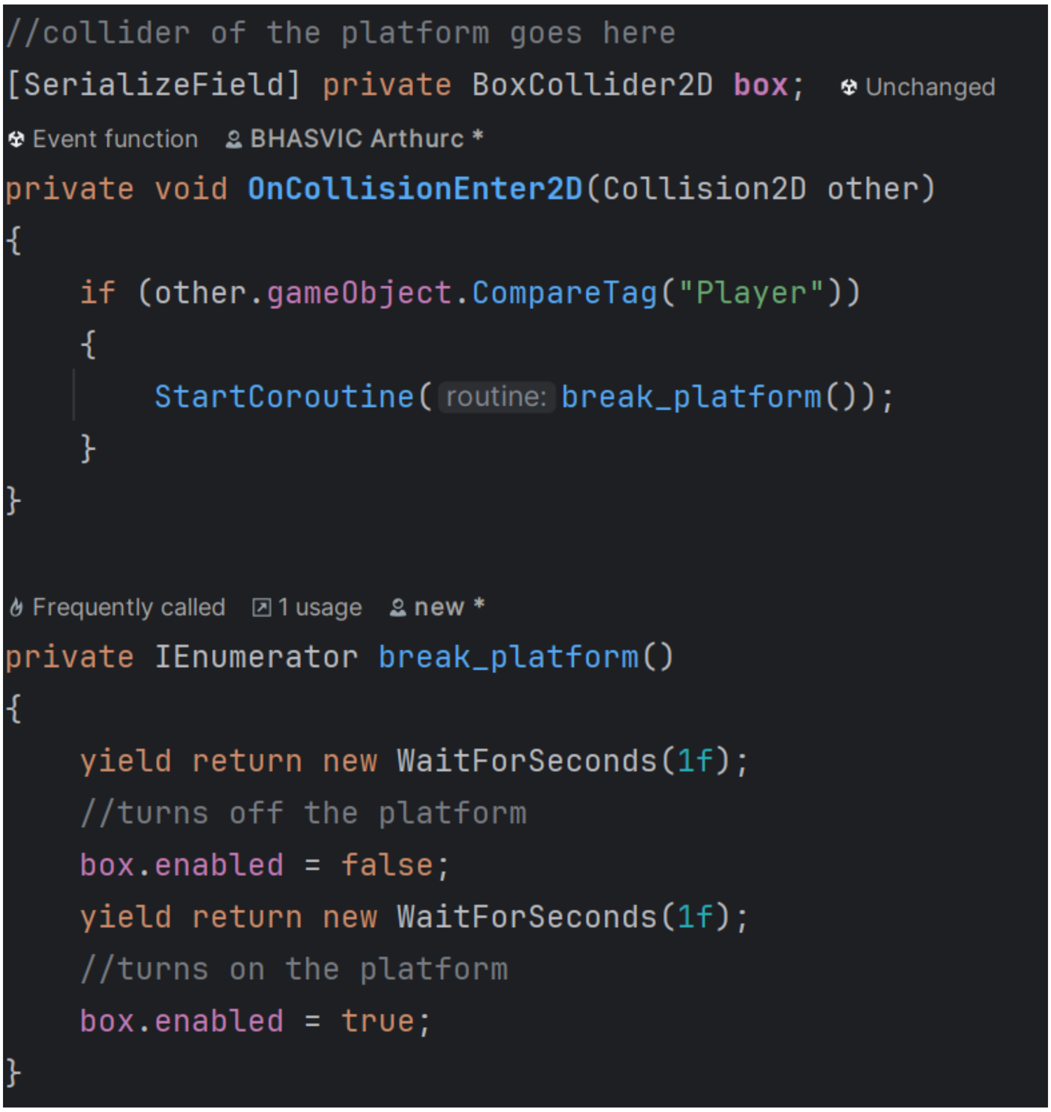
The spikes don't do anything yet as health mechanics are going to be instantiated in a later stage and so for now, they are just placeholders.

Next, I wanted to move onto the third and final room, like making a long room, I wanted to make a vertical room to challenge the player platforming skills.

i had made a platforming column but it seemed a bit plain as it was just the same jump 10 times in a row so i decided to add a few new platforms to add something new.



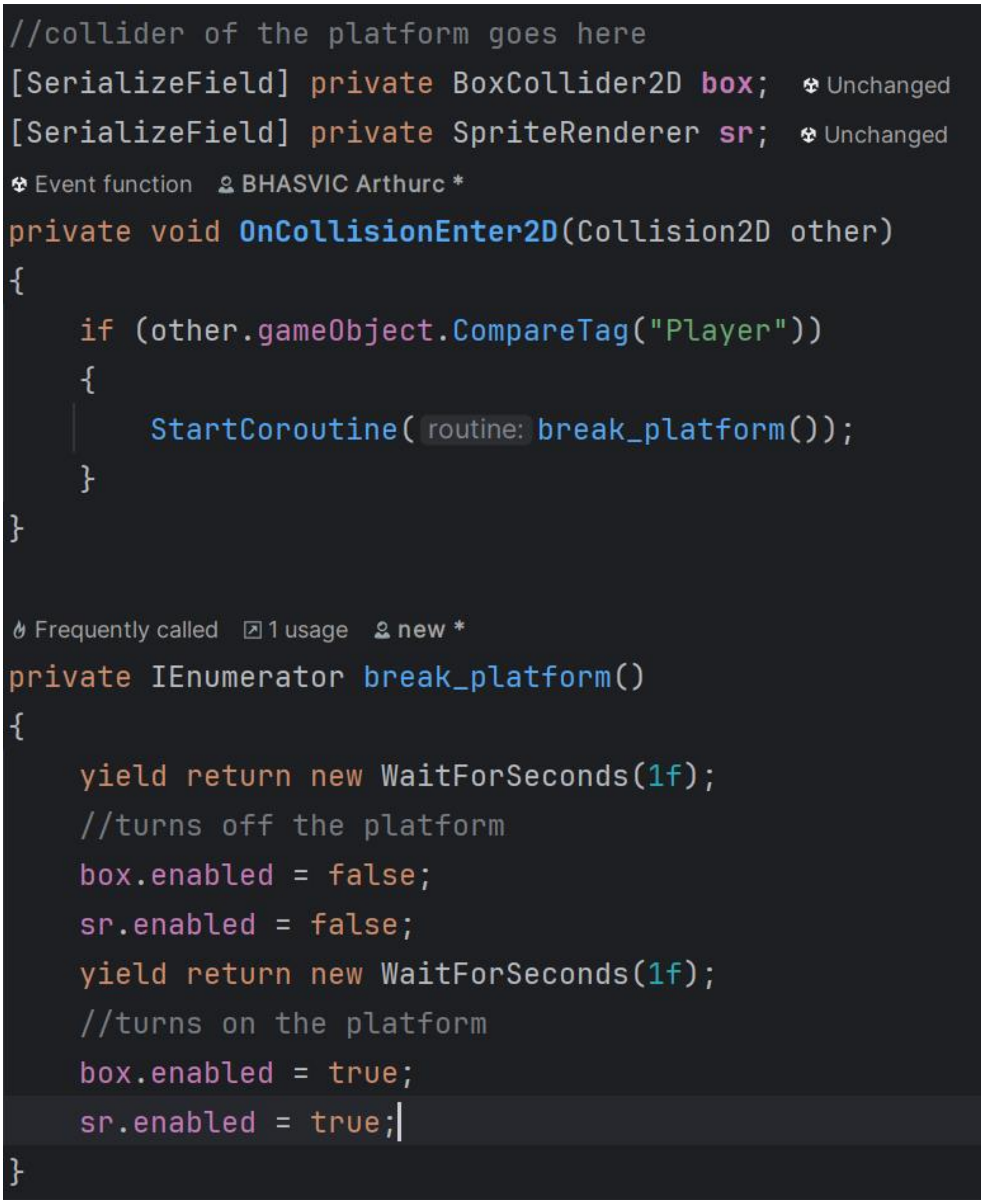
The green platform is going to be a platform that disappears after a while and then comes back meaning you can't stand on it for long. I decided to do this by giving the platform its own code that waits a second or two after touching the player and then disables the collider then a second or two later re-enables it.



```
//collider of the platform goes here
[SerializeField] private BoxCollider2D box;  Unchanged
 Event function   BHASVIC Arthurc *
private void OnCollisionEnter2D(Collision2D other)
{
    if (other.gameObject.CompareTag("Player"))
    {
        StartCoroutine( routine: break_platform());
    }
}

 Frequently called   1 usage   new *
private IEnumerator break_platform()
{
    yield return new WaitForSeconds(1f);
    //turns off the platform
    box.enabled = false;
    yield return new WaitForSeconds(1f);
    //turns on the platform
    box.enabled = true;
}
```

This code didn't work at first, so I put a print statement in the onCollisionEnter2D subroutine and the if statement and only the first one triggered. After looking around in my project I realised the player character didn't have the player tag and after that the code started working.

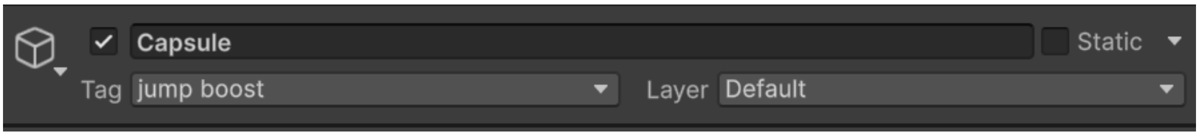
However, the box still looked like it was still there as the sprite renderer wasn't disabled. I fixed this by disabling that as well.



```
//collider of the platform goes here
[SerializeField] private BoxCollider2D box;
[SerializeField] private SpriteRenderer sr;

private void OnCollisionEnter2D(Collision2D other)
{
    if (other.gameObject.CompareTag("Player"))
    {
        StartCoroutine(break_platform());
    }
}


private IEnumerator break_platform()
{
    yield return new WaitForSeconds(1f);
    //turns off the platform
    box.enabled = false;
    sr.enabled = false;
    yield return new WaitForSeconds(1f);
    //turns on the platform
    box.enabled = true;
    sr.enabled = true;
}
```

This led to the platform working as intended.

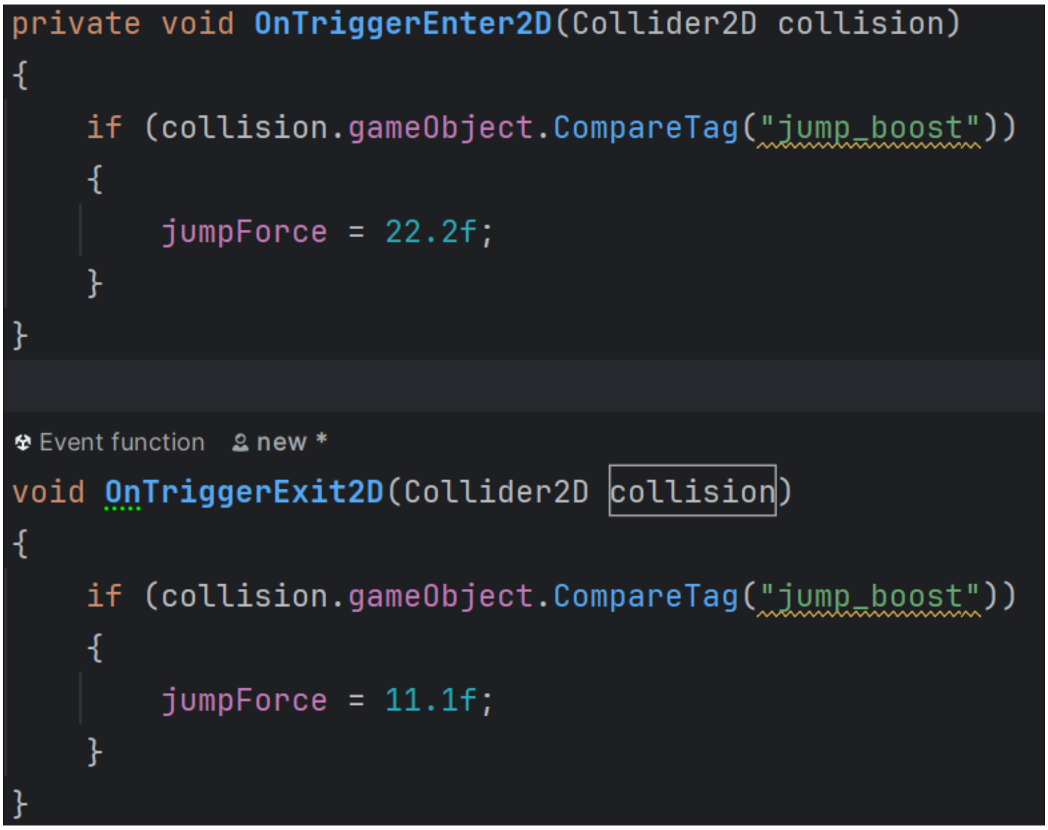
Next was the blue thing which was a jump pad. This would make the player jump lots higher if they were touching it when they jump. This will be implemented by adding to jump force when first touching the pad and taking away when you leave it. This meant I needed to add a new tag for the jump pad:



☑ Capsule □ Static
Tag jump boost Layer Default

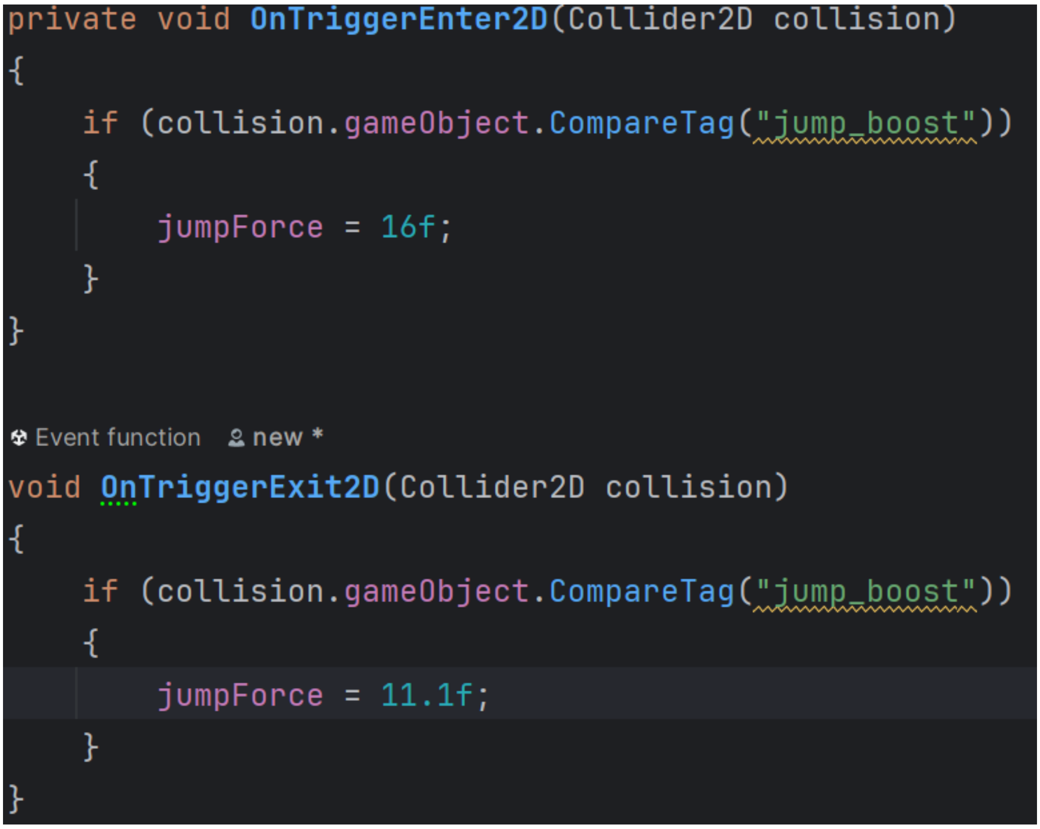
I also had to add a collider to the capsule and so that you couldn't walk on it enabled isTrigger.

I then added the two subroutines to the player movement script.



```
private void OnTriggerEnter2D(Collider2D collision)
{
    if (collision.gameObject.CompareTag("jump_boost"))
    {
        jumpForce = 22.2f;
    }
}

void OnTriggerExit2D(Collider2D collision)
{
    if (collision.gameObject.CompareTag("jump_boost"))
    {
        jumpForce = 11.1f;
    }
}
```

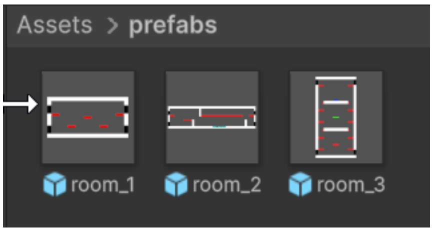
After trying out the jump it turned out doubling it was too powerful, after some maths I settled on 16 as the perfect number. This was because I had to use some equations from physics:



```
private void OnTriggerEnter2D(Collider2D collision)
{
    if (collision.gameObject.CompareTag("jump_boost"))
    {
        jumpForce = 16f;
    }
}

void OnTriggerExit2D(Collider2D collision)
{
    if (collision.gameObject.CompareTag("jump_boost"))
    {
        jumpForce = 11.1f;
    }
}
```

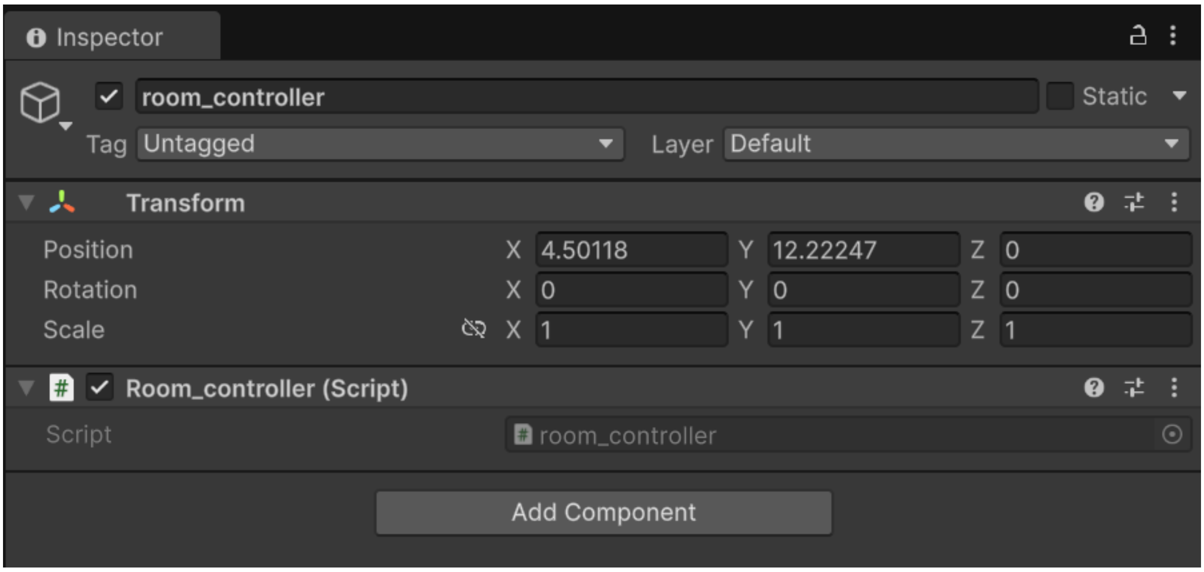
I have finally completed all 3 rooms. The next part was to connect them all together. I was going to do this by making a new room every time the player went through a door. Each door would have the location that led to it and the location that it leads to.

I started by making the three rooms into prefabs:



This was so that they could be made as wherever and whenever they needed to be.

Then made a script and an object to control the rooms and how they change.



☑ room_controller □ Static

Tag Untagged Layer Default

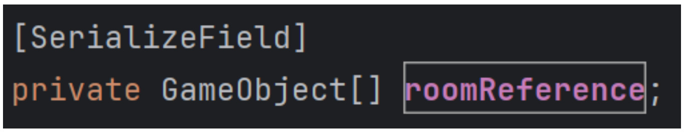
Transform

	X	Y	Z
Position	4.50118	12.22247	0
Rotation	0	0	0
Scale	1	1	1

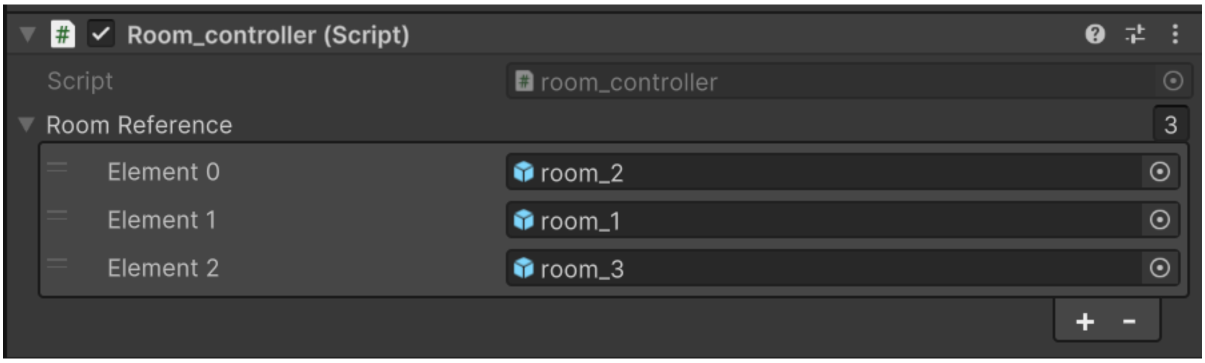
☑ Room_controller (Script)

Script room_controller

I stated by adding an array for all the rooms so that i could get a random room to spawn;



```
[SerializeField]
private GameObject[] roomReference;
```



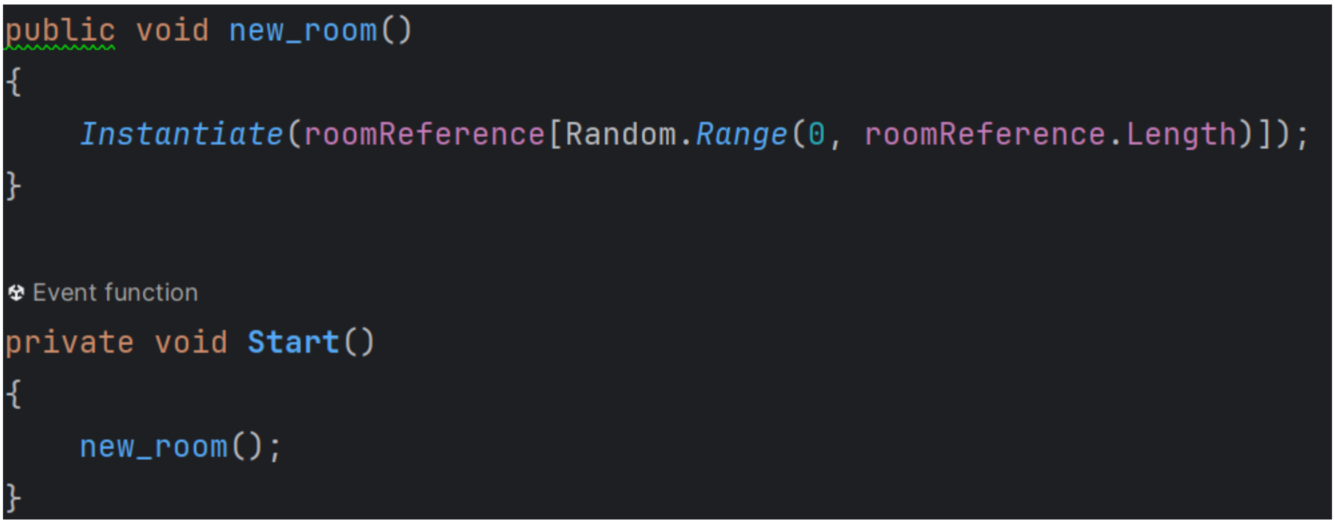
☑ Room_controller (Script)

Script room_controller

Room Reference 3

Element 0	room_2
Element 1	room_1
Element 2	room_3

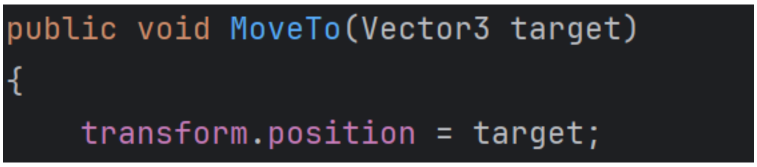
I started with some test code to make one room on start



```
public void new_room()
{
    Instantiate(roomReference[Random.Range(0, roomReference.Length)]);
}

⚙ Event function
private void Start()
{
    new_room();
}
```

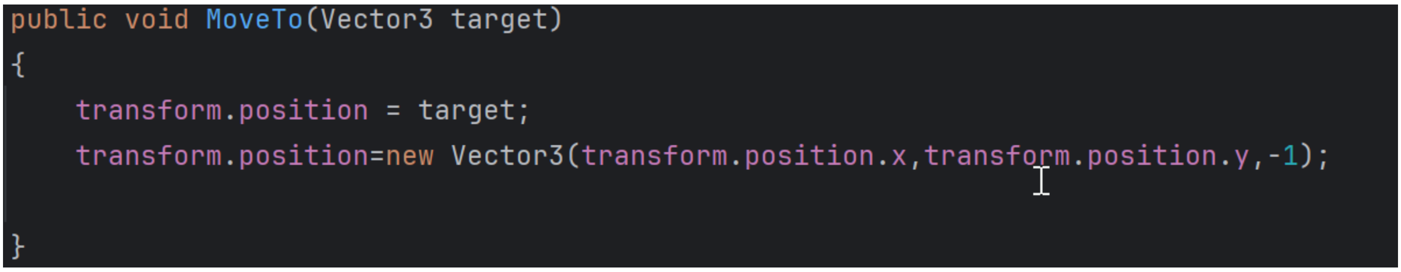
And this worked perfectly as I wanted.

The next part was to put the player at the entrance of the room. But to do this I would need to make the player moveable by other objects. So, I added a public script to move the player:



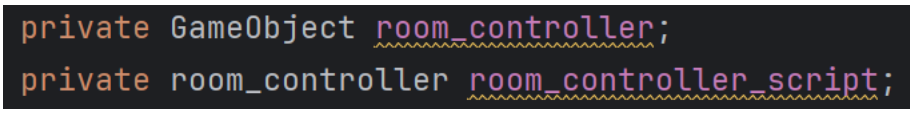
```
public void MoveTo(Vector3 target)
{
    transform.position = target;
```

The problem with this was that it puts it on the same layer as the platforms, so player had to be moved to one layer towards the camera

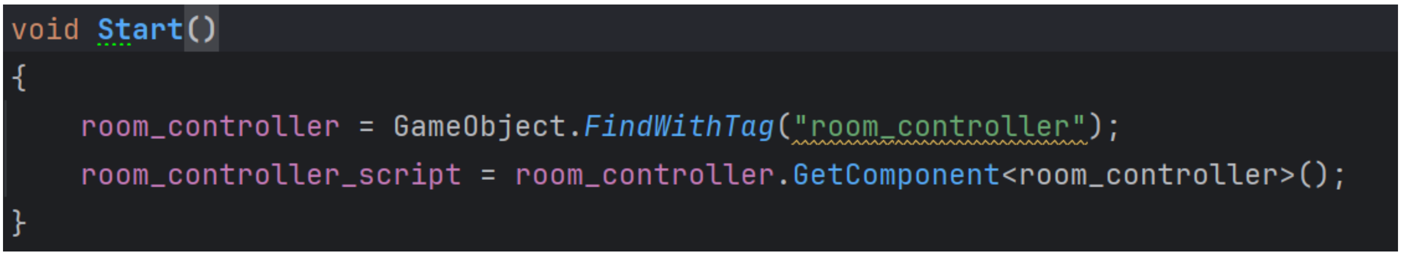


```
public void MoveTo(Vector3 target)
{
    transform.position = target;
    transform.position=new Vector3(transform.position.x,transform.position.y,-1);

}
```

After that I wanted the player to make a new room when they touch a door. This had to be triggered by the player but use subroutines from the room_controller so i had to reference the room_controller from the player script:



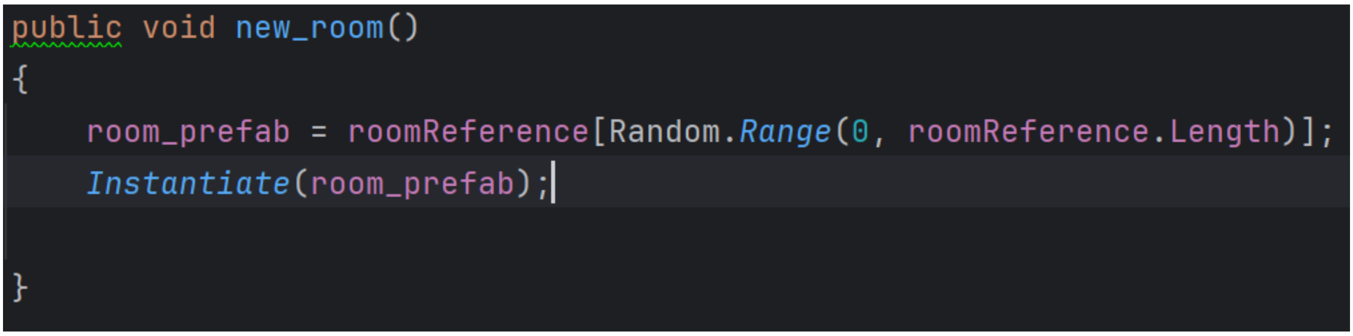
```
private GameObject room_controller;
private room_controller room_controller_script;
```



```
void Start()
{
    room_controller = GameObject.FindWithTag("room_controller");
    room_controller_script = room_controller.GetComponent<room_controller>();
}
```

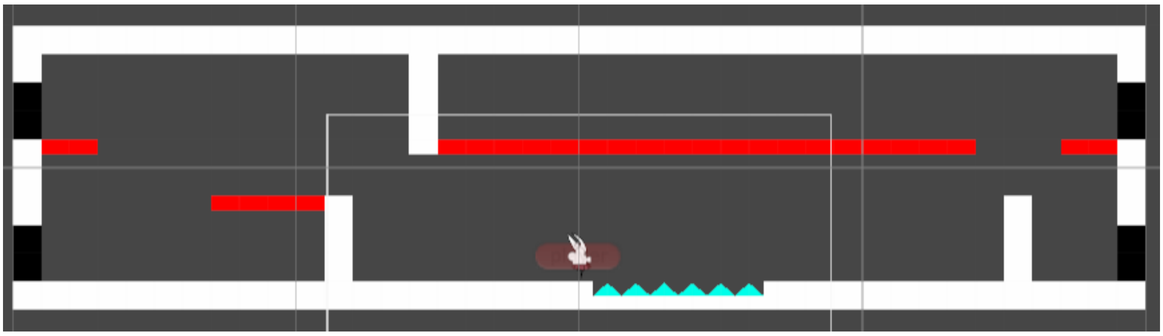
I didn't know exactly how to find an object with a tag so i had to use the documentation for unity (Unity, 2025)

Then I started making the code for creating a new room in the room_controller class

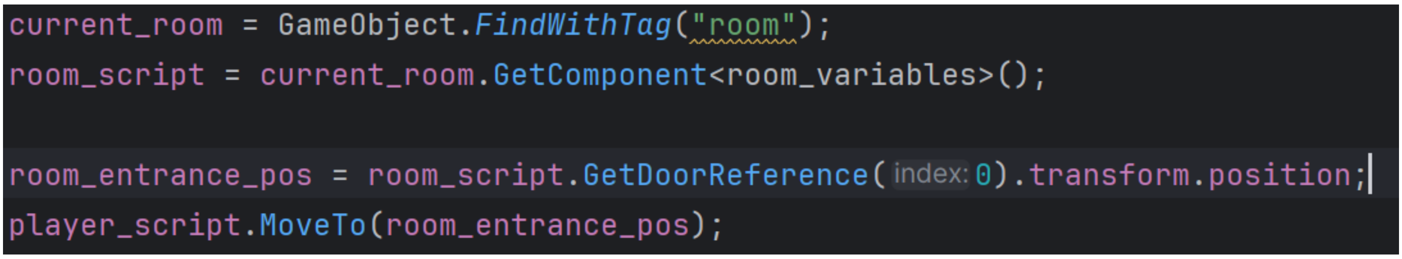


```
public void new_room()
{
    room_prefab = roomReference[Random.Range(0, roomReference.Length)];
    Instantiate(room_prefab);

}
```

This worked well:

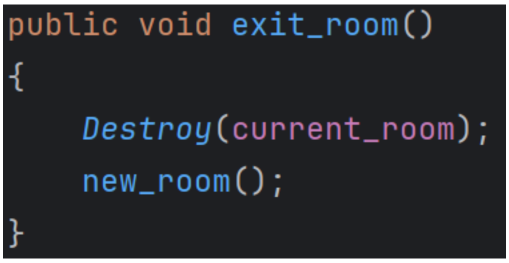


Then I needed the player to be spawned at the door of the room I wanted to do this by getting the location of a random door in the room that was just spawned. As all this information was in the room_variables script I just had to reference that to get the location of all the doors



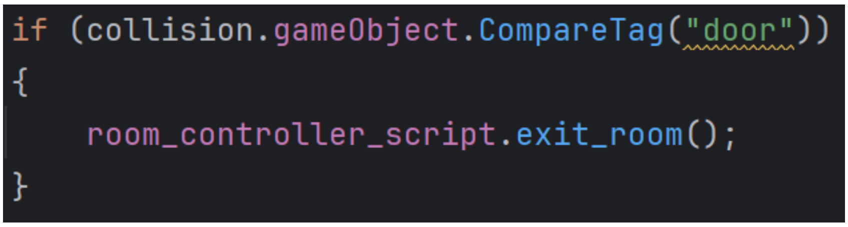
```
current_room = GameObject.FindWithTag("room");
room_script = current_room.GetComponent<room_variables>();

room_entrance_pos = room_script.GetDoorReference(index: 0).transform.position;
player_script.MoveTo(room_entrance_pos);
```

After that I needed to make the player close the current room and open a new one when they touch a door which would be done in the player script and would call a subroutine in the room_controller:



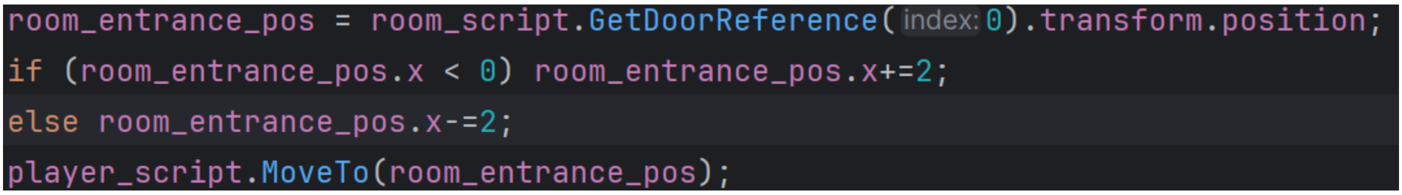
```
public void exit_room()
{
    Destroy(current_room);
    new_room();
}
```

I made this script for the player to call:



```
if (collision.gameObject.CompareTag("door"))
{
    room_controller_script.exit_room();
}
```

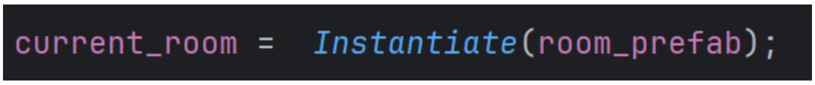
This kind of worked however when the player spawned into a new room they would immediately touch a new door spawning a new room. I decided to fix this by moving the player 2 steps into the room when they spawned in:



```
room_entrance_pos = room_script.GetDoorReference( index: 0).transform.position;
if (room_entrance_pos.x < 0) room_entrance_pos.x+=2;
else room_entrance_pos.x-=2;
player_script.MoveTo(room_entrance_pos);
```

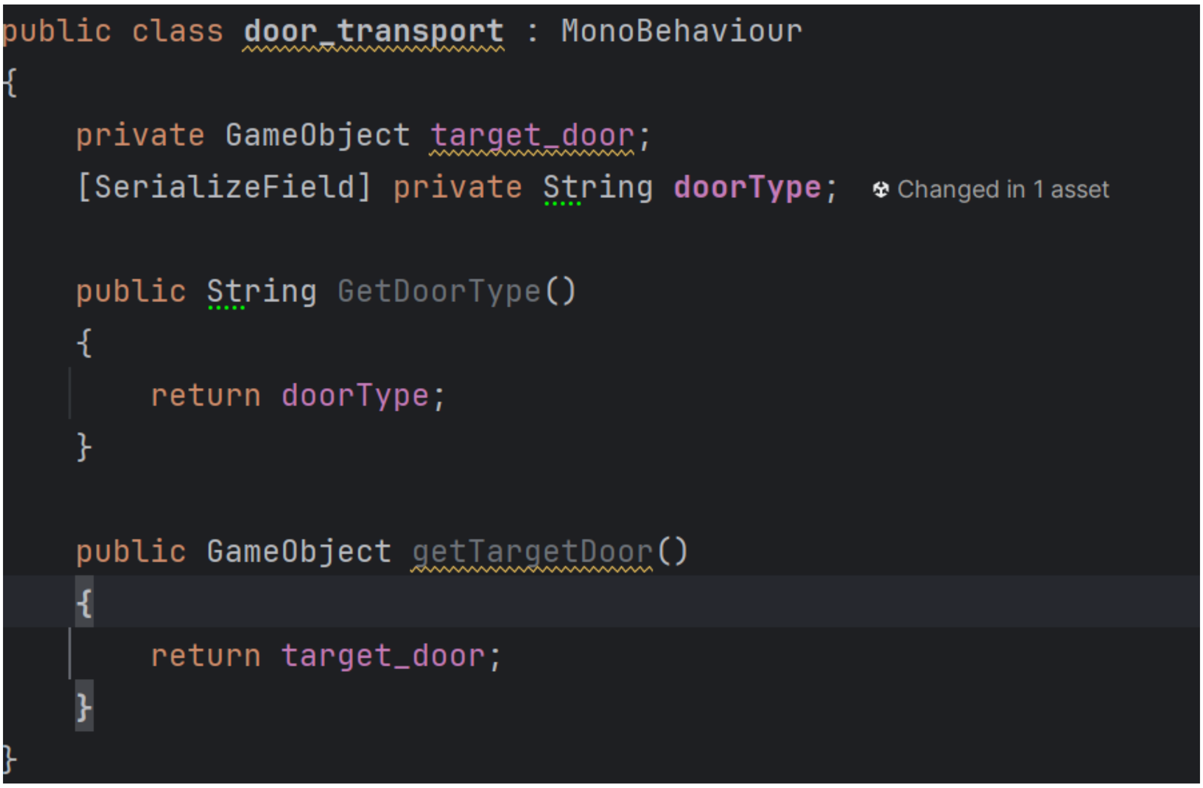
This kind of worked however I started to experience some of the rooms not moving the player to the correct point or deleting themselves when the player leaves.

After testing with print statements, the room seemed to be being destroyed after it was created which isn't possible. After looking through every page of the unity documentation linked to my code I found out that the destroy(gameobject) statement destroys the game object at the end of the frame and so for one frame there were two rooms on screen which broke the find object with tag code. I fixed this by setting the current_room straight to the instantiated object:



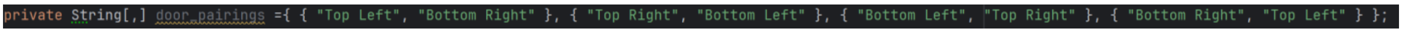
```
current_room =  Instantiate(room_prefab);
```

Next step was to make the rooms an actual map instead of just going to a random room. I wanted to do this by giving each door a destination and a location. This would have to mean that the rooms that are instantiated cant be removed as otherwise they couldn't save a location. I instead had to make a new room be spawned with the doors linked to each other. I wanted to do this by giving each door a location in the room(top left, top right…) that would only be able to link up with one other door to stop overlaps. I put this data in the premade room script:



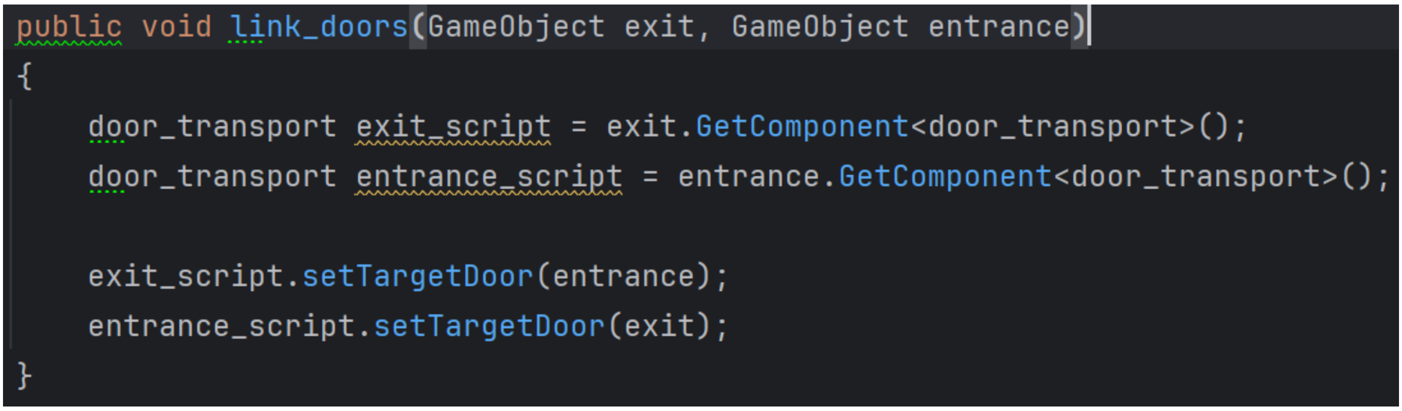
```
public class door_transport : MonoBehaviour
{
    private GameObject target_door;
    [SerializeField] private String doorType;  Changed in 1 asset

    public String GetDoorType()
    {
        return doorType;
    }

    public GameObject getTargetDoor()
    {
        return target_door;
    }
}
```

Then I added the door pairings to the room_controller so that they can be used to make new rooms:



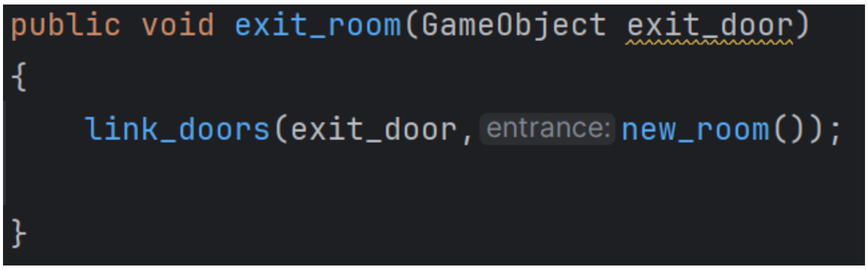
```
private String[,] door_pairings ={ { "Top Left", "Bottom Right" }, { "Top Right", "Bottom Left" }, { "Bottom Left", "Top Right" }, { "Bottom Right", "Top Left" } };
```

This ensures that no rooms overlap with each other. The next thing to do was to link doors together so that they didn't create a new room each time. To do this I created a subroutine that takes two rooms and sets their target to each other:

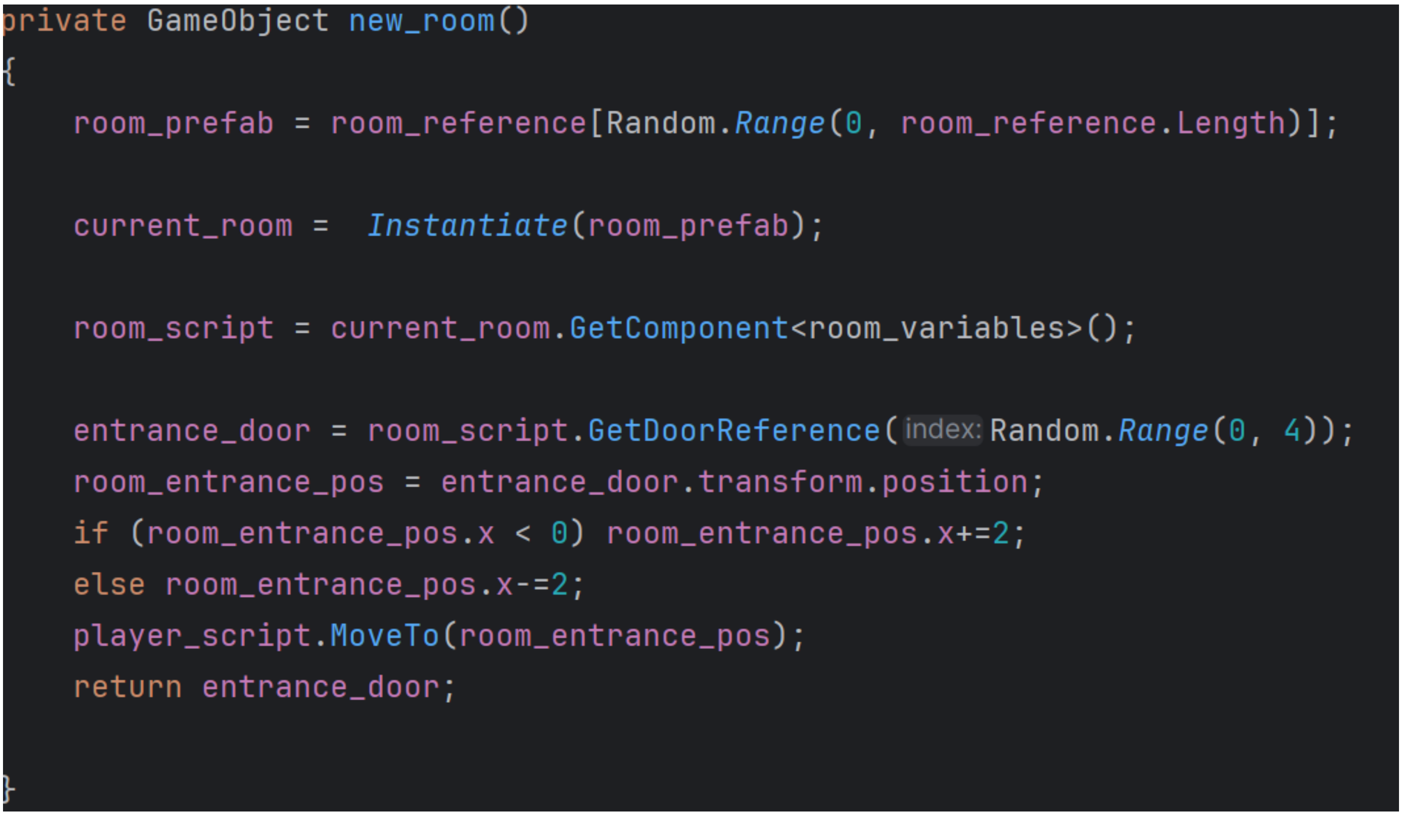


```
public void link_doors(GameObject exit, GameObject entrance)
{
    door_transport exit_script = exit.GetComponent<door_transport>();
    door_transport entrance_script = entrance.GetComponent<door_transport>();

    exit_script.setTargetDoor(entrance);
    entrance_script.setTargetDoor(exit);
}
```

Next I made it so that both the new_room and exit_room scripts returned or took a game object as an input or output so that the two could be linked.

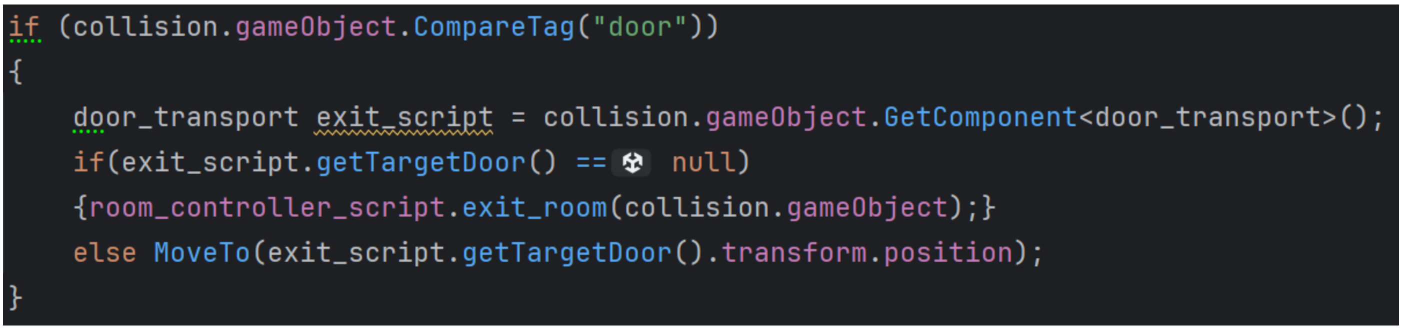


```
public void exit_room(GameObject exit_door)
{
    link_doors(exit_door, entrance: new_room());


}
```



```
private GameObject new_room()
{
    room_prefab = room_reference[Random.Range(0, room_reference.Length)];

    current_room =  Instantiate(room_prefab);

    room_script = current_room.GetComponent<room_variables>();

    entrance_door = room_script.GetDoorReference( index: Random.Range(0, 4));
    room_entrance_pos = entrance_door.transform.position;
    if (room_entrance_pos.x < 0) room_entrance_pos.x+=2;
    else room_entrance_pos.x-=2;
    player_script.MoveTo(room_entrance_pos);
    return entrance_door;


}
```

After that I wanted to make it so that the room creation from the player only happens if the door isn't linked to another:

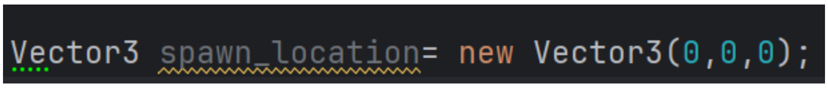


```
if (collision.gameObject.CompareTag("door"))
{
    door_transport exit_script = collision.gameObject.GetComponent<door_transport>();
    if(exit_script.getTargetDoor() == null)
    {room_controller_script.exit_room(collision.gameObject);}
    else MoveTo(exit_script.getTargetDoor().transform.position);
}
```

This worked but the rooms weren't spawning in the right place so I had to add code to change the location of the rooms to have the two doors next to each other so that they can be linked properly.

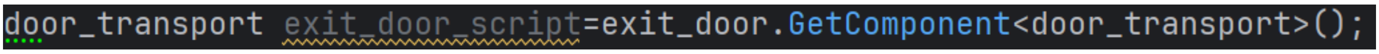
I will do this by making the entrance door on the side of the exit door. At this point my code was getting a bit confusing so I decided to try rewriting it to make it more readable and help find ant problems.

Firstly I make a variable for the location of the room I'm spawning:



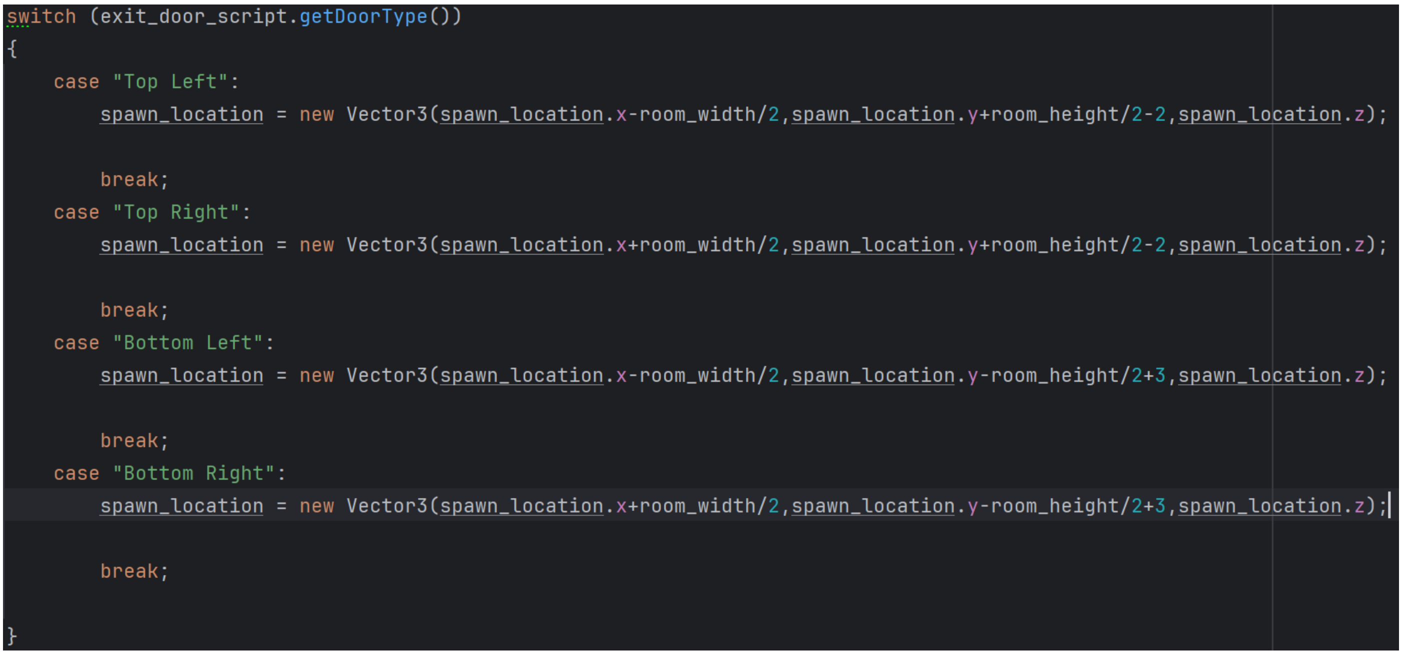
```
Vector3 spawn_location= new Vector3(0,0,0);
```

Next, I added a reference to the exit door script:



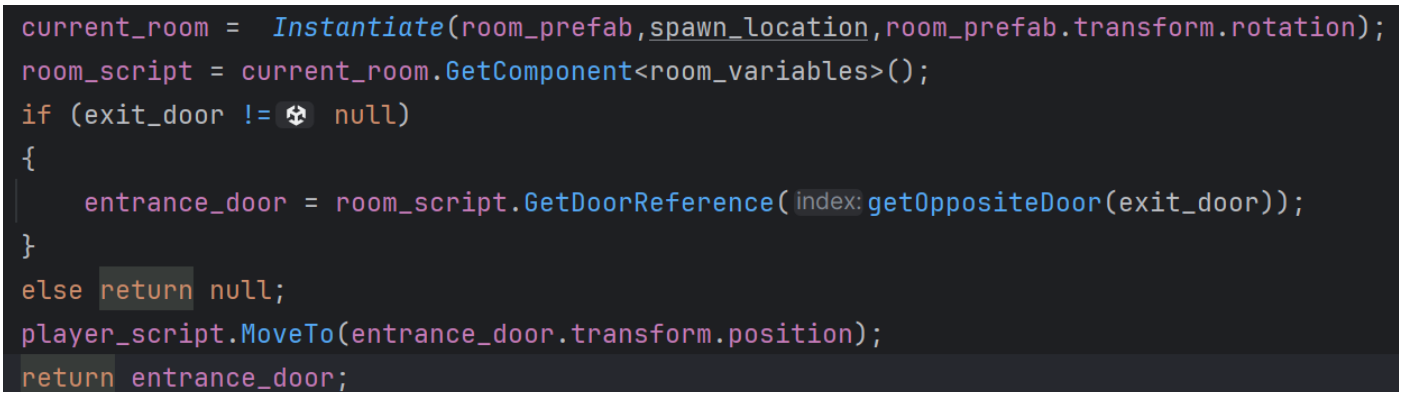
```
door_transport exit_door_script=exit_door.GetComponent<door_transport>();
```

I then added a switch case statement to tell the next room where to spawn compared to which exit the player leaves from:



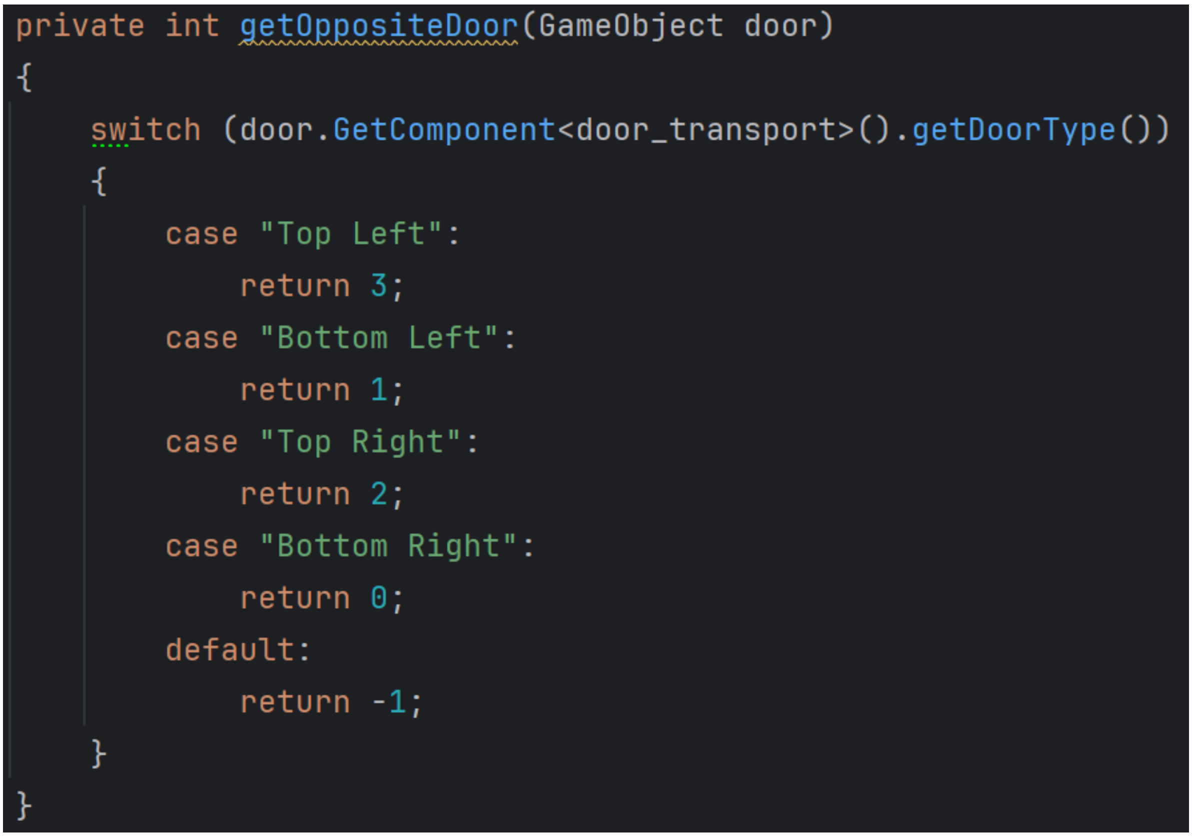
```
switch (exit_door_script.getDoorType())
{
    case "Top Left":
        spawn_location = new Vector3(spawn_location.x-room_width/2,spawn_location.y+room_height/2-2,spawn_location.z);

        break;
    case "Top Right":
        spawn_location = new Vector3(spawn_location.x+room_width/2,spawn_location.y+room_height/2-2,spawn_location.z);

        break;
    case "Bottom Left":
        spawn_location = new Vector3(spawn_location.x-room_width/2,spawn_location.y-room_height/2+3,spawn_location.z);

        break;
    case "Bottom Right":
        spawn_location = new Vector3(spawn_location.x+room_width/2,spawn_location.y-room_height/2+3,spawn_location.z);

        break;

}
```

And then the last bits of the code to spawn in the room and move the player:



```
current_room =  Instantiate(room_prefab,spawn_location,room_prefab.transform.rotation);
room_script = current_room.GetComponent<room_variables>();
if (exit_door !=  null)
{
    entrance_door = room_script.GetDoorReference( index: getOppositeDoor(exit_door));
}
else return null;
player_script.MoveTo(entrance_door.transform.position);
return entrance_door;
```

The get opposite door subroutine returns a number based on which index of room the player is going to is at:



```
private int getOppositeDoor(GameObject door)
{
    switch (door.GetComponent<door_transport>().getDoorType())
    {
        case "Top Left":
            return 3;
        case "Bottom Left":
            return 1;
        case "Top Right":
            return 2;
        case "Bottom Right":
            return 0;
        default:
            return -1;
    }
}
```

The rooms weren't working still. This was because the rooms hadn't had the height or width values inputted. After I did that and played with the values a little bit the room code started working.

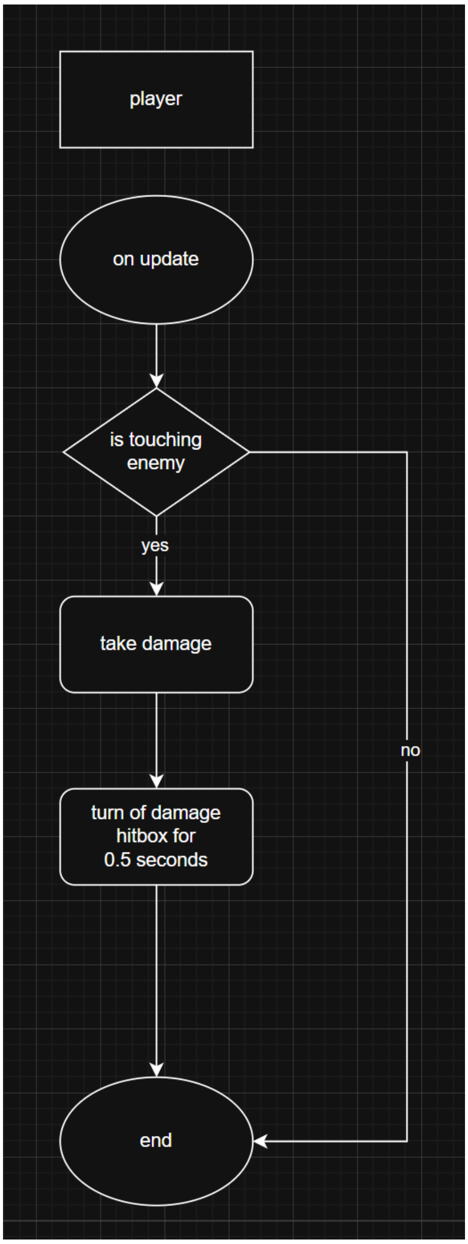
Test	Expected outcome	Actual outcome	pass/fail
Generating the world	World generates with linked rooms	World generates linked rooms	pass
Moving between rooms	Stepping into the transition moves you to the room linked to that transition	Stepping into the transition moves you to the linked room	pass
Rooms tiling	Rooms tile properly and don't overlap	Rooms tile well and don't overlap	pass

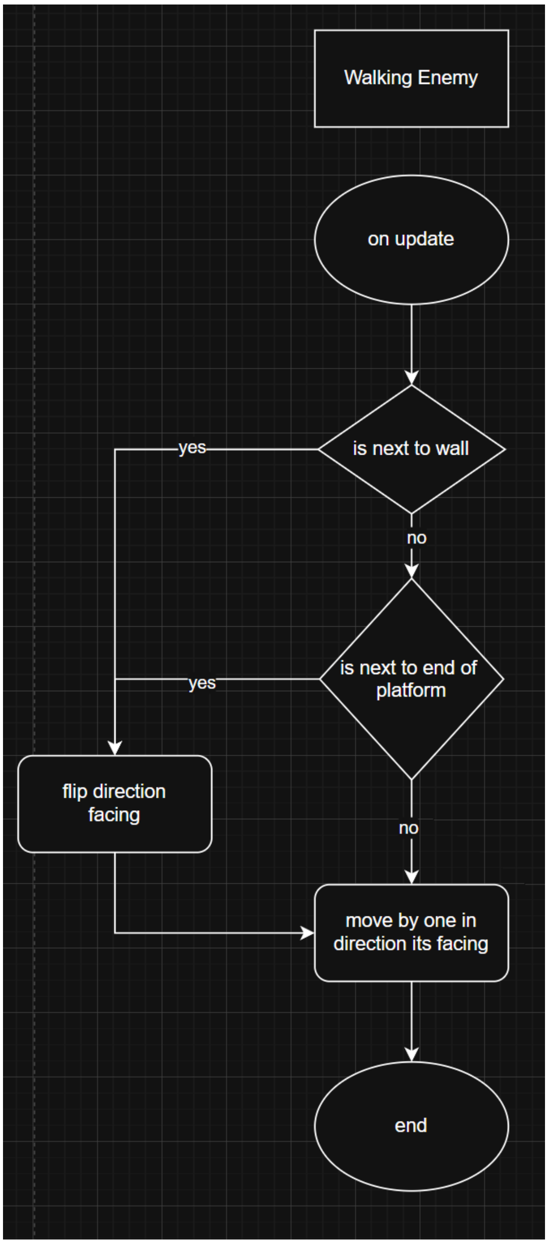
Multiple rooms with different layouts	Have at least 3 separate rooms that each lead to each other	3 rooms that can lead to each other	pass

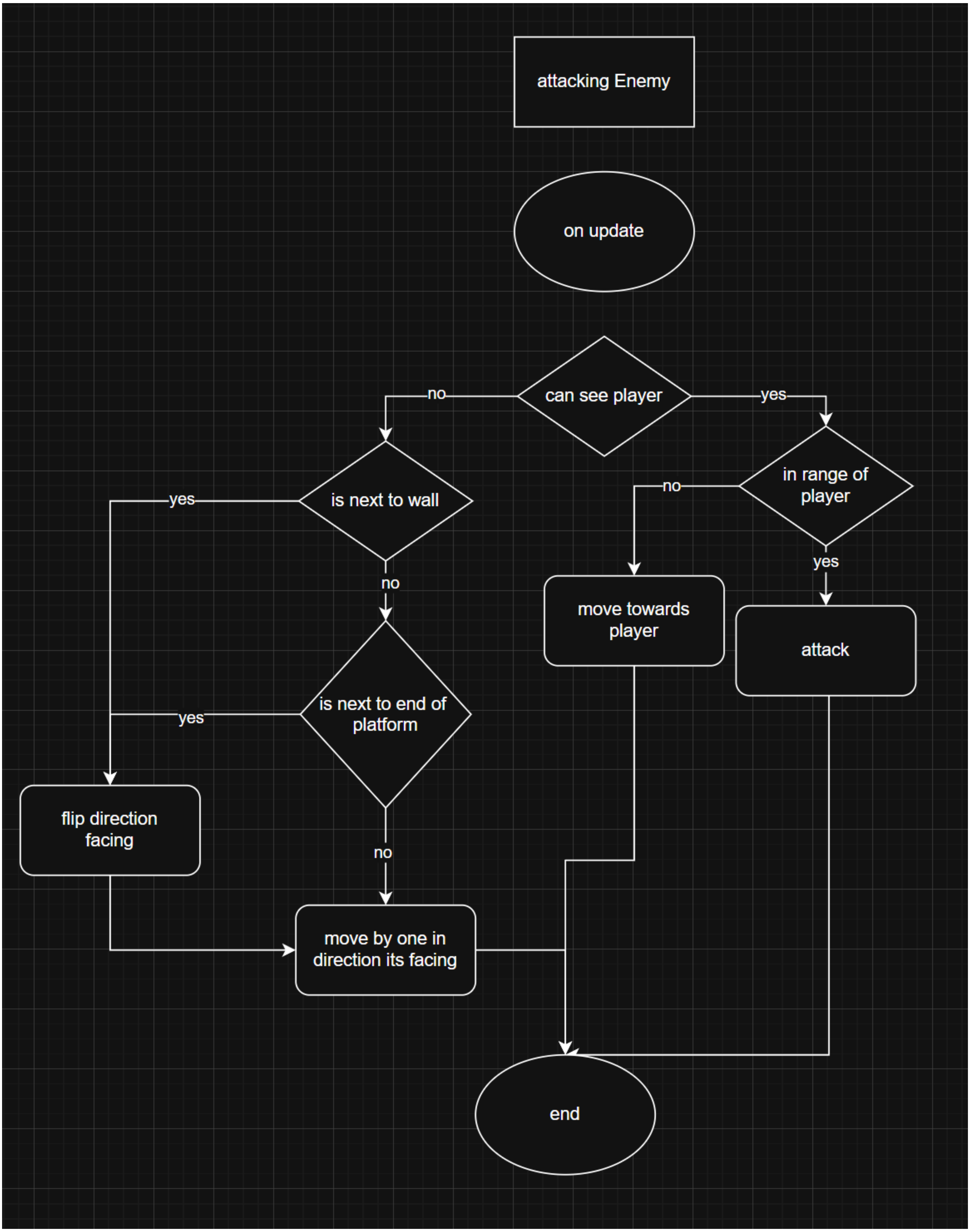
STAGE 3

Here I'm going to add enemies. They won't do much just walk up and down the platforms and hurt the player on contact and one that will be able to attack by themselves.

Here are the flow charts for the enemies and for when the player takes damage:

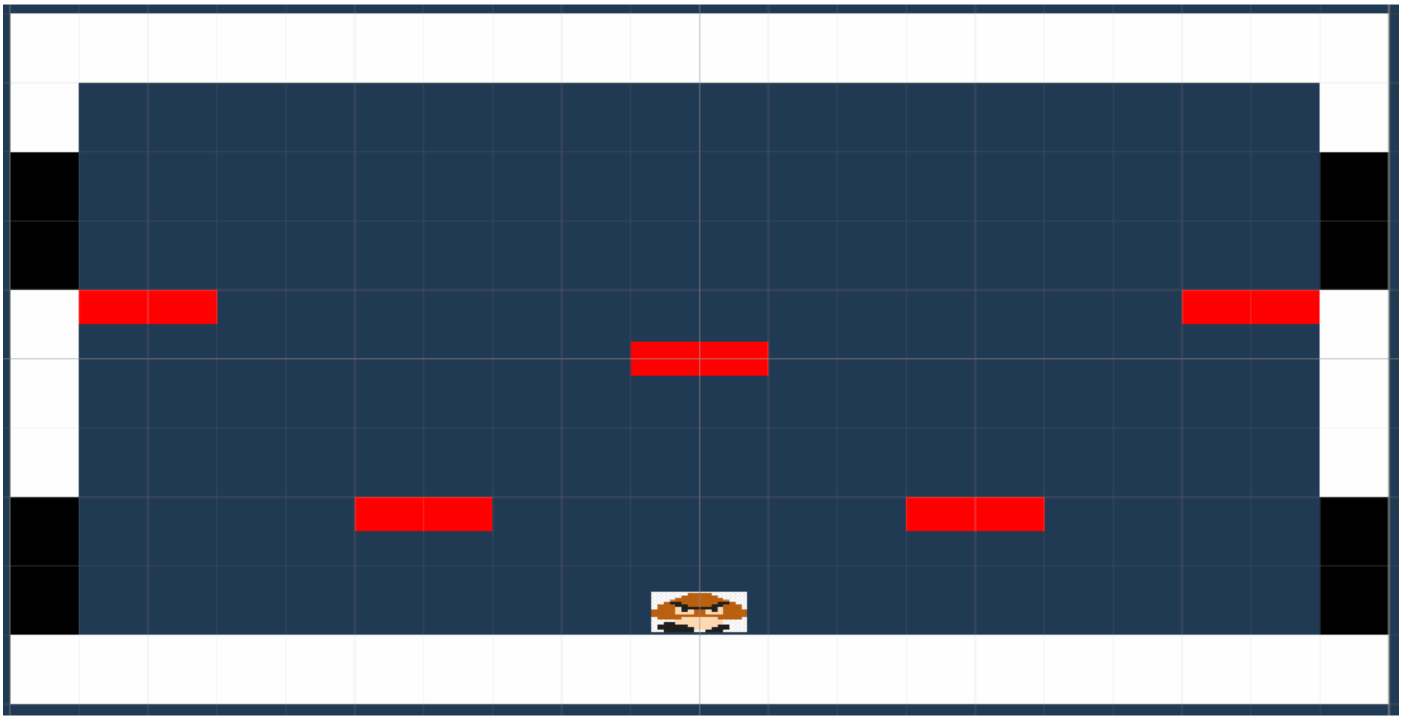




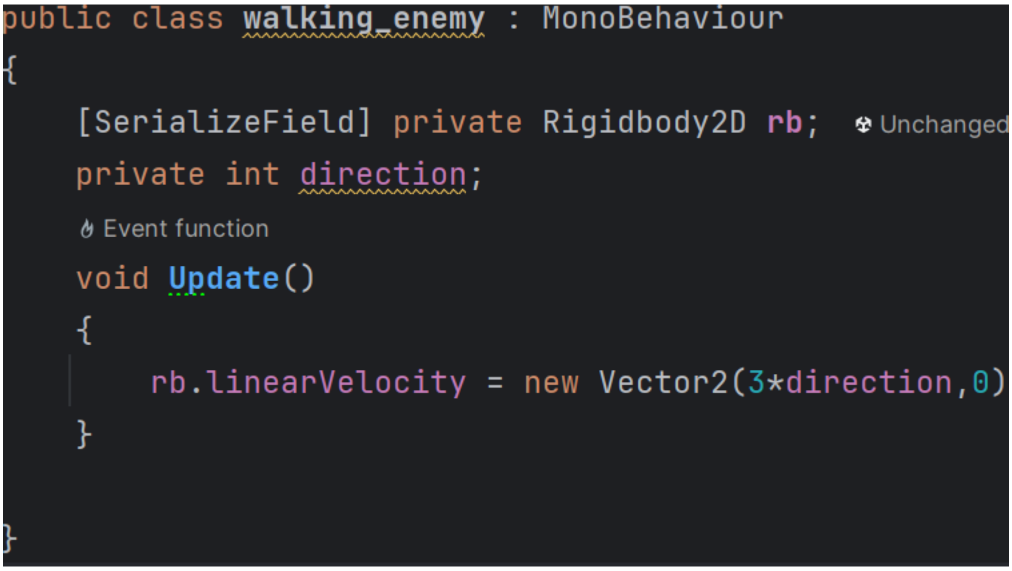

attacking Enemy
on update
can see player
no
yes
is next to wall
in range of player
yes
no
no
yes
move towards player
attack
is next to end of platform
yes
flip direction facing
no
move by one in direction its facing
end

Walk enemy Class diagram	attack enemy Class diagram
-moveDirection: int -health: int	-moveDirection: int -health: int -see_player: bool
-take_damage()	-take_damage() -attack()

I made the enemy and put it in the prefab for the start level:

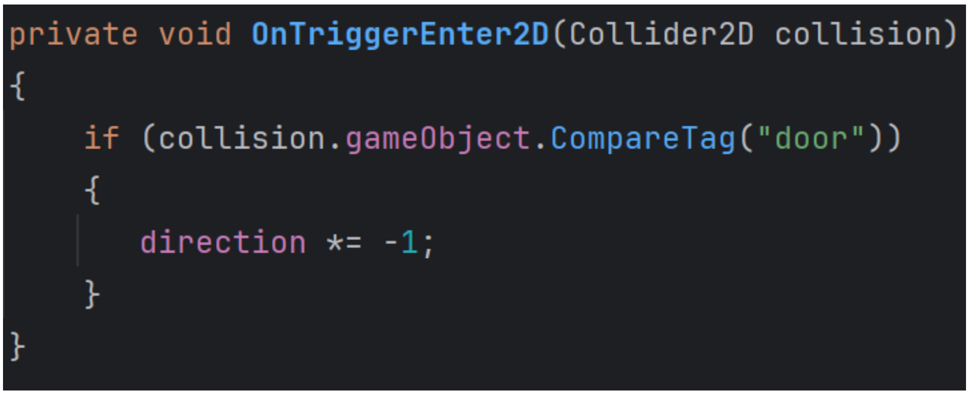


I then added the code for making the guy walk:



```
public class walking_enemy : MonoBehaviour
{
    [SerializeField] private Rigidbody2D rb;  Unchanged
    private int direction;
    Event function
    void Update()
    {
        rb.linearVelocity = new Vector2(3*direction,0)
    }


}
```

Then the bit of code that flips the direction if he touches a door:



```
private void OnTriggerEnter2D(Collider2D collision)
{
    if (collision.gameObject.CompareTag("door"))
    {
        direction *= -1;
    }
}
```

references

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