Final report

Engineers in Suits

June 2022

Project: Operation Labyrinthus

Group: Engineers in suits

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1 Introduction

This report is the final one that will be handed in alongside our game Operation Labyrinthus. Here is the tale of our long journey that took us far, farther than we would have hoped for and yet missing short of what we wanted. A journey bloodied by frustration, joy, desperation and pride. We have learned much since the beginning of our quest and we feel like if this was to do all over again, if we could muster the will to redo it that is, we would progress at an outstanding pace and produce work of quality that we couldn't even hope for a few months or even weeks ago. It is in the fire of action that skills are forged and what better action than an unfinished game just a couple days before the final presentation? Despite knowing we had to start earlier than for the previous defenses some things still cut it short and we had to resort to late nights again (yes there is a lot of those, if you're wondering. Sleep has not been a friend of ours recently). If this project might seem like falling short of its true potential know that we have tried our very best to bring you what stands before your eyes awaiting judgement. Countless days, maybe even weeks, of tutorials have been watched and digested by each of us (it is very painful to have to watch tutorials at 0.25 because what you are trying to do is done by pros who seem to have been born and raised sucking on a keyboard instead of their thumbs and learning how to use applications you can barely navigate in before learning how to walk). But enough with this lengthy introduction and let us dive in without further ado.

As a reminder, *Operation Labyrinthus* is a First Person Shooting game. Our group, the Engineers in Suits, have chosen to work with Unity in C#. Other software and tools have also been carefully selected.

The goal for players is to complete mazes by finding a portal in order to be teleported to another maze, and so on until the final maze. The last maze will host the final boss which the player needs to kill to claim victory. The player will also be facing waves of enemies, an optional boss per level and another player with the same goal as him, making this game a race to the finish line!

Previously, a list of tasks was assigned to each group member. The aim of this report is to show how far each student has come, and present our achievements as well as our impressions on the results and this whole journey. If we are being completely honest, and why not be, after all this is to be a recount of our pains and joys, this last week was hectic and everyone kind of did what they could. So the task distribution has kind of been taken, folded, nicely put on the corner of the table and promptly forgotten by everyone. And with that, let us go on this merry ride straight down to hell!!

2 Book of Specifications follow-up

Task	Main	Substitute
UI graphics	Enguerrand	Rayan
UI implementation	Rayan	Enguerrand
Character actions	Rayan	Edouard
Multiplayer	Edouard	Rayan
AI	Rayan	Emmanuel
Tutorial	Enguerrand	Edouard
Level design	Enguerrand	Emmanuel
Level implementation	Emmanuel	Rayan
Object implementation	Edouard	Rayan
Particle Effects	Enguerrand	Rayan
3D Modeling	Enguerrand	Emmanuel
3D animation	Emmanuel	Edouard
Music	Edouard	Rayan
Sound Effects	Edouard	Emmanuel
Website	Rayan	Emmanuel
Report	Enguerrand	Emmanuel

So this was our previous task distribution. It has been changed somewhat to fit our needs in a better way. A redistribution follows. You may also want to note that Enguerrand has seen fit to take on the role of the group leader as the need arose, but he will come back to this in his part.

Task	Main	Substitute
UI graphics	Enguerrand	Edouard
UI implementation	Enguerrand	Edouard
Character actions	Edouard	Rayan
Multiplayer	Edouard	Rayan
AI	Edouard	Rayan
Tutorial	Enguerrand	-
Level design	Enguerrand	Emmanuel
Level implementation	Rayan	-
Object implementation	Edouard	Rayan
3D Modeling	Enguerrand	Emmanuel
3D animation	Emmanuel	Edouard
Music	Enguerrand	-
Sound Effects	Rayan	-
Website	Rayan	-
Report	Enguerrand	Emmanuel

3 Additional details

- **UI graphics** Enguerrand took the lobby screen previously made by Edouard and implemented a more complex menu. Game UI hasn't been changed.
- **UI implementation:** All the UI that were created were implemented.
- **Character actions:** Already implemented for the second defense.
- **Multiplayer:** Functional
- **AI:** Functional
- **Tutorial:** Fully done
- **Level design:** Fully done
- **Level implementation:** Fully done
- **Object implementation:** Fully done
- **3D modeling:** Fully done
- **3D animation:** Fully done
- **Music:** Fully done
- **Website:** Fully done

4 Achievements

4.1 Enguerrand

4.1.1 Introduction

Here we are once again. Didn't think I'd be back here so quickly. Well I've already been here for a while now, writing the previous parts.

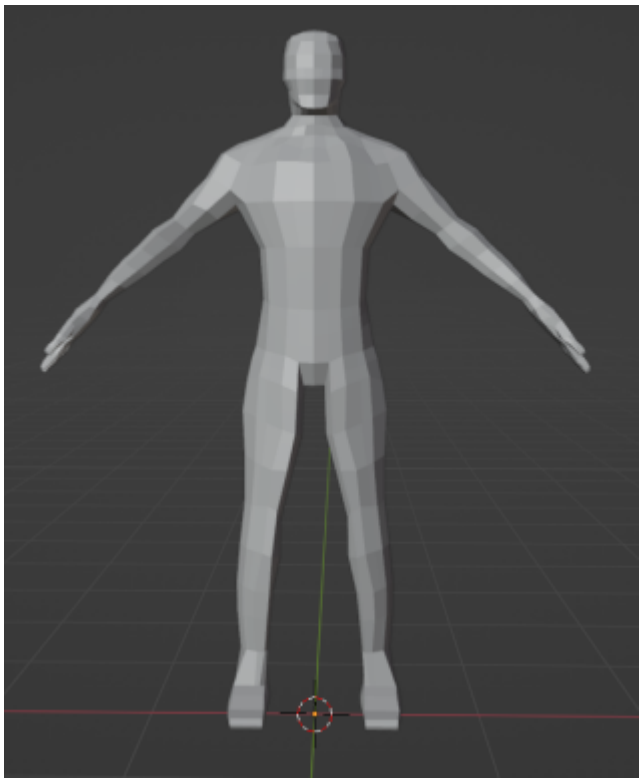
My main job for this project was to keep on working on the 3D modeling. I've also played a role in the UI implementation, mainly menus and on the implementation of music. And finally I've had a dip with the AI trying to solve some problems that the members of my team had. I also had to take my turn in the managing area of the project. Since the beginning of our preparations for the second presentation I felt the need to have a bit more control over things, to make sure everyone was doing their job properly, efficiently and in the best conditions possible. I normally assume this role in most projects but Rayan wanted to be it this time so I gladly left him the spot thinking I'd have a little break from this tiring position. And yet, I just couldn't leave it alone it seems! Let's just say we had a dark period of demotivation for some members of the team during the second presentation. I thus took the reins on the project and have since tried my best to make everyone feel like they were working in a good environment so they could work to their maximum potential. Well, to no surprise, it was very tiring, I now had to try to find solutions to my problems and everyone's problems. I had to coordinate the team members to make sure they could help each other when was needed and possible, which required me to know exactly what everyone was doing. I think I can safely say that I did a good job at this and that me taking this role on was needed. Overall I think assuming this position has helped me strengthen my leadership skills as this was no easy task, having to coordinate everyone online and having an overall understanding of every aspect of the project.

4.1.2 The 3D modeling

4.1.3 Introduction to 3D modeling

As you may remember from the previous reports, before this project I had absolutely zero experience with Blender or 3D animation in general. To be honest I don't even know how to draw anything and when I have to, I still draw my sun in the corner of the paper like a proud 2 year old would do. I won't include my part of the work on the mazes because I feel like I've extensively talked about it in the previous reports, I haven't changed anything in my technique and I don't want to take up too many pages (just know that I've done 5 more mazes for this defense).

For the first presentation I create a humanoid model on Blender with the help of a tutorial on YouTube. With this I was able to create the players and one of the enemies, the thrall.



Base model of the characters, done for the first presentation

4.1.4 The player model

This model helped me do the player model. It took a lot of tries as, yes I did have a base model, but making an actual good looking character out of it was way harder than it sounds like. But I made it happen. It might not be my finest work but it was my first work and at that time I was really proud of it. I still think it is good considering I pulled it out of my brain (and that's quite a feat).

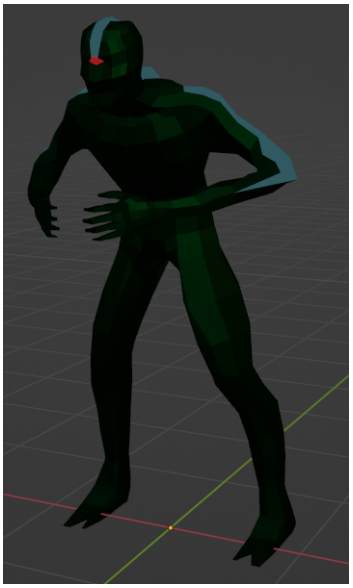
For the helmet, I inspired myself from a few pictures I found on the internet, from the Halo Master Chief helmet and from one helmet of a game I play way too much for my sanity's sake, Destiny 2. I added little antennas and those donut ears because I didn't want the face to look uniform and empty. I also extruded several faces to make it look like armor plating. I then had the great idea to apply a glowing cyan material to the edges of all those extruded faces. I really like how the grey material I used shades nicely and doesn't look completely uniform. I added a little jet pack/O2 tank on the back of my character and went to paint the rest of his body. So, during my testing I thought about doing a chest plate which turned out to look good, but I realized at the end that I could just have used the chest I already had instead of modelling a chest piece over it. It was done and I didn't want to touch it again. I continued with this cracked armor vision and raised faces randomly. I then moved on to the arms (I didn't even recreate a gauntlet this time, just modified the already existing arm! Getting smarter...). I was a little more daring on some parts for the arms and extruded more than I did for the rest of the body. I then did the legs, with is the same process again and for sake of simplicity decided that the hands, feet and back of the legs could be left black. My glowing space soldier was done and ready to kick some monsters in the face.

Our player

I later had to revisit this character a bit as when I realize I had to import my models as FBX and not blend files I found out that for the faces of the model to be colored in Unity they all needed to face the same direction. And turns out that in my incompetence my model had a bunch of faces facing inwards. I thus had to manually select everyone that was not facing in the right direction and invert them. That was annoying (but what isn't at this point).

4.1.5 The thrall monster

Next came the first creature I had to design. I went with something reminiscent of the triton creature and a thrall from Destiny 2. I used the stooped posture from that last one to shape my creature (which I'll name a thrall, original I know), so, no, it's not a hunchback. I gifted it a cool looking spine, and had to change his arm posture and legs to fit more into what I had imagined. In my head it would slash and try to grab the players with its claws. It was at this point that my laptop decided it had seen enough, and Blender would just freeze every twenty seconds. I would close the window, reopen it, try to change something just for it to freeze again. After multiple rebootings and sobs I gave up and decided these color scheme would have to be enough. It's not as detailed as I would have liked but it will do the job nicely.



Our thrall

4.1.6 The golem

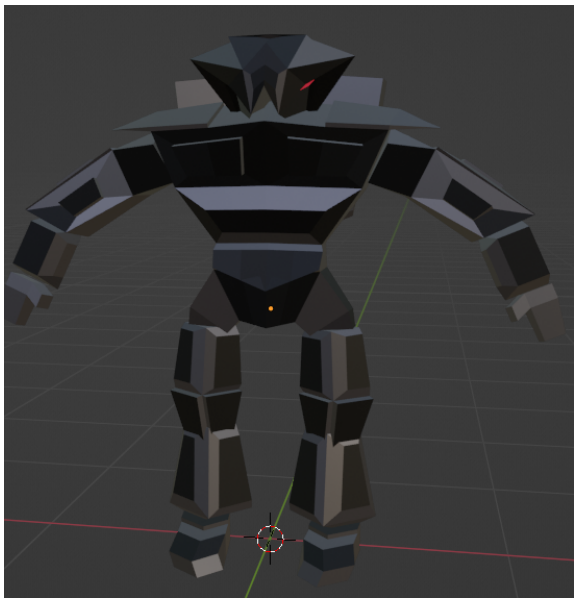
Now comes the part of the things I did for the final defense and oh boy how we've stepped up since the thrall and the player models. As I was looking at my other friends' projects I realized that their models were way better than mine. When I asked them about it they simply told me that they found tutorials for these assets. And that is when I realized the error I had been doing since the beginning. I had been watching tutorials. But tutorials on how to use Blender and not how to make particular things. I had thought that my imagination was enough for this and I found out that I was gravely mistaken. I thus went on the hunt and discovered this incredible YouTube channel with a 100 guides of how to make Blender assets. Of course I did not need those 100 assets but the library of content was sufficient to allow me to build three enemies and give another one to Emmanuel to do. In these videos, the person making the builds only did them in 10 minutes. 10 minutes that became an hour or two for me but guaranteed that what I was doing was simple. You can't do overly complicated things in 10 minutes right ? Right ? Just kidding it was quite simple actually, once I'd sped down the video to 0.25. I learned so much during these couple days following his tutorials. This YouTuber is called Imphenzia and has my thanks and gratitude. And here is the product of the first of his tutorials that I followed: a full fleshed golem!! He looks amazing and is probably the best looking thing I'll produce in my entire life on Blender. My productivity went up in a spike and so did my Blender expertise (while still staying in the depth of beginner). I really like in particular the way I can make his skin seem to be composed of two materials, one stone and the other more liquid like ice or lava. This is done by actually having two models superposed. The first one has an affect giving it that stone cell look and the other has just been scaled a bit to fit into the fist one. Another thing that I've started to use a lot more is actually duplicating surfaces. Before when I wanted to add something to my model I would create it as a separate object and then merge it with the model. Duplicating allows to have the object be a part of the model and thus rendering the process easier.

The golem

4.1.7 The Mech

We already has the thrall and the wolf as enemies. The wolf was supposed to be the very fast but weak enemy while the thrall was to be the base enemy, with "normal" stats, not too fast, not too much health points and dealing regular damage. We were thus missing a tank unit. I decided to create a mechanical enemy, the mech. For this I also found a tutorial. But halfway through I decided to go my own way. I accidentally did something to its face but instead of reverting the change this time I actually kept it and built upon it. It gives him a nice insect like two face aesthetic. I made him pretty basic, he also has some gundam vibes (I think, I've never watched those).

The mech



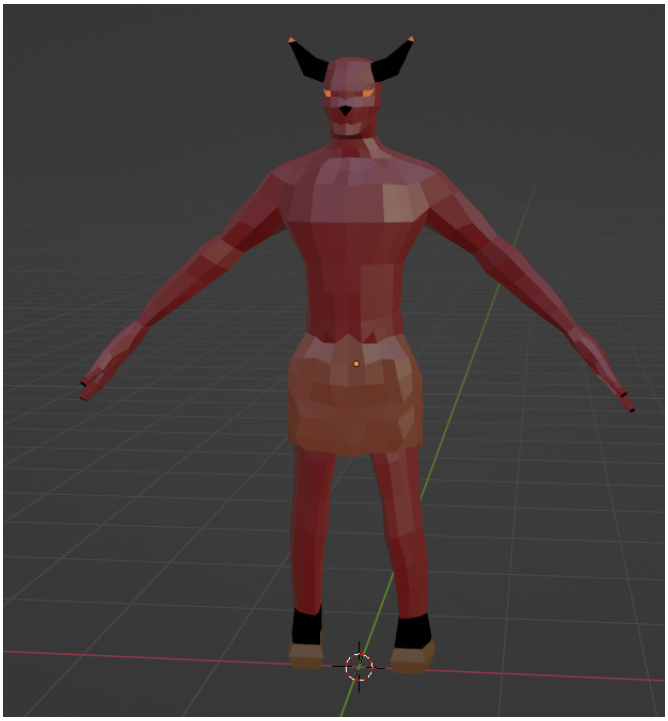
4.1.8 The Cyber Spider

Why that name? Well because it sounded cool and it rhythms (yes this is the real reason). I, you won't believe it, have once again followed a tutorial from the man, the myth, the legend, Imphenzia and created this really awesome mech spider (alright alright it's not a spider it only has 6 legs I know just bear with me please). The spider was really fun to make as it was my first non humanoid character, the previous ones had been made by Emmanuel. It was very interesting to make the legs as they were highly detailed, which I'm a bit sad we will not really be able to notice in game. The spider looks really good and actually was not that hard to make as I just made on leg and the body (which is pretty basic) and then duplicated the legs. I did not add the turret that is supposed to be on top of the spider as we do not want any of our mobs to be able to shoot. All in all the spider was really fun to make and I'm quite proud of that model too.

The Cyber Spider

4.1.9 The Devil

For this last boss I wanted to go back to my first base character model, the one used for the player and the thrall, and try to apply what I had learned. Unfortunately it was still way harder than it sounds and I quickly realized that it would not look good. Unfortunately I had used up all of the good tutorials from our YouTuber friend. I thus decided to stick with it and try my best. It is not my best work but the process of creating it was accelerated at least by 6. Where the player took me a very long time to make this one went surprisingly fast. I think he looks funny, with that loincloth that doesn't look natural at all. The one thing I wish I had done better is to make him a tail. I tried but the base model isn't particularly tail friendly. So after several failed attempts I gave up on the tail.



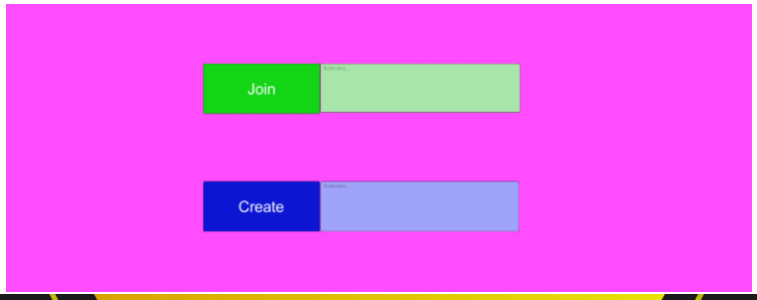
The Devil

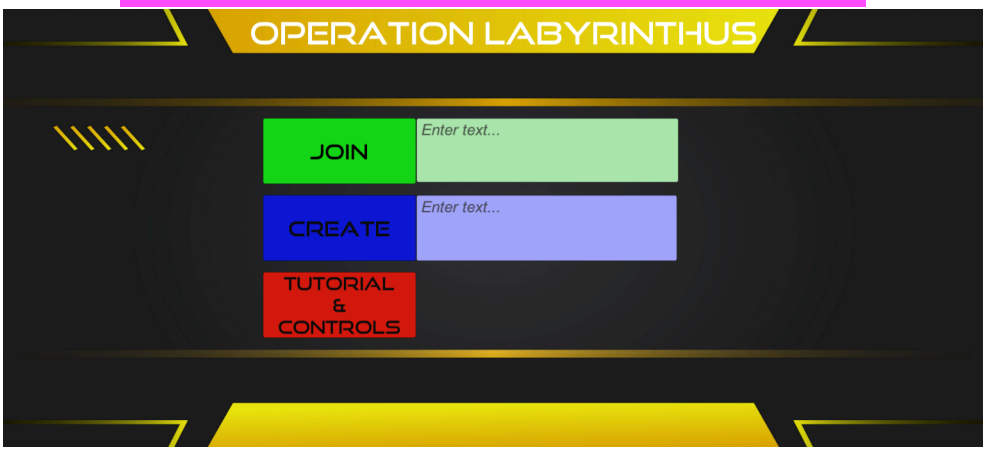
4.1.10 Textures

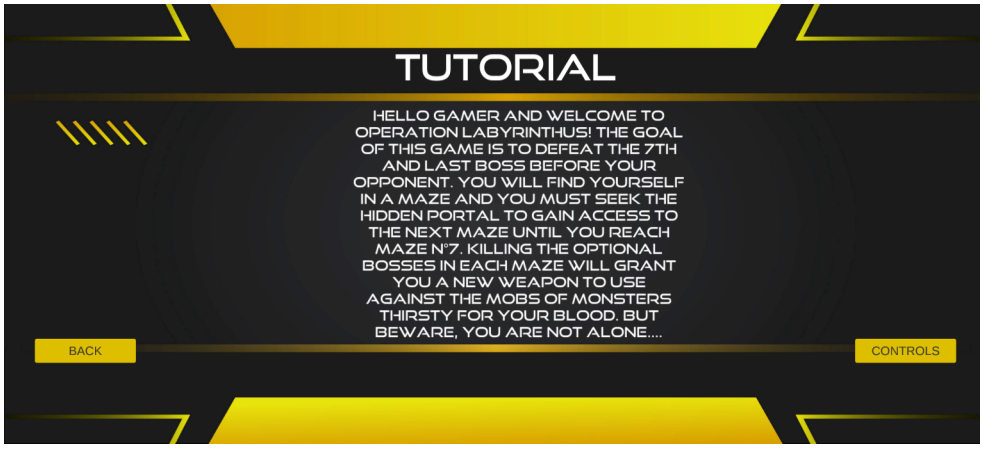
You might remember I wanted to add some cool textures to the mazes. Yeah well I had to ditch this idea. The textures did not look very cool in reality when slapped on the mazes and I did not have enough time to find better ones. I decided to put everything in black and it looks great just like that (while singing I want it painted black by the Rolling Stones of course).

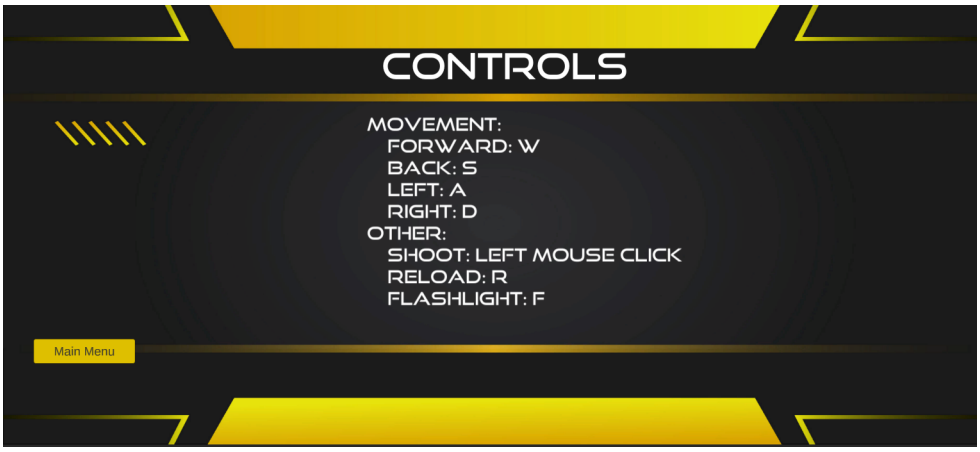
4.1.11 Menus

For this part I actually also had a lot of fun (I'm starting to realize that this project was actually fun but it did not really feel like it in the moment, probably because I was really stressed out the whole time). I follow a straight forward tutorial (hey I swear I can think on my own! I just need some tutorials...).
So, Edouard had already done the lobby (a hideous thing of green and pink) and I now had to make it look nice while also adding a tutorial. The first thing I did was pick a background. I found this nice free background image on the wonderful internet. It fitted the vibe I was going for pretty nicely, futuristic yet not exactly high tech. I customized the Join and Create buttons. I've had difficulties making them look more net as they look blurry to me and I still haven't found the way to make them look better. Had a slight problem where the font I was using just mysteriously disappeared from the game files (thank you Unity...). I then created a second menu, featuring the tutorial text. In the beginning I wanted to make a slideshow with in game pictures but as our game was complete a bit late I was not able to do that. Instead I decided to create a small text explaining the goal of the game and add a control panel. I think this fills out the role of a tutorial pretty nicely. It was nice to see everything work perfectly on the first try too (which basically never happens with anything else). I've also designed the end screen which was pretty basic as well.









The old menu vs the new menus (it just doesn't want to line up, I don't know why, it hurts me more than you I promise)

4.1.12 Music

For this I wanted to put music for the menus but also for the game. But I could not find a song that would fit the vibe of the game enough to be heard continuously during the game. I did not want the music to kill the vibe. I also myself enjoy listening to songs while playing games and I knew that I probably would not have the time to make a noise setting page and so that people would be stuck with the music which could get quite annoying (I do not know the length of a real game but I can only imagine how annoying one minute of music on a loop can be after a while). Instead I simply implemented the music in the menu (sorry to the ones having to listen to it every time they have to test the game). It was surprisingly easy to do. The hardest part really was picking a song. I downloaded a library of 2O or so free game menu musics and choose the one that fit best the vibe I was going for. It reminds me a bit of the soundtrack for Subnautica (it is after all named "Floating in the Abyss").

4.1.13 Small AI part

For this to be honest I mainly provide emotional support. It was a hard job to do and my colleagues needed a little boost. So I mainly did the job of sticking around with them, seeing if I could spot any obvious error and providing ideas and tutorials I had found. I also played the role of the plastic duck (to non programmers this is when you have to explain your code to a plastic duck and most often than not you realize your errors as you are explaining them). Except I was a plastic duck that could provide some feedback, solutions or leads toward them. I did get a fairly decent understanding of how the AI functions thanks to this.

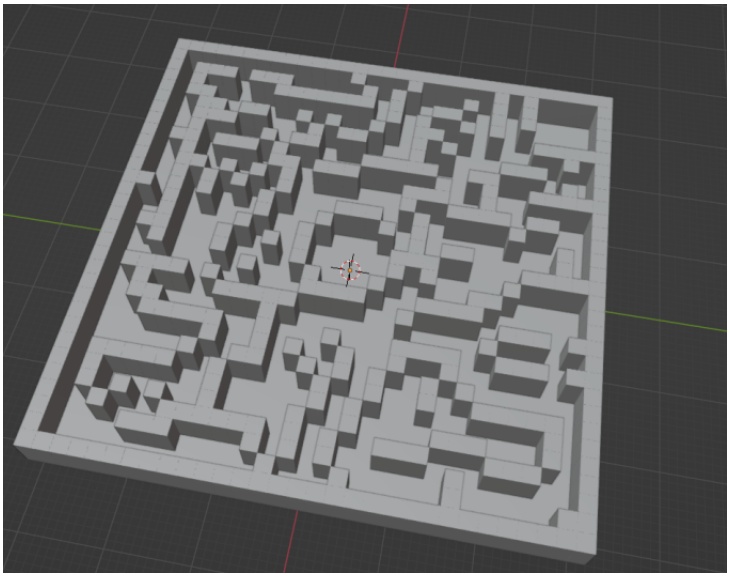
4.1.14 Conclusion

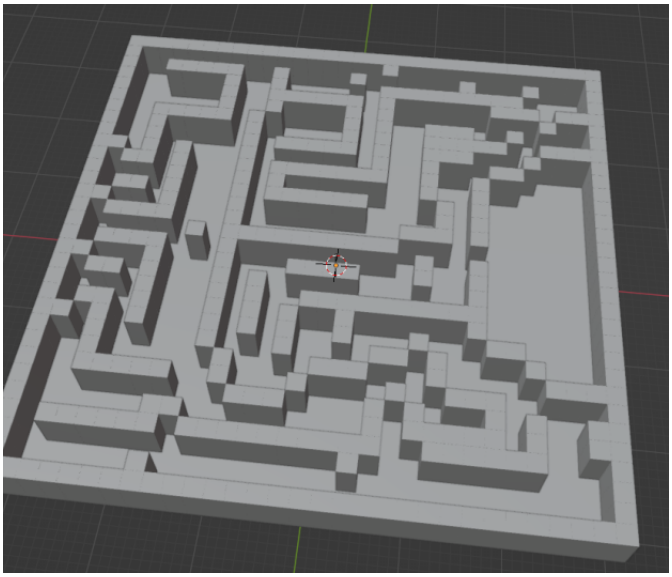
This project was a great way to learn a bunch of new things. I just regret that we did not really have enough preparation for this project (the NTS tps were cute but not really helpful) but more importantly that we did not all have the required materials. I have been stuck multiple times on Blender because my computer would just freeze and refuse to work. Multiple times that added to multiple hours and restrained me on what I could do. I see no real solution to this to be fair but it's just a point I wanted to make.
This project was definitely a real challenge, in terms of technical aspects but also of work distribution and schedules. It wasn't always easy, our team had its ups and downs but it is finally over. All of our work will pay off soon, during our final presentation tomorrow at noon (yes I'm doing this report on the last moment, I am a programmer after all). I want to thank everyone on my team for following the hard schedule I forced upon them these last couple days but I think they can all agree that it was necessary.

4.2 Emmanuel

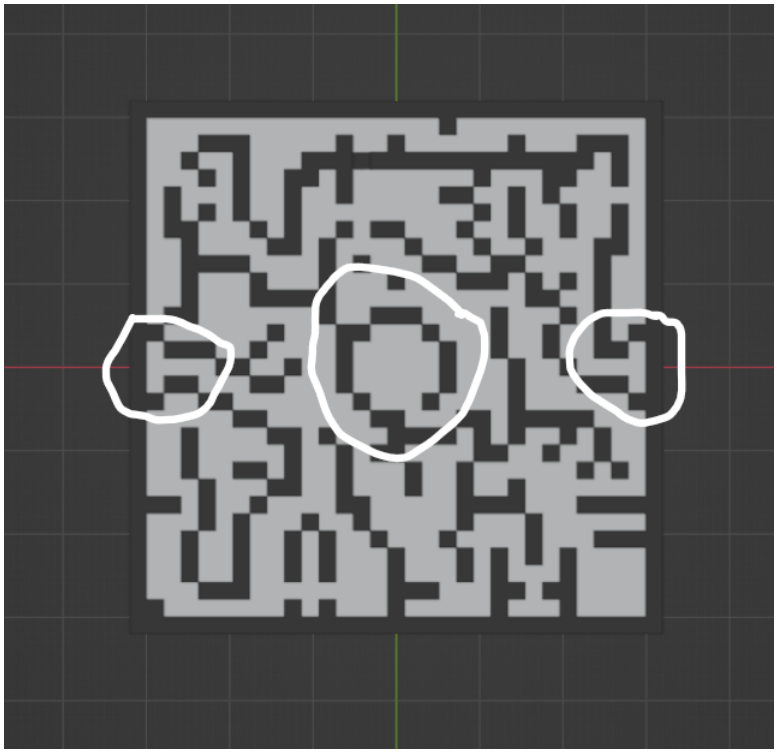
4.2.1 Mazes

A part of my work was to design mazes for the game. In order to design mazes that are coherent with our game, we needed to respect a few points : all the mazes must contain 2 spawn points, these points are T-shaped, and it is in these rooms that the players will appear. All the mazes must also contain a boss room given that the player will have to face a boss at each level to reach the next level.





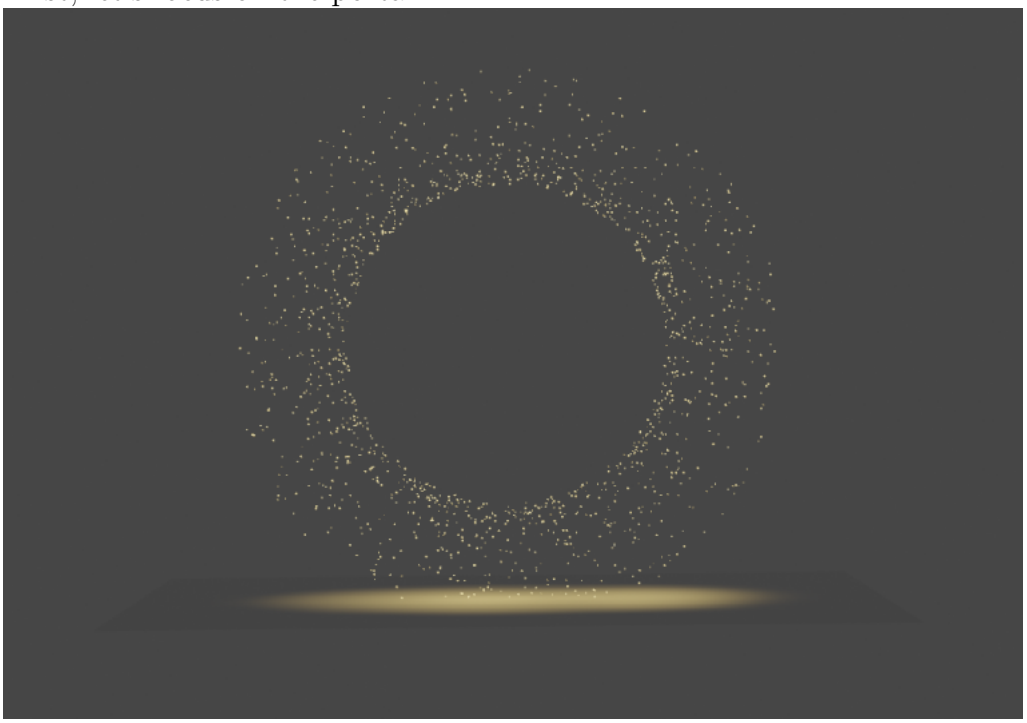
Here are two examples of maze.
In the maze below, the boss room at the center of the maze and the spawn points are circled. Although this maze is organized this way (boss room at the center, spawn points at the edges) it is not mandatory they can be placed anywhere as long as the path lengths between the two spawn points and the boss room are approximately equal and that the players can meet each other.



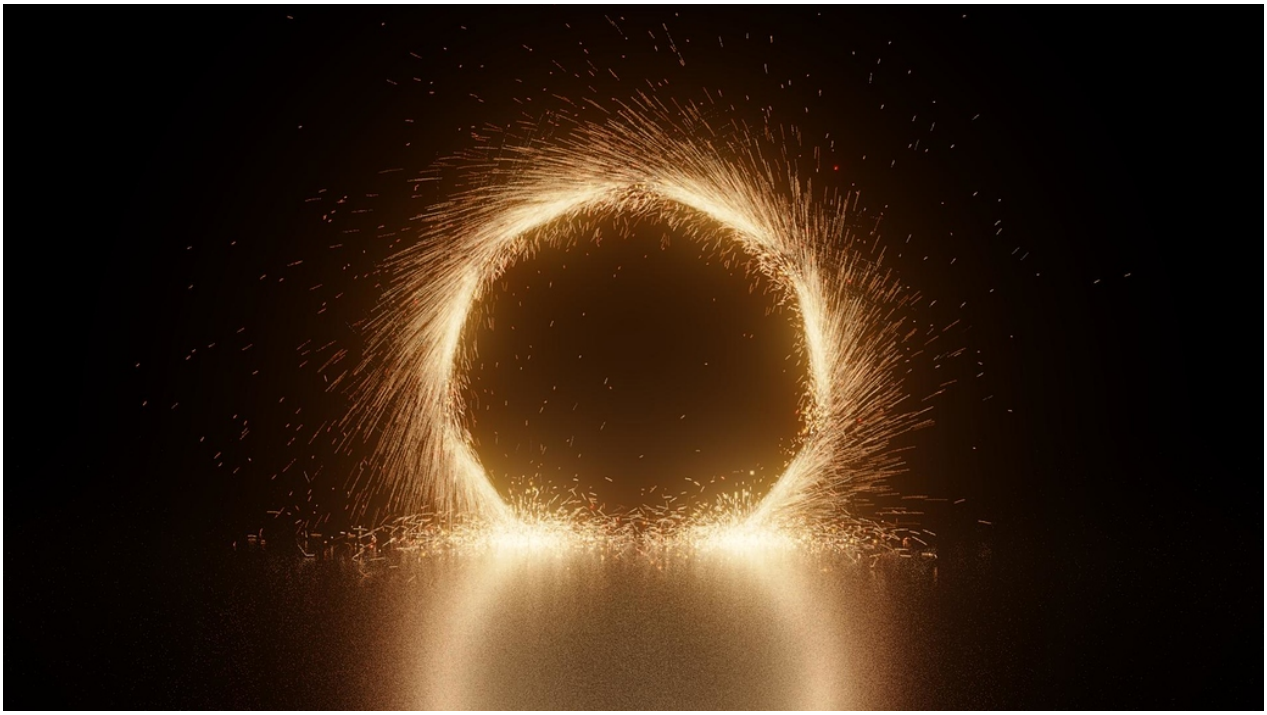
I also had to work alongside with Enguerrand on the 3D modeling. Given that he had done the base character model, we decided that he would focus on the anthropomorphic characters. On the other hand, I created non-humanoid characters and all the objects of the game.

4.2.2 Portal

First, let's focus on the portal.



As you can see, the portal is a simple circle with little sparks spinning around it. I got my inspiration from Marvel Comics' Doctor Strange's portals

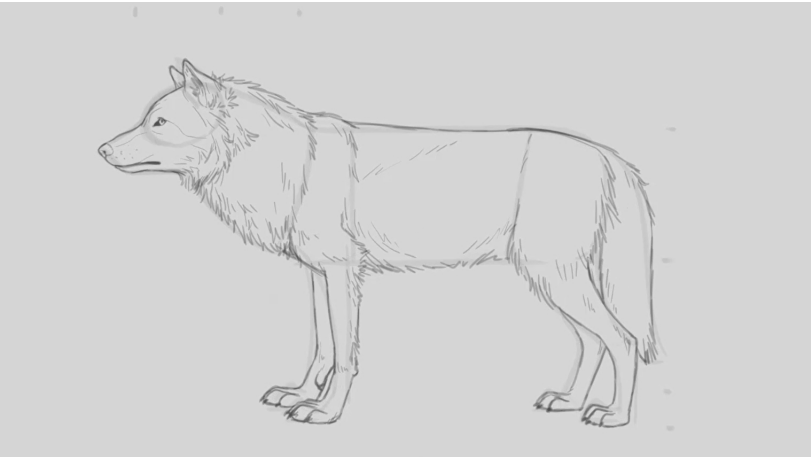


Doctor Strange's portal

I decided to simplify it because the graphics of the game are going to be low-poly, so if there is suddenly a highly detailed object in the game, it will look weird, this is also why I decided to make a portal like this instead of a "smoke" portal.
Making the portal was quite straight-forward : create an empty cylinder, shrink it as much as you can, apply a particle effect to it, the particles emitted are going to be the simplest glowing ico-spheres possibles, so there aren't too many polygons, put a vortex at the center of the portal, and it is done. I spent most of my time trying to find the right amount of particles to emit, the right color to choose and finding the best speed for the animation, but the most important was to manage correctly the vortex : it should not be too strong nor too weak, being too strong will result in sending all the particles far away whereas being too weak will almost not act on the particles.

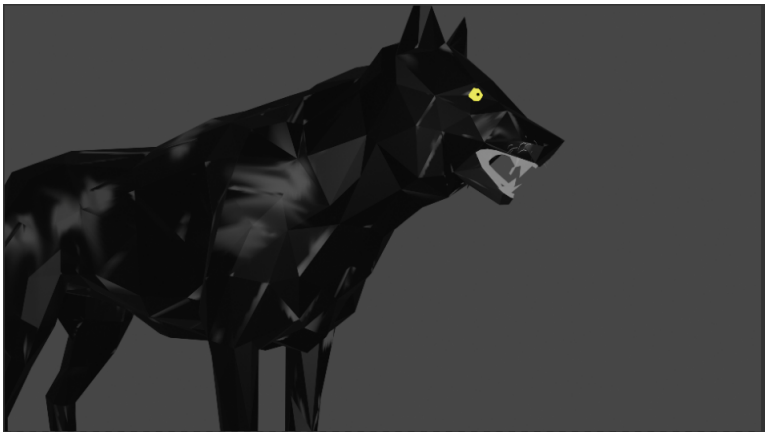
4.2.3 The Wolf

Right after making the portal, I had a new mission : create the first boss of the game. Since I like wolves, I thought a wolf would suit the atmosphere of the game and would make an interesting boss. So I immediately searched on Google some guides that would explain how to create such an animal on Blender, after watching parts, or entire tutorials, I started to create my own wolf using many models for the different body parts.

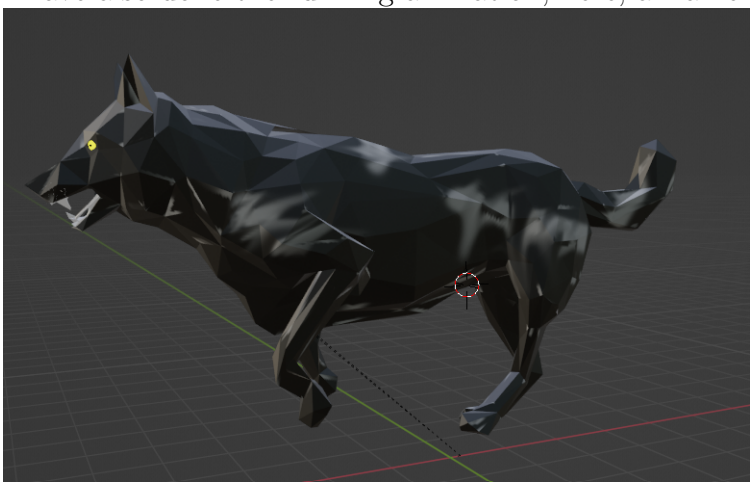


One of the many models used

Here is the final result :



I decided to give him the colors of Fenryr the mythological wolf.
I have also done the running animation, here, a frame of the animation :

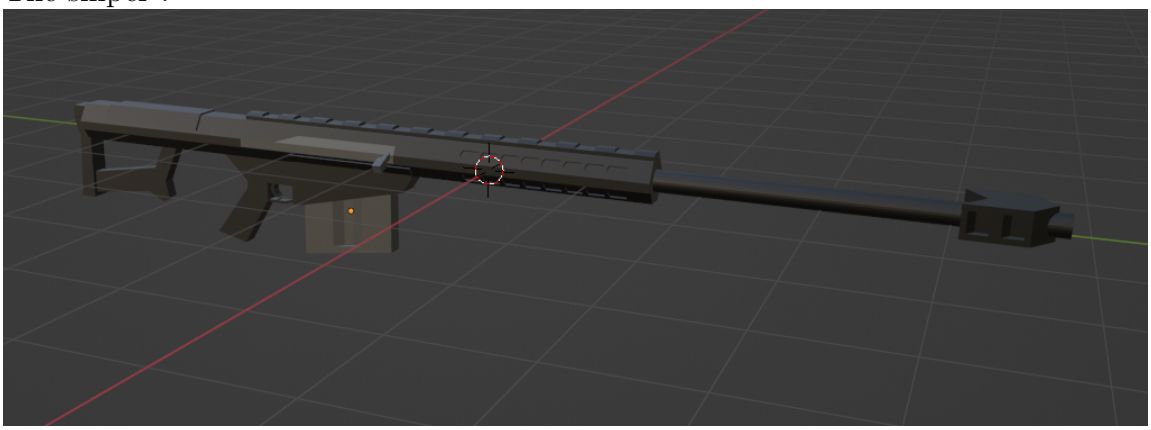


In the end the wolf will not be used as a boss but as an enemy, you will see many of them while playing our game.

4.2.4 The weapons

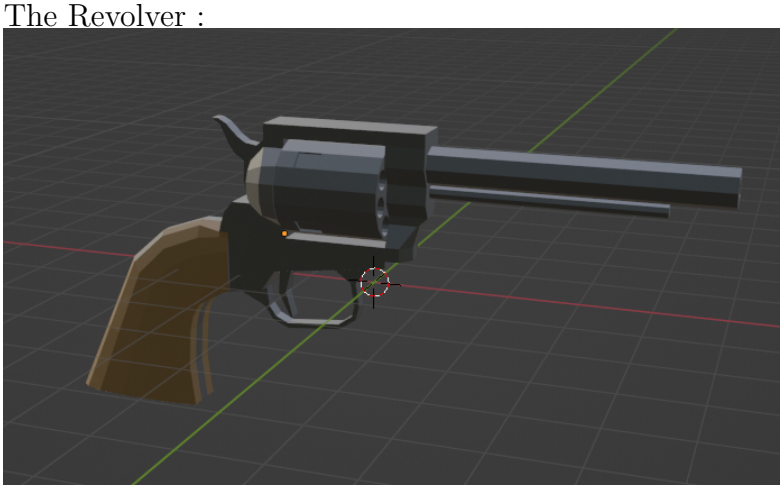
Now let's move to the weapons, I have created a rifle, a sniper, a shotgun, a revolver, a burst rifle and a sci-fi styled gun. In our game there will be the possibility to unlock new weapons, so it is important to make models for these new weapons, have a look at the rifle :

The sniper :



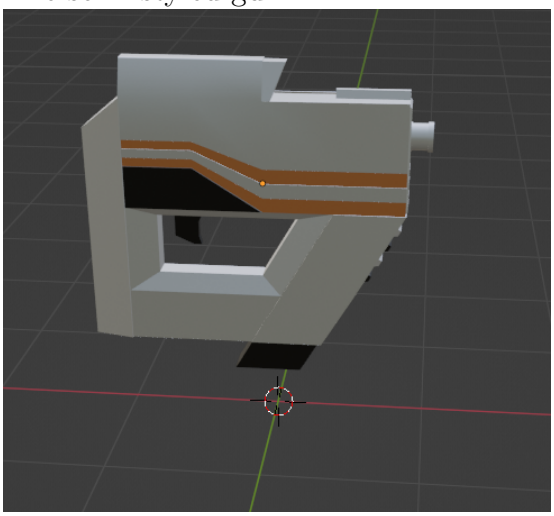
The Shotgun :

The Revolver :



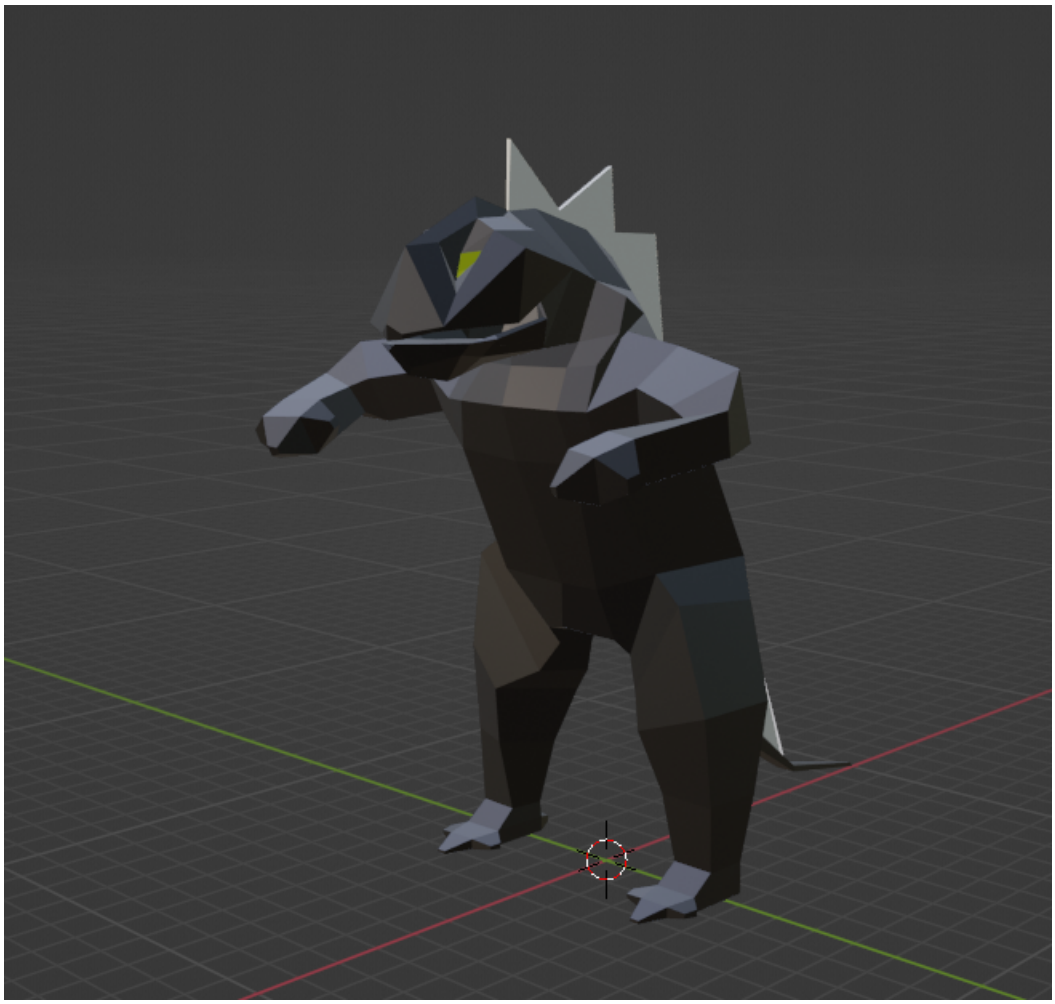
The Burst rifle :

The sci-fi styled gun :



4.2.5 Godzilla

The last 3D model I made was this boss, directly inspired by the famous monster Godzilla.

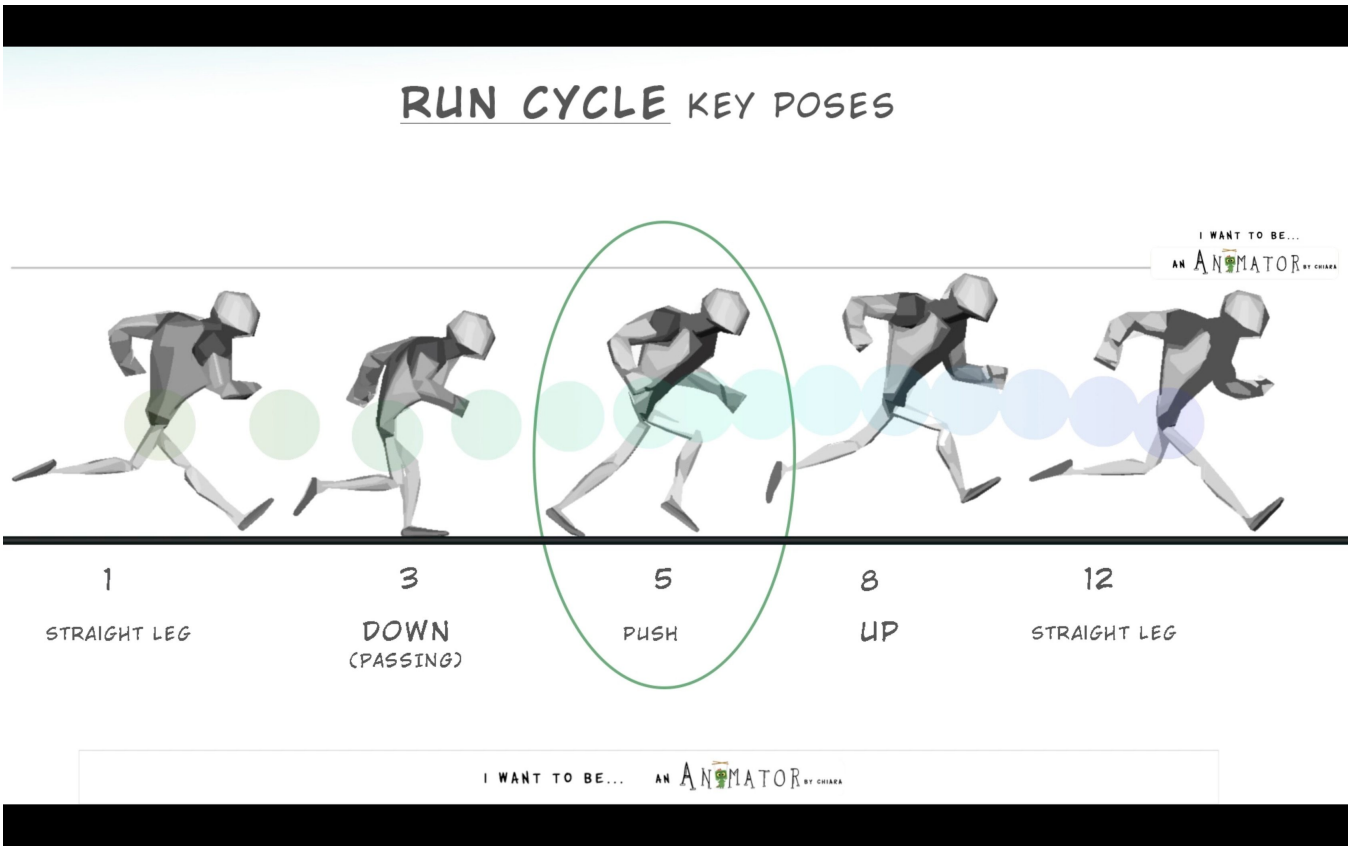


To make it, I created a cube, extruded the faces, then by rescaling, moving and extruding the faces, the edges and the vertices I got to the result above.
We needed a boss that is tall, hence Godzilla, who is probably the most famous of all the big monsters in our culture today.

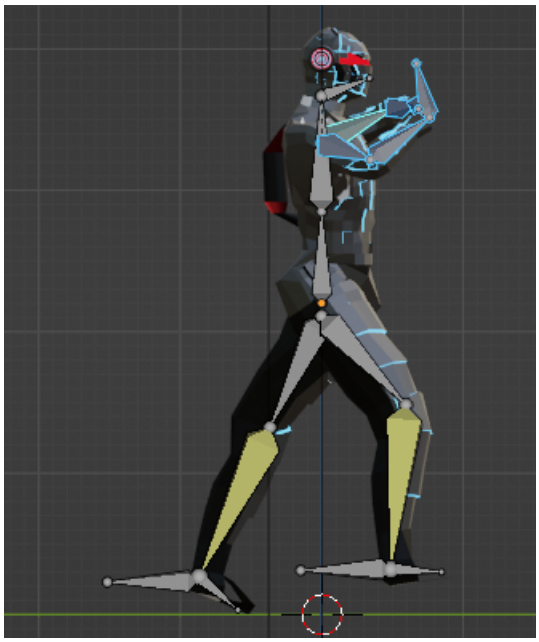
4.2.6 Animating

Now let's focus on another part of my work that was, I think, as important as the modeling. I had to animate many of the models, in the end, I animated the players, the wolf, the bosses and the mech.

The players :
The players were already rigged by Edouard, so I only had to do the animation. But I quickly noticed a big problem, some vertices would move with the armature, causing big problems with the animation itself, because of this problem, we had to delete some vertices, luckily this problem was only present on the feet.
To do the animation, I used a drawing describing each phase of a step:

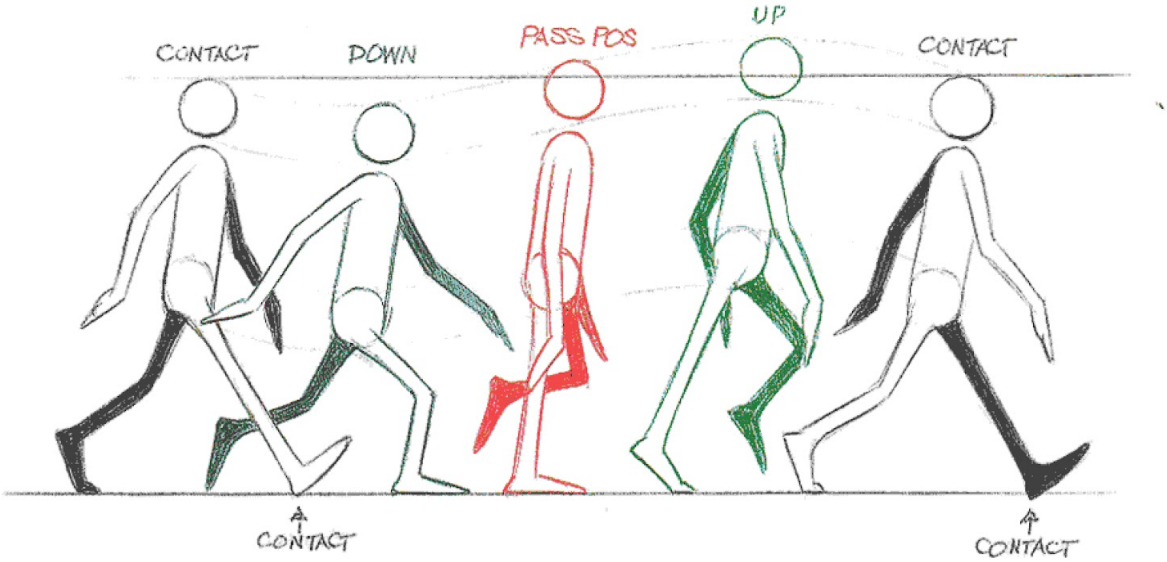


Here you can see the "push" frame of my animation:



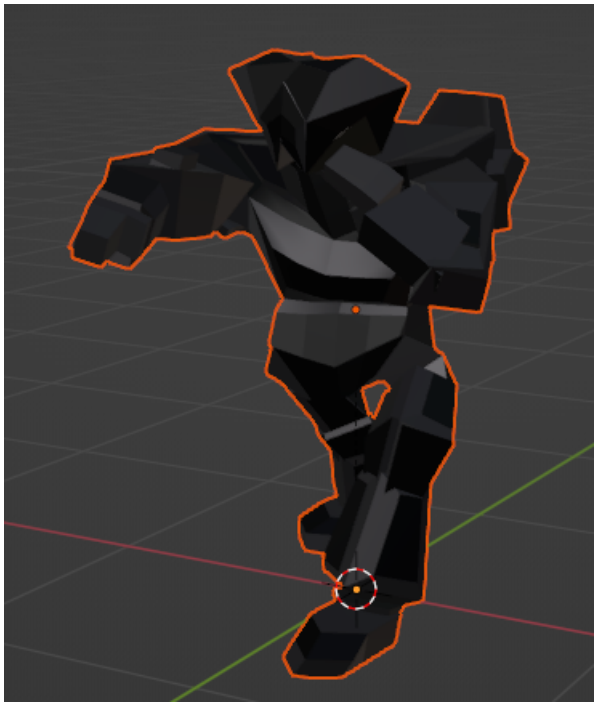
I decided to keep the back straight because the character has to always be ready to shoot an enemy, if he leans his back, he will have to straighten his back before being able to aim correctly.

For the next animations, I didn't encounter any problems.
For the walking animation of the mech and the devil boss the following image has been used to make the walking animation :



The mech :
For the mech I made a simple walking animation and a punching animation :

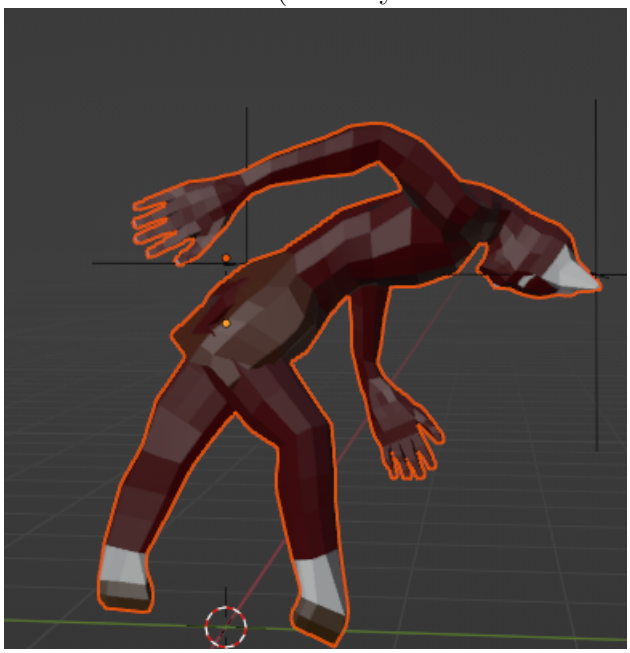
The mech walking



The mech punching

Devil :
For the Devil I made a walking animation that is almost the same as the mech's, a headbutt and a kick.

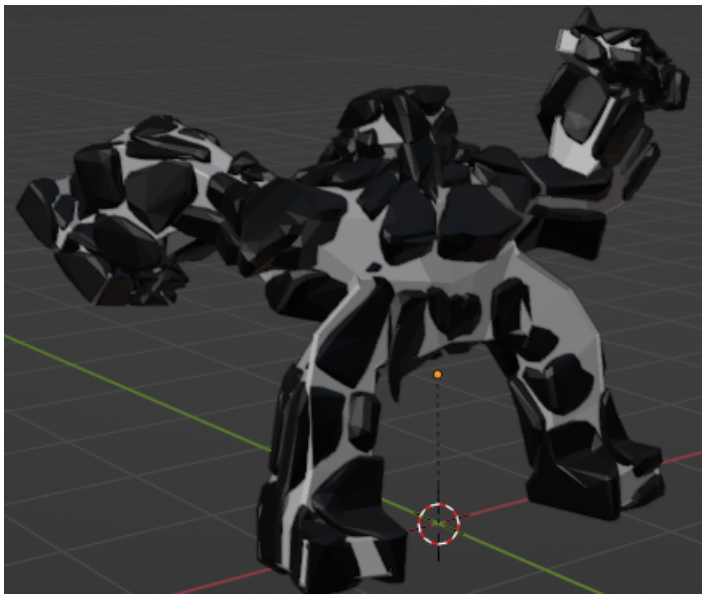
The devil's headbutt (actually based off Zidane's):



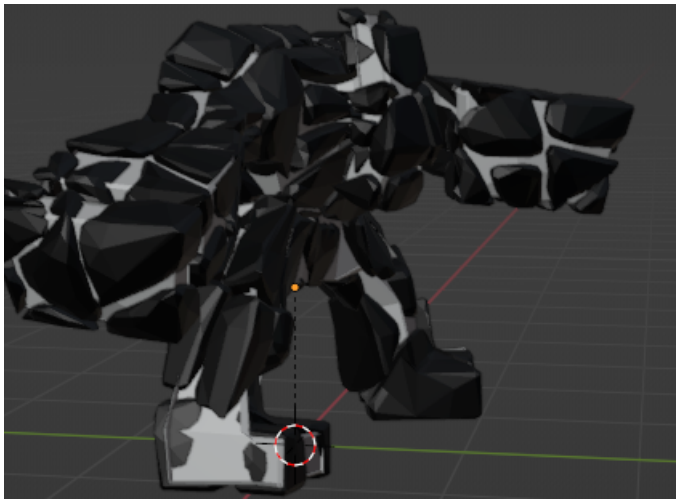
The devil's Kick:

Golems :
The golem can walk, he has a powerful attack where he hits the ground with his right hand and right after the left hand and a light attack where he basically punches in front of him with a hook.

The Golem charging his powerful attack



The end of the Golem's light attack



Cyber Spider :
The Cyber Spider can walk, has two attacks : the first one hits with its two forward legs and the second one hits with all its body by jumping and spreading the legs while spinning anticlockwise.

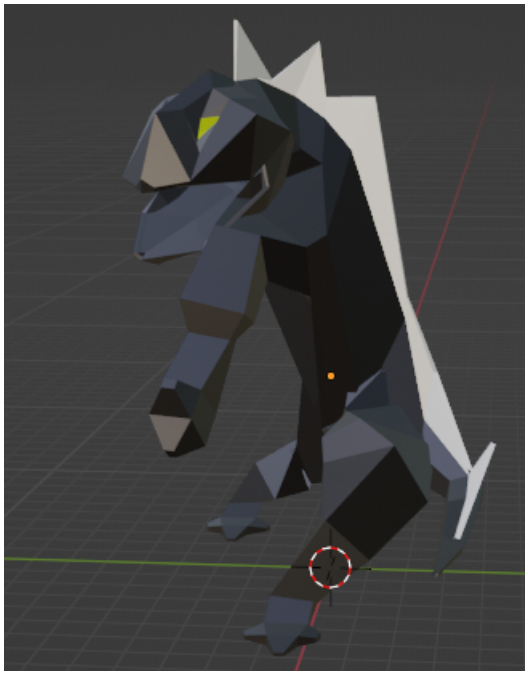
The first attack:

The second:

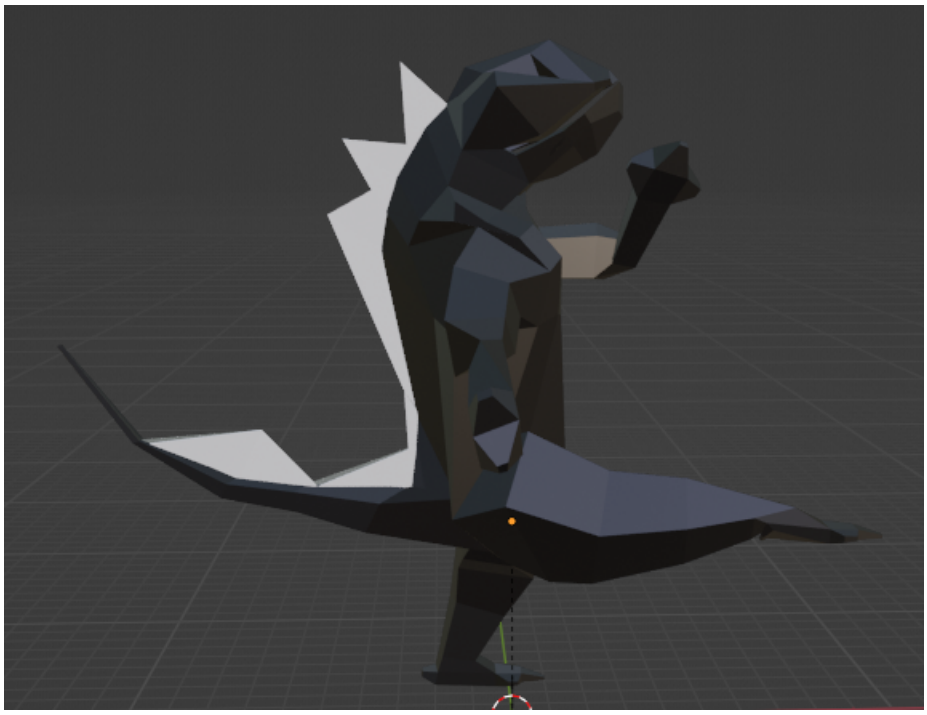
On the second image, the spider is in the middle of its jump, since it does a complete 360° jump, it is facing the opposite of the player.

Godzilla :
Finally, the Godzilla, it can walk, hit with its tail and with its right foot.

The end of the tail hit animation



The end of the kicking animation



The Godzilla was the last character I animated, I was short of ideas, but then I thought that Godzilla is always seen as a slow and big monster, so... I decided that his walking animation would be slow but his attacks quite quick just to surprise the players.

To conclude my part, I had absolutely no experience of 3D modeling and 3D animating, so I learned how to use blender thanks to this project. Now I can model and animate models way faster and better than a few months ago. Some works that seemed impossible to do a few weeks now look so easy. For example, to design the first weapon, I spent a whole day but to make the sci-fi styled gun I only spent a few hours because I had learned how to use blender. Other than, this project has taught me a lot when it comes to working as a team. This project has been a really great experience, it was not easy at all, but I have learned a lot.

4.3 Edouard

4.3.1 Introduction

So we have finally arrived to the end of this "adventure", during this project our group as well as I encountered numerous roadblocks, however these roadblocks have taught me a lot more in a much shorter amount of time than I did working on any other projects. The most important thing I learned while working on this project is the importance of having a structured and clear workspace, especially when working in a team. For our first defence we didn't really have said structure which resulted in synchronisation issues on my part, such as the ones I encountered when I was implementing a multiplayer for our game. For the second defence we managed to put in place a sufficient structure to get more work done then we did for the first one, yet we still struggled to work as a team in some parts of the game. Which brings us to this last defence, where with the help of the experience we acquired for the second defence and a better understanding of the implications that came with task management in a team, we got to a place where I believe that if we were to start a new project from scratch it would probably take us half the time it took us to get to the same completion level. All in all this project is the best versatile learning experience I have had the pleasure to take part in.

4.3.2 Multiplayer

The first task I undertook for this last defence was perfecting and finalizing our multiplayer. As it was mentioned in the last report, by the second defence despite having a multiplayer that was able to see the other player's movement and rotation it didn't actually do anything else, in other words it wasn't that interesting when it comes to the actual gameplay (unless you like to look at your friend run around in the maze.) So to make it more fun I got working on actually making the players able to kill each other, to accomplish that I had to once again restructure our movement code so that I could make use of object oriented programming features such as inheritance, which made later on my life a lot simpler. I struggled at first with making all the classes to work together to make a streamlined and easy to understand code for my teammates but once it was done it was all straightforward (with a few bumps along the way obviously or else it wouldn't have been fun :)) With the multiplayer done I was than able to go and help Rayan with the AI.

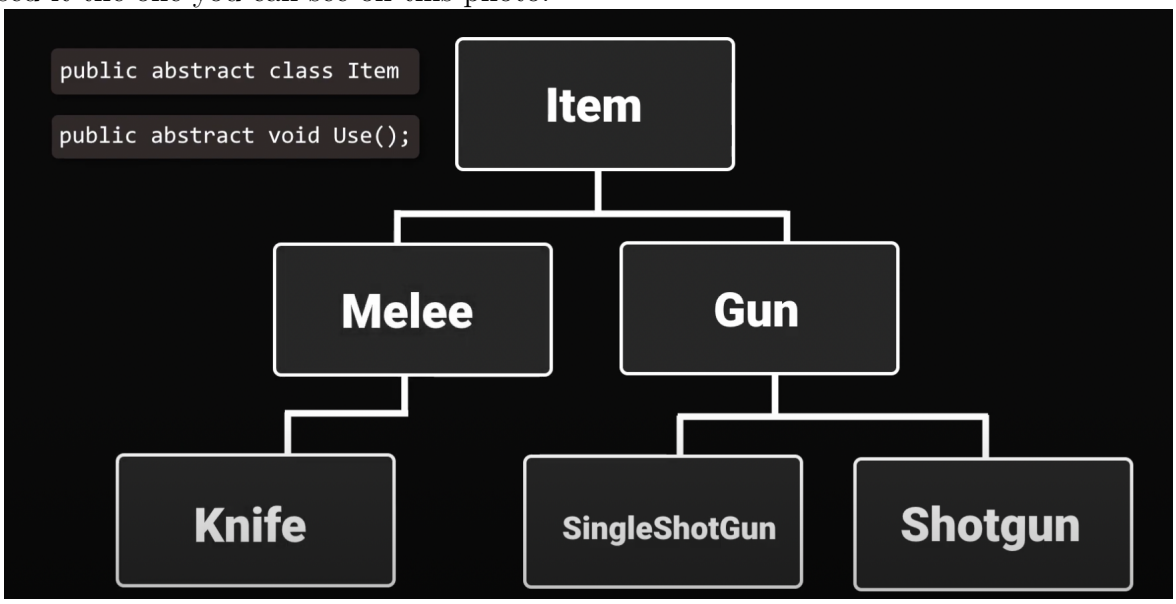
4.3.3 AI

As I mentioned in the last part the hardest part of my work for this last defence was the AI. I worked on it with Rayan and Enguerrend who assisted us in debugging the code. Despite already having an AI for the second defence we struggled with creating a new one since the AI we had was made for a single player mode and we needed our AI to be able to shift it's focus between two players. The biggest problem in all of that is that in single player our player Game Object was already in the scene so we didn't need it to find a player to follow whereas in the multiplayer we had two Game Objects that were instantiated which meant that our AI didn't know what to look for. To solve this issue we created a specific AI with the help of Unity's AI features. Whenever a new object was instantiated we used a script that looked into the properties of said

object and if it was a player it would start it's AI script. Our AI then had to choose a player that it wanted to focus on, to choose the player each mob looks at the distance between itself and both of the players and it target's the one that it's closest to and it follows said player. Then during each frame we look at how far the AI is from our player and if it reaches a low enough distance between itself and the player it starts dealing damage to the player. For this part we implemented it our way since we found that using colliders didn't really feel natural and oftentimes it ended up being buggy whereas with this solution we were able to modulate easily the distance between the player and the mob during the attack which allowed us to make it more "lifelike".

4.3.4 Character actions

For this last defence I was in charge of object implementation. We took the decision of putting me in charge of it since I was the one creating the multiplayer and it allowed me to better synchronise all our character actions with the multiplayer. I wasn't really happy with the way we implemented most of our objects for the first defences so I started again from scratch, and I redesigned our character movement and shooting. I created a whole new player prefab and made it as clean as possible so that it wouldn't feel cluttered as it did before and thus make it more understandable for everyone else. I kept my old movement scripts but other than that I also had to create brand new shooting mechanics and overall redo the whole framework for creating weapons. To do so I "abused of Inheritance" and overall Object oriented programming. The structure I used it the one you can see on this photo.



As you can see on the photo the structure I used is fairly straight forward, I created an Item class from which I created sub-classes which made easier the implementation of new Items. If my friends needed a knife or any sort of close combat I could have just created a new melee class that would inherit from the Item class and then I would be free to create all my melee weapons. And despite the fact that this effort might seem futile at a glance it actually turned out to be a key asset later on. With the use of interfaces I was then able to connect all the pieces together without having to create

individual scripts for all the Items and also it allowed to work with the same fairly basic scripts during the whole process, for example if I wouldn't have used this structure I would have to rethink entirely how my character will take damage depending on the type of weapons and how I would transfer the health information of my character over the server. Also this new structure helped me with the implementation of damage between the AI and our player which despite being a bit tricky at times turned out to be much easier this way than if I had done it in a "dumb" way.

4.3.5 Object Implementation

The last main thing I did for this last defence was Object implementation. During this part I created a health bar implemented the death of the player and hence the re-spawns. To create the health bar I didn't struggle as much as I thought I would, since our health bar is basically a canvas that is animated in correlation with the health of our character. I did have to create a square sprite for it because there wasn't one in Unity and once again this wasn't that complicated I just had to create a special file in which I added the image I wanted and it worked perfectly. I then had to Implement the deaths and the re spawns, for this part I struggled a bit more and I tested out a number of strategies to make it work. I first played with destroying the game object once it's health went to zero but in the end I decided to teleport my player character to a re spawn point once his health went to zero but when I did that the player didn't actually regain back his health so I tried just resetting it manually but that didn't work properly for some reason which until today remains unknown to me so I found a way to re instantiate the player prefab health without actually destroying my player prefab, this process was fairly tricky and probably fairly complex in terms of computational power but I believe it ended up being a better option then re instantiating the player's prefab.

4.3.6 Conclusion

All in all I have learned a lot during this project despite it being very painful at times when I wasn't sure if I wanted to keep going or just give up. However as of now I am happy I stuck with it since it helped me better understand object oriented programming, it got me into server creation and it allowed me to experience with a lot of different development apps such as Unity, photon or Blender. It also allowed me to get a first taste for character design and animation which in turn made me more appreciative of animations in video games I have played over the years and actually understand the effort that goes into the creation of massive video games. In the end I am proud of what my group and I have accomplished over the past six months considering none of us had much experience with game development and character design.

4.4 Rayan

In this part of the project my tasks were double, one the one side i had to finish the website, clean up some links that weren't sending anywhere and adding the final download screen with the appropriate files attached to them. On the flip side, there was the multiplayer and all of what came with it.

4.4.1 Merging problems

I worked on the multiplayer jointly with Edouard and the first thing we saw as a problem was the merging issues that arrived during the fixing of the different scripts to accommodate a multiplayer mode. To fix that we decided timestamps, where one of us was always doing something that the other person needed to do his own part of the project. It was a very fine and delicate balance, but we were able to maintain it thanks to Edouards responsiveness and seriousness, qualities that, if we both didn't have, nothing would have gotten done.

4.4.2 Portal

There are 2 portals, one which you get into and one which you come out of. The portals were changed so that anything that comes into contact with the "in portal" gets its coordinates changed with the "portal out". They are accordingly placed on every maze according to their specification (they have to be in the T shaped rooms and far enough from the portal out). One hurdle I did come by was very banal, at first the portals did not teleport the player at all, it was something i uselessly stayed on for hours, it was fixed by simply toggling the is Trigger option on the game object

4.4.3 Enemy Spawner

With enemies designed in the previous defense we needed a way for them to spawn into the game without us placing them manually. The old spawner was made specifically for a single player mode, it used to build and instantiate the enemies around a certain player position, but with the changes made to the game (implementing multiplayer) that couldn't work. So the script was changed so that instead of spawning around the player they would spawn around a specific spawn point defined on each maze. At first I thought they were not working because there was something that got messed up with the multiplayer (as all things were) but when i got re-accustomed to unity, photon and rest of the programs and functions, that fix came in easily.

4.4.4 Animations

Here comes a part that i have been waiting for for quite a while, animating all the characters, their movements and attacks. This was the first and quite not the last section that needed great coordination between me and Edouard. Since he was working on the

enemies dealing damage on the player and movement towards the players, the walking animations were implemented when the movement was done and the same goes for the attack animations. The way i used to perform this, is by creating animator controllers for each of the mobs and the player, modifying the specific running animation of each of them to stay in a loop. I then added an animator component on each model and attached the control and their avatar made from their model without changing any of the default settings. For the attack animation, I dropped the specified animation on the enemies' and players' animator, made a transition that goes both ways and a boolean that toggles from one state, the running state, to the other, the attack state. In the enemy master script i added a few lines that would perform exactly that.

4.4.5 Enemy AI

Like most things in Unity a simple ticked box or a single line can change the whole project from broken to functioning, that was the case for enemy AI. We went through many changes in how the script worked. Similarly to enemy spawner, the AI main job was to find the players location that was closest to him and follow him. This worked in the single player, where the player component could be directly chosen and target, but in the multiplayer the same logic doesn't work since at the start the players are loaded in as clones. To solve we've tried many things, we thought at first it was a multiplayer issue, that didn't solve it. We thought it was a path finding problem, so we removed the navmesh component and changed it to look for the character controller component, that also didn't work. We stayed on it for many days, when finally, we figured out changing the players tag to player and look for the tag. We did that but did not manage to get it working since there was many different iterations of the player, and i couldn't figure out which one was right. Many debugging hours later and we had a working enemy AI that could be copied onto all the enemy models, alonside a delay that would determine when they do activate.

4.4.6 Comments about the project

This project was an amazing opportunity to use what we have been and still are learning in c. I was able to tackle into the world of game making and all of its intricacies. It is really amazing how i was able to tackle many fields such as AI making, multiplayer match making, animations, using Unity. I am partially satisfied with all that was done, even though some things could be touched on, we have done a really good job and the team was pretty efficient. I love to discover and especially work on new fields, partially to broaden my knowledge and figure out which part of Computer Science i am really most attracted to.

4.5 Website

A website has already been created to show the progress of our work. On this website you will find all sorts of information about us, our game, and a download page (not finished as of now) where you will find all our files such as the book of specifications and executables for the game. The link of the website is `https://eninsts.github.io/`

4.5.1 Description of the site

The website is the element that will allow anyone to follow our project, discover our game and later on, even play it.
Our website is divided in 4 pages

- The homepage, it contains a short introduction to our project and an overview of the steps of the development of our game
- The "About" page, you will find here further information on our game, a presentation of the team, and a personal presentation of each member of the team.
- The "Roadmap", in this page there are : a countdown to the final presentation which corresponds to the release date of *Operation Labyrinthus* and progress bars for each aspect of the game
- Finally, the Download, where you will find all the file, from the book of specifications to the final game when it will be ready.

4.5.2 Backend

The backend is handled by GitHub, it provides free hosting for the website and server backend. All we had to do to put the website online was to put it in a GitHub repository.

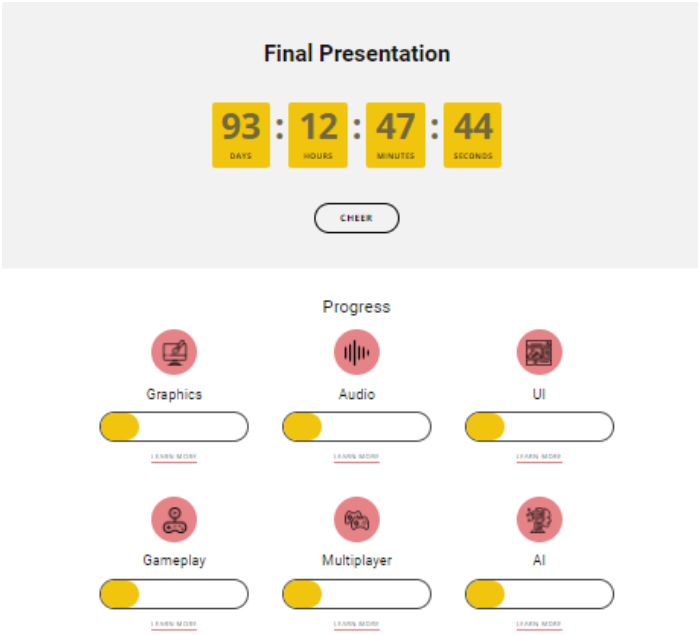
4.5.3 Frontend

The website has been done with HTML and CSS for the layer and the theme of the pages.

The most challenging part in the making of the website was the choice of the colors. We had to make a website that is good-looking and that fits at least a bit our game. Another difficulty that we faced regards the homepage, more precisely the slides on the homepage because we wanted to be able to see the next picture while we are scrolling.

We chose to stay simple, the main color is the yellow, the background is white and the secondary color is a pale pink.

Here, a look at the roadmap


Final Presentation
93 : 12 : 47 : 44
DAYS
HOURS
MINUTES
SECONDS
CHEER
Progress
Graphics
Audio
UI
Gameplay
Multiplayer
AI

5 Conclusion

This project allowed us to learn to use many different tools and software that we may not have used otherwise. It taught us to be more thorough and meticulous in our programming while we kept trying to stabilize Operation Labyrinthus. A lot of research was done on all ends, as most of us had little to no experience in making video games. We improved our ability to work in a group, with a very heavy workload at times and under significant stress, which will be very advantageous in our future projects, at EPITA but also in our future careers.

Even if some things were not polished or completed as thoroughly as we would have wanted, we are still proud of the result. Some of us might even continue working on the project during the holidays, who knows. This is the end of the journey for the Engineers in Suits. Thank you for playing.