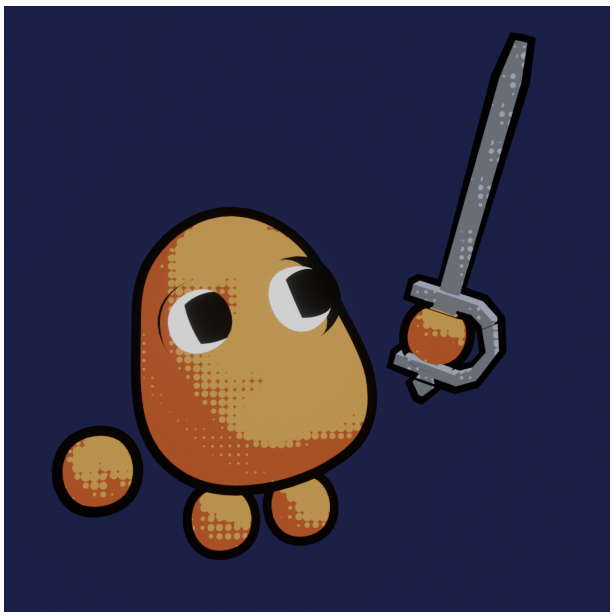
Project Specifications



Julie Fiadino Paul Dufour
Auguste Charpentier David Goncalves

Prepa S2

Contents

Introduction

This project is a two players PC VR game named:
"BattleFields: Return of the Potatoes".

The game is a Tower Defense: potatoes will spawn in different places and will try to reach the player's base. The players must prevent this and hold as long as possible.

The primary wish for the game was to have a VR game. As much as the reason for having potatoes as enemies is obscure, the idea was funny enough to be the main symbol of the game. The idea of a Tower Defense came then as a good choice for the game type as it seems realistically realisable. Furthermore, the idea of facing an endless numbers of cute potatoes seems oppressing enough, reinforcing our choice.

This game will differ by having an asymmetric gameplay. There will be a second player to help the VR player by being able to watch the overall state of the map and have a more control over it, more in the classic style. This is our way to diversify the gameplay and taking advantage of the possibilities offered by VR.

Origins of the project

Origin of the project

We wanted to make a VR game from the start.
Before finding any idea, we started testing some VR games to know what to do with this peculiar system. Two of them caught our attention :

- The Lab, and more specifically the Longbow minigame. The bow mechanic was fun to use and really rewarding for the player.
- Keep Talking and Nobody Explodes, with his multiplayer mechanic of communicating with the one on the computer

We then got the idea to mix those 2 mechanics. The game would then be a VR Tower Defense in which the player on the computer needs to guide the player with the headset to eliminate waves of potatoes.

Nature of the project

To create the game described in the introduction, the two player need to have defined roles:

- One player with a VR headset : he is the bowman. On top of his tower, a bow in his hands, he will have to aim, bend the bow and shoot the incoming players. However, he has limited vision and information about the map, and is informed by the second player.

- The second player is using the PC, with a mouse and a keyboard : he is monitoring the game. He has a view of the whole map from the top (Zelda I camera) and can see where the enemies are coming from. He will also have to manage the credits won and spend them in some upgrades, eventually modify the stage with new obstacles.

Object of study

Skills

The first goal of this project is to improve our skills in C#, Blender and 3D modelling. Organisation is also a big part of a project's completion. This experience will then be useful for our professional life.
Learning of video games work, and more generally how to share tasks and use the skill sets of every one can make us more aware of what we can bring to the table.

In addition, we will also be learning how to work with an existing environment. Unlike most projects starting from scratch, Valve provides a lot of tools that are necessary for the game to work. This is very helpful to have additional resources, but it can also be a challenge to adapt our work around the environment.
Sometimes tools can be outdated and have to be fixed, or hard to use, lacking documentation. We believe this is an important exercise as we will have to frequently deal with that during our careers.

Final Project

In the end, it is required to have a working tower defense game with two players on different platforms, having a different type of gameplay each other. It is needed as well to have good enemies that give a progressive challenge.

Game Operation

3.3.1 Virtual Reality

The game will run using the SteamVR Runtime and is currently tested using a Valve Index headset, but will be compatible with all headsets supported by SteamVR, including Oculus, HTC and Windows Mixed Reality headsets.

We are using the SteamVR Plugin for Unity with our game. Valve is providing a lot of tools like assets for the VR camera, scripts for tracking, rendering and physics, a user-friendly input system, or a showcase scene, featuring the built-in features.
There is among them the longbow, a working bow with arrows, which we will be using.

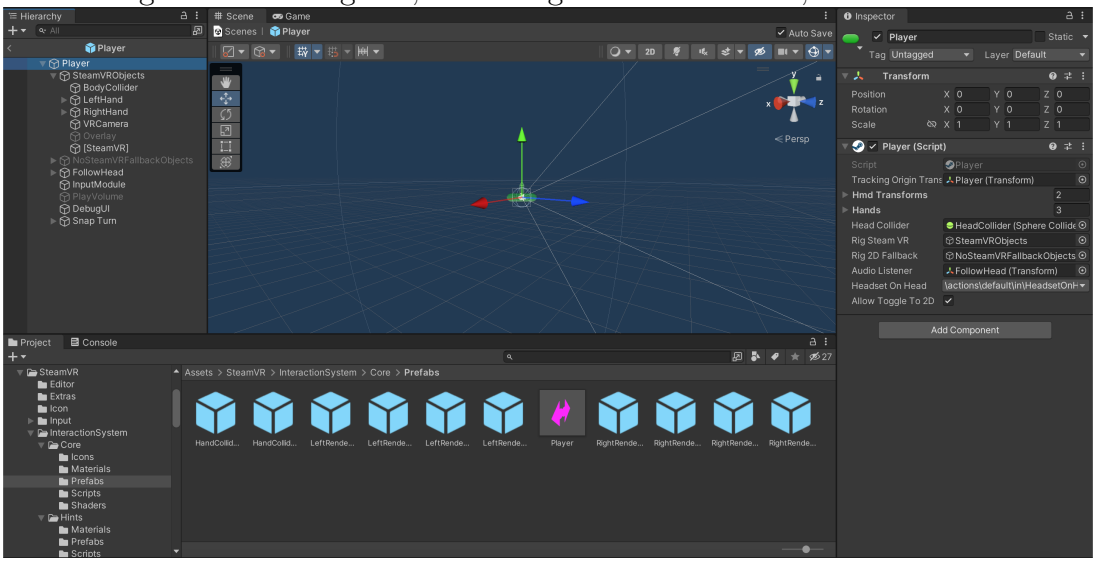


Figure 3.1: The player prefab (camera and controllers)

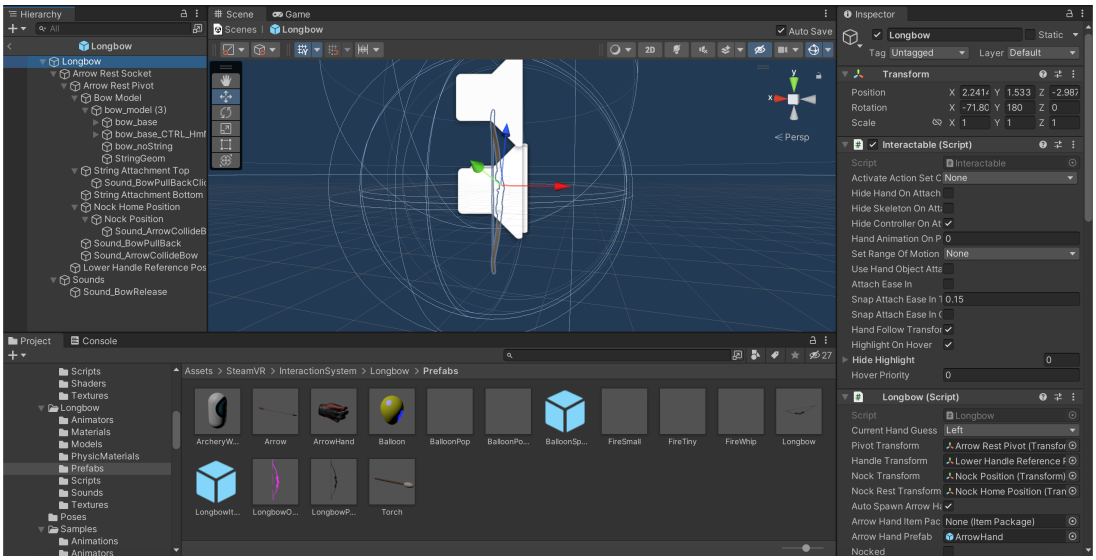


Figure 3.2: The longbow prefab

3.3.2 Graphics

The Universal Render Pipeline (URP) is used for rendering the game. It allows high-quality shaders and new methods for building them.

3.3.3 Artificial Intelligence

For the enemies, a path will be created using points and line (Bezier curve). They will randomly follow a path to an objective. It can be a friendly construction to destroy, or the ally base, depending of their class, which will diversify their action. A randomizer will be made to spawn enemies, making sure that the game give challenge progressively.

VR player

The player will, like said before, use a bow. This will give him access to different arrows and effects. But overall, VR interaction is the main point of the player gameplay. It requires good interaction with object physics, the player should be capable of handling them easily.

PC player

This player will have access to an overall vision of the map where the VR player will play in. He will have the possibilities to see enemies positions, buy upgrades for the VR player and place trap and buildings. This require to have an efficient user interface and enough challenge.

Multiplayer

The two players will play together against infinite waves of enemies and have to survive as long as possible.
This is an asymmetric gameplay, the kind you could also see on the Nintendo Wii U (two screens, different view, different controls). The goal is to make the two players communicate and cooperate as much as possible.

Game Assets

Realisation

The game will be using Unity (a cross-platform game engine developed by Unity Technologies) and the in-game code will be made using the C# programing language.
For the modeling, we will use Blender, a software developed by the Blender Foundation.
The web site will be using HTML and CSS programing language, and will be useful to find some information about the game.

Game Story

The game needs a story to keep the player aware of what is happening and the state of the world he is in. Here is it's current state:

The Potato Kingdom was going through a rough time. They were lacking the minerals necessary for their life. In an desperate attempt, The Potato King asked his neighbours for some of their goods.

The other kingdom, The Green-Plants Camp, was also trying it's best to survive. They decided to refuse the offer. The Potato King returned home, defeated.

Some months later, the green plants managed to gather enough resources. It wasn't the same for the Potato Kingdom.
The Potato King was angry. He felt betrayed. Thinking the Green-Plants Camp Leader lied to him, he declared war.

The Potato Army is now coming, and we need all of the archers ready for battle.

Project Repartition

The Team

Auguste Charpentier *Project leader, programmer, tester*
Manages the overall state of the Unity project and its integration with VR software. Has the hardware capable of running VR.

Login: `auguste.charpentier`
Email: `auguste.charpentier@epita.fr`

David Goncalves *Artistic direction, programmer*
In charge of the artistic direction, will provide design ideas and artworks. Also will contribute to the code.

Login: `david.goncalves`
Email: `david.goncalves@epita.fr`

Julie Fiadino *3D modeler, programmer*
Has the most experience with 3D modeling and Unity tools like animations, shaders and other various stuff.

Login: `julie.fiadino`
Email: `julie.fiadino@epita.fr`

Paul Dufour *Web developer, programmer*

Will manage the website of the project and contribute to the code.

Login: `paul.dufour`
Email: `paul.dufour@epita.fr`

Task Repartition

Leader **Contributor**

Task	Auguste Charpentier	David Goncalves	Julie Fiadino	Paul Dufour
Multiplayer				
VR				
PC				
Menu				
Map				
Entities				
3D modeling				
Music/SFX				
Website				

Figure 5.1: The potential task sharing

Workflow

We are using git to work together and have a version control. It was carefully configured to make sure it integrates well with everyone and is easy to use.
The following tools are setup in our repository

- A .gitignore file, provided by Github, for handling the important files only.
- The git-lfs program that allows storage of large binary files, like textures, 3D models or sounds, inside the repository without taking unnecessary space. This is combined with a .gitattributes file.
- The Unity Smart Merge tool that handles merge conflicts for Unity files. If the merge cannot be resolved, it falls back to WinMerge. This is configured to work with git.

In the end, the project folder size is 1.8GB but the .git folder size is only 90MB. Github stores the heavy files accordingly, and the package files like URP are not uploaded. Then, we will use branches to split the work efficiently, and merge them afterwards.

Expected State

Progress forecast (in %)			
Progress	Presentation 1	Presentation 2	Final
Multiplayer	60	80	100
VR	60	90	100
PC	50	80	100
Menus	20	60	100
Map	60	100	100
Player	60	75	100
Enemies	30	60	100
Longbow	90	100	100
3D modeling	60	80	100
Sound Design	0	60	100
Music	0	60	100
Website	50	70	100

Figure 5.2: The potential presentation program

Publication

Target Demographic

BattleFields: Return of the Potatoes will be open to everyone.

We want our game to match the PEGI 7 rating, aiming for a large audience, ranging from 7 to 77 years old people. It shouldn't be a competitive or complex game, but a family party game.
We cannot aim for lower-age children because wearing a VR headset is not recommended below this age.

Funding

We will need the following tools:

- Github pro (free with EPITA)
- JetBrain (free with EPITA)
- A Unity licence (free)
- If we want to publish our game on Steam afterwards, the licence costs $100
- Two tripods for the VR base stations for presenting the game at EPITA

Conclusion

We have a lot of expectations for our game. An important part of our project was not repeating the same thing and try to innovate, which is why we chose to create a virtual reality experience.

The virtual reality domain opens a broad range of new possibilities but they're still not used enough as of today. However, it has been vastly improving for the last few years, and we want to contribute to that expansion.
Oculus has been bringing VR to everyone's home for a very affordable price with the Quest. The Beat Saber game found an interesting usage of VR's mechanics and became the main reason why people buy a headset today. And Valve made the first triple-A VR only game: Half-Life Alyx.

Our game will be a different experience, exploiting those new mechanics. Even if it lacks networking in our current specifications, we believe the asymmetric gameplay and the usage of VR can compensate for that.

The goal is to make a fun and accessible game, while being renewing. Something we can be proud of at EPITA, researching on the latest technologies and showing them to the next generation during open days.