



# First report

Engineers in Suits

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**Project:** Operation Labyrinthus

**Group:** Engineers in suits

# Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
<b>2</b>	<b>Overall progression</b>	<b>4</b>
<b>3</b>	<b>Additional details</b>	<b>4</b>
<b>4</b>	<b>Task distribution</b>	<b>5</b>
<b>5</b>	<b>Achievements</b>	<b>6</b>
5.1	Multiplayer . . . . .	6
5.2	Game mechanics . . . . .	7
5.2.1	Player movements . . . . .	7
5.2.2	Player actions . . . . .	7
5.2.3	AI actions . . . . .	8
5.2.4	Spawning enemies on the scene . . . . .	8
5.3	Level design . . . . .	9
5.4	3D modeling . . . . .	11
5.5	User interface . . . . .	13
5.6	Particle effect . . . . .	15
5.7	Sound effects . . . . .	15
5.8	Website . . . . .	16
5.8.1	Description of the site . . . . .	16
5.8.2	Backend . . . . .	16
5.8.3	Frontend . . . . .	16
<b>6</b>	<b>Expected progression for defense 2</b>	<b>18</b>
<b>7</b>	<b>Conclusion</b>	<b>19</b>

# 1 Introduction

This first report will serve as a follow-up for the book of specifications, we will also describe the tasks that have been realized since the beginning of the project. The difficulties we encountered, and the adopted solutions, will also be described here.

As a reminder, *Operation Labyrinthus* is a First person shooting game in the making. 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 going to the room of the boss of the maze in order to be teleported to another maze, and so on until the final boss. The player will be facing another player, so the game will be a race in a maze.

For this first stage of the project, we aimed to produce the basics for the game, the skeleton of the project, meaning getting a working multiplayer mode, creating the models for the main pieces of furniture and the items, as well as the soundtrack. We also finished the core mechanics of the game and the website has been updated since we handed the book of specifications in. Basically, we worked on the most prominent features.

## 2 Overall progression

Task	Expected	Completed	Main	Substitute
UI graphics	50%	50%	Enguerrand	Rayan
UI implementation	10%	30%	Rayan	Enguerrand
Character actions	70%	50%	Rayan	Edouard
Multiplayer	10%	60%	Edouard	Rayan
AI	50%	60%	Rayan	Emmanuel
Tutorial	0%	0%	Enguerrand	Edouard
Level design	60%	60%	Enguerrand	Emmanuel
Level implementation	60%	60%	Emmanuel	Rayan
Object implementation	50%	50%	Edouard	Rayan
Particle Effects	20%	20%	Enguerrand	Rayan
3D Modeling	80%	30%	Enguerrand	Emmanuel
3D animation	40%	0%	Emmanuel	Edouard
Music	70%	0%	Edouard	Rayan
Sound Effects	30%	10%	Edouard	Emmanuel
Writing (Storyline)	70%	70%	Rayan	Enguerrand
Website	0%	40%	Rayan	Emmanuel
Report	-	-	Enguerrand	Emmanuel

## 3 Additional details

At the beginning, while we were just making the Book of Specifications, we had our hopes a bit too high and we thought we could achieve more than we did. But that did not change our mindset, and now more than ever we work hard, and try to get as much work done as possible. We managed, on most of the aspects of our project, to stay on track. Most of what we had planned to do has been done, properly. However, some aspects, like the music or the 3D Animation have not been worked on at all.

On the other hand, we have worked a lot on the user interface and the Multiplayer, we have done way more than we thought we would for these two aspects, we are ahead of schedule on these two things. Being in advance in the development of the user interface and the multiplayer will allow us to spend more time on other parts of the game where we lag behind.

Also, we have made some changes compared to the book of specifications about the task distribution, they will be discussed more in depth in the next part of the report.

Overall, we are pretty happy with our progress. We feel like we have made some good advancements and that we are on the right track. We are starting to see our progress fleshed out and that is always satisfying.

## 4 Task distribution

When we first divided the work while writing the book of specifications, we only had a rough idea how we should distribute the tasks. This is why now that we have started to work, we have decided to make some changes to better reflect what each one of us is doing and will be doing. Some have found talent and occupation where we did not plan them to and thus, we had to reorganize some of the task distribution.

Rayan, being the leader of the group, has to coordinate the work and make sure we adopt a good work rate and the development of the game goes well. He is in charge of the storyline, the music, the UI and the actions of the character. We decided to make a change in our organization : at first, Rayan was supposed to be in charge of the multiplayer and Edouard in charge of the website, as mains but Edouard decided he wanted to do the multiplayer with the help of Rayan and Rayan took it upon himself to do the website, with the help of Emmanuel. Thanks to this adjustment, we can say that our website is now in an advanced state of development and Edouard has been able to develop a functioning multiplayer.

Enguerrand's work is mostly focused on the graphics. He will take care of the particle effects in the game. He is also responsible for the level design and the 3D modeling, he was inexperienced with Blender but was able to learn how to use Blender which was not easy and got some important work done. It is also planned that he takes care of the tutorial.

As we've said earlier, Edouard took care of the multiplayer mode of our game. Thanks to that decision, the multiplayer mode is now, by far, ahead of schedule. He oversees the development of the sound effects and the object implementation, this work will be really important because with the music, the sound effects are what will create the atmosphere of the game. He will also work on the 3D animation and on character actions.

Emmanuel has to do, with Enguerrand, all the work on Blender which includes level designing, 3D modeling but also 3D animation, he mainly has to work on the graphics of the game. On the 3D modeling, his work will principally be the design of the bosses. He also works on the sound effects of the game with Edouard. As said previously, Emmanuel also took the job of designing the website but left his spot on the multiplayer part to Edouard.

## 5 Achievements

### 5.1 Multiplayer

The multiplayer mode is a major element of our game since the game is played in a one against one system. To create the multiplayer mode we considered different options but in the end we felt like Photon would be the easiest one to work with in harmony with Unity. None of us were familiar with Photon so we had to learn it all from scratch, to do so we used the photon tutorials, which taught us some aspect's multiplayer of which none of us were aware of.

We started off by creating a loading scene in which we had to establish a connection between the client and the PUN (Photon Unity Networking) server, to do so we created a script which connected us to our server and sent us to a lobby we created. We then went on to implement the lobby in which the player has the choice between creating or joining a lobby. To accomplish that we added two buttons Create and Join, and two input boxes, one for creating a game with a specific name and the other one for joining one of your friends in a game he already created. These two parts were probably the easiest as they could easily be deduced from the examples we found on the internet. However upon launching two separate games, we instantly noticed that one of the player was not appearing on the other one's screen, as well as the other way around. The reason for that is that our players were spawned locally and not on the server we created. To have both players see each other we made a script which would spawn the players from a prefab folder instead of having them as game objects in our Game scene.

Now that we have both of our players spawn in the same scene, we ran into our last issue which we have yet to resolve. When we are moving our player we can control both of the players, the other player merely mirrors the player's movement and we cannot see the movements the other one is making. We tried to resolve this mistake using numerous methods found on the internet but none of them applied to the structure of our code.

However despite this setback we have exceeded our expectations as to how far along we would be with the multiplayer, which will allow us to have it nearly finished by our second defense. By the second defense we will have revisited our loading screen and lobby design, and we will introduce a loading progress bar for the loading scene.

## 5.2 Game mechanics

### 5.2.1 Player movements

We quickly started to implement the most basic game mechanics. Player movement was the first mechanic to be implemented, how would you solve a maze if you can't walk after all. Our movements are physics-based, we made this choice to be sure that all the collisions happen properly. We chose this route to implement momentum, something that is needed for the sliding effect. Our player can not only walk but also run and, as said, slide, the sliding allows a really important speed on a very short period of time whereas running grants the possibility to move faster, for a longer period of time, permitting to run from enemies for example. These two actions will take more time to "reload" than simply walking. Note: these actions can be done by the player, but the model in itself is not animated as of now. Only what the player sees has been done.

He can also jump, the same process is used, applying a force on the z axis to push the player up using physics. A failsafe is available to control the jump, it is here to ensure that the player does not jump multiple times, in order to do this a boolean variable called grounded is turned from true to false if the player is in the air or touching the ground.

Since the camera is detached from the main body of the player, it has to move with the same force as the body, to do that a simple function called Look is used to move the camera correctly. A max speed for running is also added. Since a player can't walk or choose to only run, a feature that we might need to change later, the force that is added when pressing the w key (forward movement) is capped at a certain number, one that we can freely choose.

In the future, jumping would be removed in order to give the game the feel of a horror game, and to prevent any players from jumping over the level or glitching out of the game. A slowdown button might also be implemented to, again, follow the scary genre that we are trying to mimic.

### 5.2.2 Player actions

The player is now not only capable of roaming around, he can perform some basic actions. In our game he can shoot, shooting will withdraw some health points to the enemy (less damage if the body is shot, all the health points if the head is shot for basic enemies). A feature we decided to include in our game is the total absence of light. However, the player has a torchlight on his weapon, that he can switch on and off whenever he wants, switching it off can be interesting if the other player is near and you do not want him to see you.

### **5.2.3 AI actions**

The players are not the only ones who benefit of some actions, the AI, can perform some simple actions too. The enemies can wander in the maze just like the player. They can also detect the player inside a certain radius and attack them. A successful attack on the player will result in a loss of health points for the player. If the enemy detects the player, but then he manages to get out of his detection radius, the AI will go to the last known location of the player to try to find him and eventually will resume its roaming.

### **5.2.4 Spawning enemies on the scene**

This was one of the first problems we encountered, because we had to make sure that the enemies spawn on the ground and not on the walls or inside the walls of our maze. To solve that, we had to separate our maze in two parts while making them : the ground and the walls. So, when we import blender files in unity, it recognizes the difference between the floor and the walls, after that we just had to define a spawn zone, which is basically the whole floor.



## 5.3 Level design

Making the mazes was one of our first priorities because we have to create a lot of them.

Designing the mazes was the first step, in order to have challenging mazes, that are fair for both players we had to respect a list of characteristics, this is why we decided not to generate the labyrinths. This list of traits is the following :

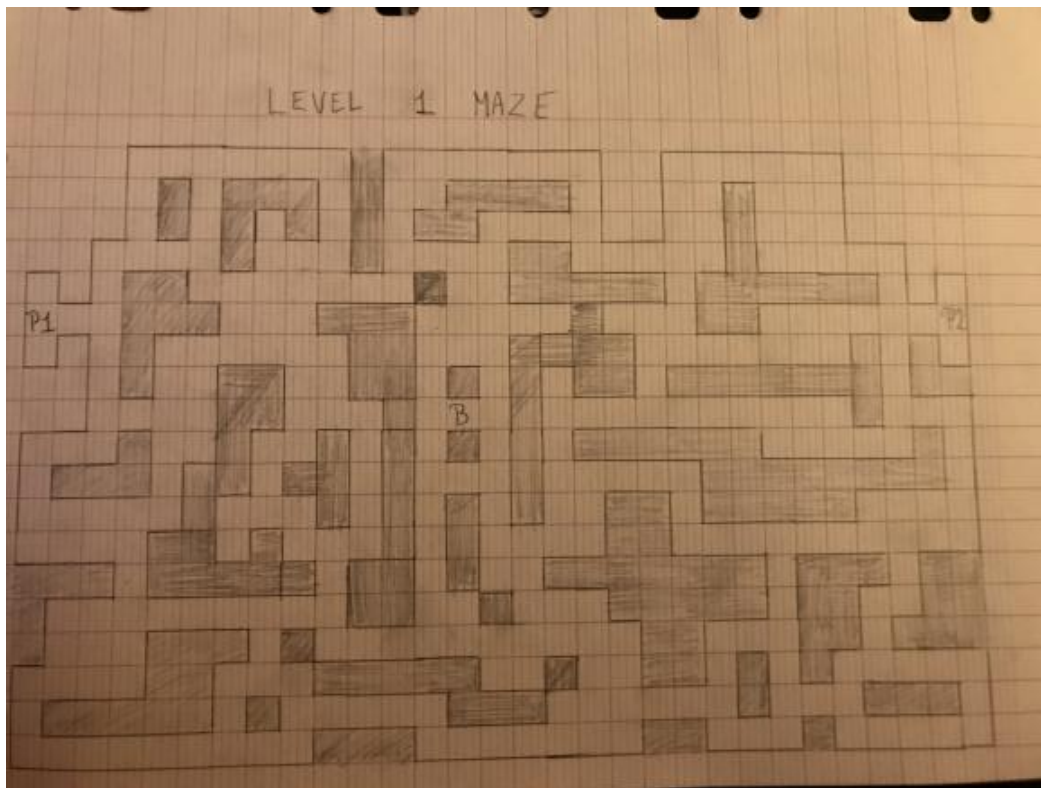
- First, our mazes contain two spawn rooms, one for each player, for aesthetics and practical reasons we put them on the edges, it is easier to make a maze in which the start is on an edge, but these rooms can be anywhere.
- All our mazes contain a boss room because at each level, on each maze, there will be a boss, the player can skip him but will not get the awards of beating him if he doesn't, skipping the boss will make the following levels harder.
- We also put some "rooms" in our levels, these rooms are here because the labyrinth will be filled with enemies so if there is no space in it, it can become impossible to see anything because we already don't have a lot of light
- Finally, we must respect these 3 additional points :
  - There are impossible paths
  - The two players can meet each other
  - The path lengths between the spawn rooms and the boss room are approximately equal

At first, it was challenging because it was the first time we used Blender and there are a thousand of ways to make structures with Blender.

Afterwards, we had to find an optimal method to build our levels. A method that had to be quick (because they are fourteen), allowing us to easily customize the mazes (to add diversity), rendering the mazes malleable, and finally we needed the maze to be quick to charge so we don't have any issues loading every maze every time we launch the game or progress to another level.

The method we decided to adopt consists in creating a 32x32 plane subdivided in tiles of 3m<sup>2</sup> each. Once this is done, we extrude all the wall tiles. This solved an issue we had because of another method, where only the edge were extruded, this method had many problems, the major one being that the player could walk through the walls because they were too thin. The method we chose allows us to efficiently create 30x30 mazes (the edges are all walls).

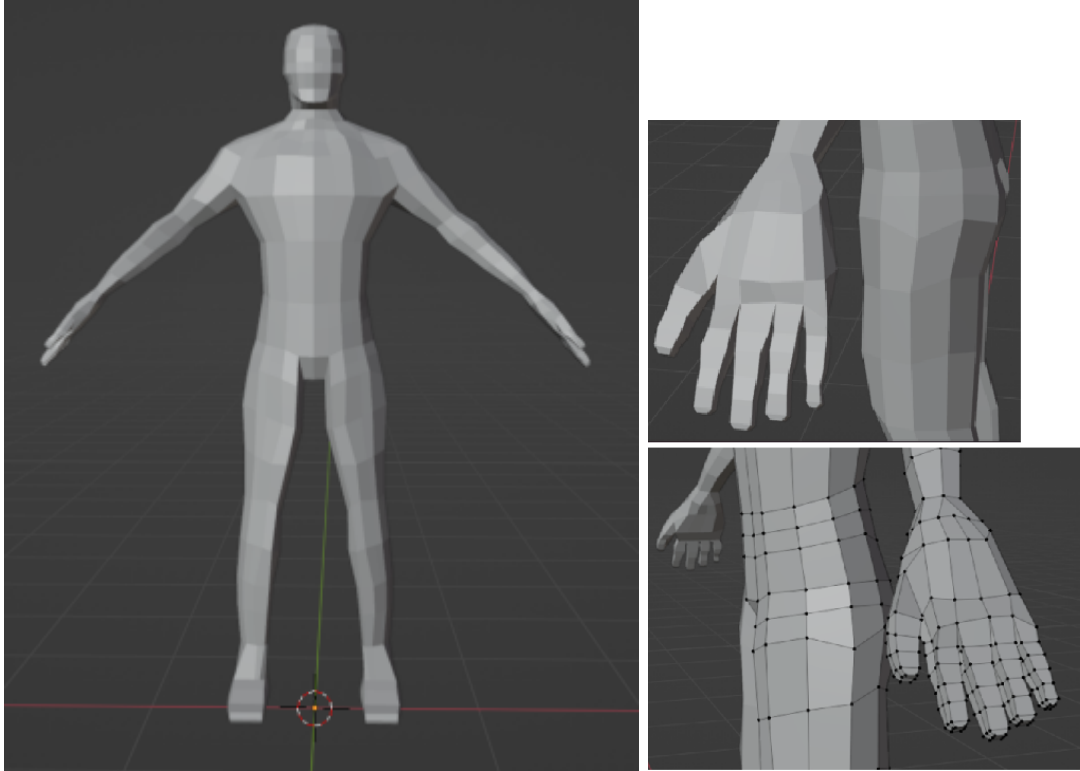
Thanks to this technique we started sketching and then making the mazes and we now have a couple mazes ready and our rate intensifies as we make them because it has becomes quite easy and we are becoming quite proficient.



Sketch of one of our first mazes, the P1 and P2 on the sides of the maze are spawn points for the players and the B in the middle of the map is the location of the boss.

## 5.4 3D modeling

3D modeling is a very important aspect of our game, we must create models for objects that will be present in the game, we will use as much as possible assets that we have created and not found on internet. To create our assets, we use Blender.

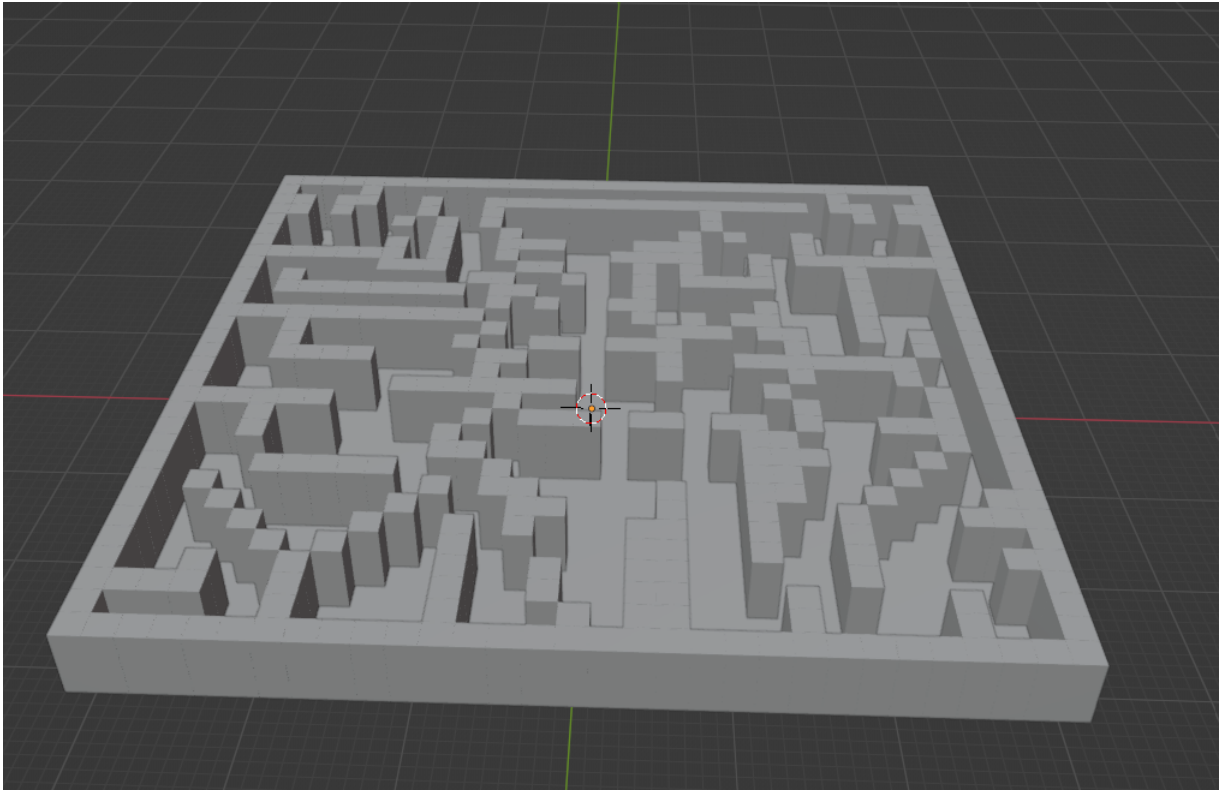


Base model of the characters

After the mazes were done, we decided to start the modeling of the character. At first, our lazy selves thought we could find some models online for free, but we quickly had to accept that we will have to make the characters ourselves. We know our monsters will be anthropomorphic, so the first thing we had to do was to make a basic human model easily customizable. We also want to keep control of our work, know what we are doing, so making our own designs would allow us to edit them easily and reshape them as we wish.

After long research, visualization of (too) many tutorials on YouTube, a fine guide of "30 minutes" was found, made by Blender Art. 30 minutes between quotation marks because the guide is so fast that even watching the video at 0.75x speed you constantly have to pause and rewind the video in order to understand everything. Enguerrand tackled this first model and took approximately 5-6 hours to deliver a final product. This experience taught him a lot on how to use Blender and will greatly ease our work when the need to edit it to create new characters presents itself.

Enguerrand and Emmanuel are now charged of taking this base model and modify it to make the players and enemies come to life. You can find right above three images of the character designed by Enguerrand.



3D model of one of the mazes we have made

We have a handful of other mazes, some of them already implemented in the game.

## 5.5 User interface

While playing a video game, the player constantly needs quick access to certain information. This is even truer in first-person shooting games, in which the player needs to know the amount of bullets he has left in his magazine for example and how much health he has left.

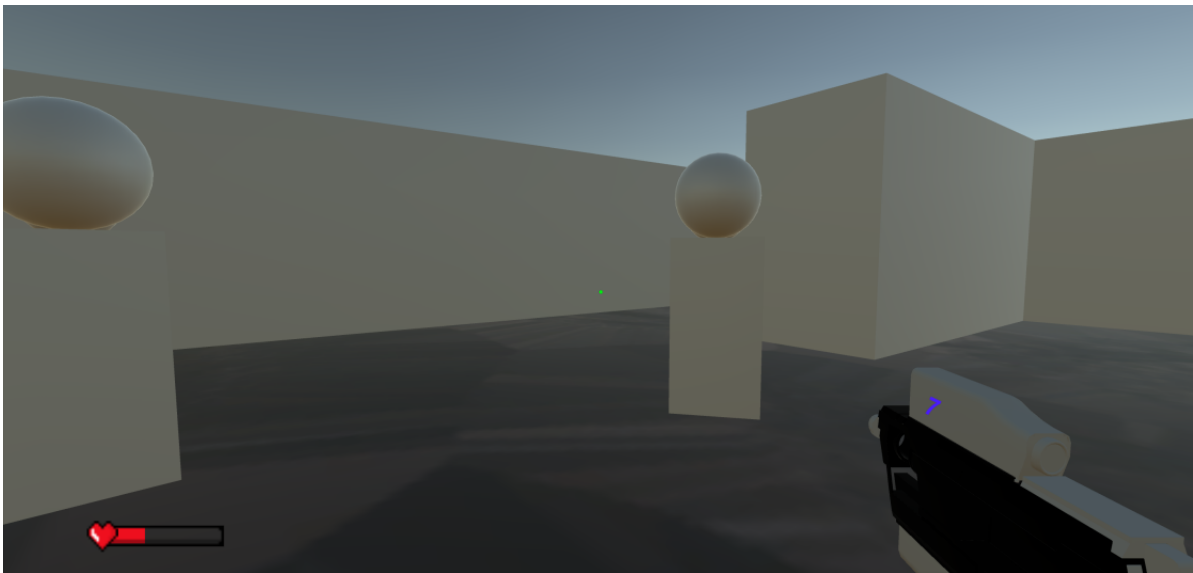
So far in our game these elements are present as well as the Health bars for the enemy, we also have a game over screen that allows to play again or to quit and also a lobby screen for the multiplayer mode.



Multiplayer lobby screen



Game Over screen



Screenshot of the game we can see the health bar in the bottom left corner and the magazine directly on the pistol

As you can see, we do not have a defined color scheme yet, it is one of the elements we will have to reflect on later.

## 5.6 Particle effect

So far, a lot of work hasn't been done for the particle effects, we aim to work on them when the game is in a more advanced stage of development. But we do have the muzzle flash of the weapon when it is fired :



## 5.7 Sound effects

Like it has been said earlier, the sound is a really important part of the game, the player will not be able to see a lot because of the near absence of light. Therefore, we have to make some sounds. So far the sounds that we have are the following : switching on and off the light, footsteps (4 samples), jump, landing, pistol shot and reloading the weapon.

We have recorded some of these sounds, like the sound of the switch when you want to turn on or off the light. Some others were downloaded from online libraries because it is not always possible for us to create the sound which is the case for the reloading sound for example. We still need to work on sound effects, we have to make sounds for when the player dies, when an enemy is killed and create unique sounds for every enemy.

## 5.8 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/>

### 5.8.1 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.

### 5.8.2 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.

### 5.8.3 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 is an image of our home page



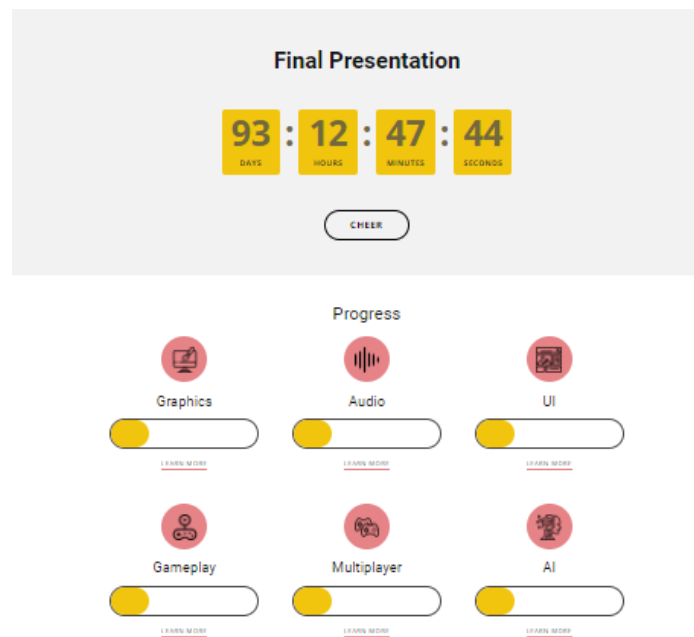


## OUR PROJECT

As part of the second semester project we have decided to create a two-player maze runner, beating each other to reach the top of the tower. On their journey there, they will encounter mobs and bosses trying to slow them down.  
May the fastest man WIN

## KEY PHASES

Here, a look at the roadmap



## 6 Expected progression for defense 2

Task	Old expectations	New expectations
UI graphics	60%	60%
UI implementation	60%	70%
Character actions	80%	70%
Multiplayer	20%	90%
AI	80%	80%
Tutorial	40%	30%
Level design	90%	90%
Level implementation	90%	90%
Object implementation	70%	70%
Particle Effects	50%	50%
3D Modeling	90%	70%
3D animation	60%	60%
Music	90%	70%
Sound Effects	50%	50%
Writing (Storyline)	80%	80%
Website	90%	90%
Report Manager	-	-

As can be seen, we have rearranged a bit the schedule in order for it to reflect better our projected progression. The UI implementation and the multiplayer are expected to be completed sooner than planned (a lot sooner for the latter). Other tasks are planned to take a bit longer than initially anticipated but that is only because we are starting to grasp the amount of work truly needed. Small modifications have thus been made that we hope we can achieve in a timely matter. But there is no need to worry upon the fact that we will deliver our project fully finished for the last presentation and that, by the second presentation, we will have a semi functioning game.

## 7 Conclusion

Despite some difficulties and some changes in our organization, we are overall on schedule on our project. The tasks individually may not be on schedule, we are late for some of them, and we will mainly focus on these points in the following weeks, but we also are in advance for some others.

To sum up : the website is online, the first models and levels have been made, the multiplayer is almost functional, we have some basic controls and mechanics for both the player and the AI and we have some levels. We all got to learn new skills which will help us progress faster. We created a skeleton with the main mechanics.

We are looking to increase our work rate for the following defenses because we still have a lot to do, for example we need to work on the modeling, the animation and the sound.

Finally, as said, a lot of work is yet to be done, this is the reason why we have recently increased our work rate and we plan to keep it. So far this project has been a great experience for us, it has allowed us to learn new skills, like the use of different software but also some organizational skills that will help us work better as a team.