



# UNSW

## A U S T R A L I A

COMP9415/3421  
Project Report

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## SECTION A:

In this section we will provide an overview of the system, key demographics, the system style, differences and similarities of and from other systems, system engagement with the audience and a list of the system features.

### 1. System Overview:

- The system we are developing and working on is a first-person shooting game. The game revolves around a player who confronts a group of zombies on a remote island after being hit by the waves of the sea. The events of the game revolve around the player's attempts to escape from the deadly zombie attacks. The game contains four waves. In each wave, the player will face many zombies, and the zombie boss will also appear in the last two waves. Every time the player overcomes the zombie wave, the next wave increases in difficulty to increase the sense of challenge and adventure during the game.

### 2. Targeted audience:

01. This game targets all fans of bloody horror games that target the sense of attempt and challenge to survive, specifically those who tend to play computer games, as this game is designed to be played using it. "No mobile version has been released yet".
02. The game is targeting the age of 14+ because its content may include graphic violence, blood and shooting content.

### 3. System Style:

01. The system style that we worked on is a first-person perspective game system. The system may have a more entertaining aspect in terms of gameplay, challenge, and adventure that the player finds while playing, but there is also an educational aspect, as we focused during our development of this game on making it very realistic, especially the weapon used in the game and the fully corrected trajectory of shots, so this game may help in calculating directions and improve the user's aiming and shooting skills.

### 4. Differences and similarities from other systems:

01. The game system that we worked on "FPS" is a very common system in the world of games, and many games were designed in the same style. Before starting with our system, we conducted a lot of research on the most famous games designed for the same style, and we tried to identify areas of weakness or areas that are less preferred by users. Which were the lack of space, the slowness of the player movement and the unreal weapon shots damage. And these flaws were presented in two most popular FPS games, " RESIDENT EVIL 7" and "VALORANT".

**We managed to solve these three disadvantages on our system by:**

01. We found that one of the most important and famous games " RESIDENT EVIL 7" users were complaining about the limited space to play, as the game revolved around one place, which is an old house, and the events of the game revolve around this house, and with the presence of the first-person perspective system, it was difficult for players to enjoy this game as they felt it restricted their freedom of movement.
02. The second disadvantage was indicated by the users of the “VALORANT” game where the movement of the player was weak at times and we made sure that the player in our game moves flawlessly without errors so that the user can get the best experience of the game.
03. The third disadvantage was also indicated by the users of the “VALORANT” game. The users mentioned that the weapon shots had an unrealistic effect as they had a very high impact and damage on enemies. In our game, we made sure that the effect of the shots was reasonable and very realistic, as we have well balanced the health value of zombies and zombie bosses and the damage value of the player's weapon, making killing zombies and bosses reasonably challenging and interesting. And we have differentiated the damage of hitting the zombie's head and body, so that the damage of the headshot is significantly higher than the body damage.

**5. System engagement with the audience:**

**01. A look at how the game is sequenced:**

- a. Start menu: when the player runs the game he will get a start page where he can choose between start or quit the game.
- b. The user can use a mouse+keyboard or VR equipment to run the game and control the character.
- c. When starting the game the user must move the character around the map looking for the zombies to defeat them and manage to keep the character alive during this game.
- d. In order to win the wave and move to the next wave, the user must defeat all the zombies and the boss if present.
- e. The user will be facing 4 waves and a total of 30 zombies and bosses in all the waves.
- f. At the end of the game, the player will be shown a two-option page. If the player defeats all the zombies and bosses, he will be shown a victory page, in which is written well done. And an option to exit or return to the main menu.

- g. If the player was killed by zombies or runs out of bullets, a lose page will appear that says you lose and options to return to the main menu, retry or quit.

**02. In the game system that we designed:** we made sure to provide a competitive aspect, but in a comfortable environment. Since these two systems are linked to each other, the competitive aspect may be fun and present, but the environment is not comfortable for playing. We may lose the user after a short period of playing due to the loss of a sense of comfort. And also from the other side, it is necessary to present comfort along with the competitive side so that the player does not feel boredom of playing.

- a. Regarding the competitive aspect, we worked on it in terms of the abilities of the zombies and the leader to damage and their movement speed, and added the ability for the player to refill the health bar if he was not exposed to any damage for a period of 5 seconds and the HP increases by 10%, the ability to refill bullets, and two powerful ultimates. Which gives the player a sense of competitiveness.
- b. Regarding the comfort aspect, we made sure that the environment gives the player sufficient freedom of movement and mobility. In addition to the gradation of difficulty in playing through more than one wave, each wave becomes more difficult than the previous one, so the user feels comfortable when playing, as the game gradually increases in difficulty.

## 6. A list of the system features.

Type of feature	Feature name	Description
Non-technical	Character	Since our game is a first-person shooting game, and all that is visible from the player is his hands only, our focus was on being as realistic as possible to give the player a sense of realism by adding a realistic texture. Game characters have health, energy, weapons , and can use ultimate abilities to attack zombies by consuming energy.
Non-technical	Ability	The game character will have 4 abilities, which can be used by consuming one unit of power. The abilities are two kinds of ultimate abilities (can only be used once and have a time limit), they are: gain super strength (increase movement speed and jump height) and one shot any zombies. And two regular abilities (by consuming energy, you can use up to 4 times), they are: acquire the bullets, restore player health.
Non-technical	Weapon	The weapon system is designed in the form of a pistol with an ammo bar containing 30 bullets ready to be reloaded. Player initially has 120 bullets.
Non-technical	Zombies	Zombies (Ghouls) are the most basic monsters in the game, with health and attack power, as well as initial clumsy mobility. The zombies have sensors if the player is close within a certain space the zombies movement speed increases and starts chasing the player.
Non-technical	Boss	The boss (Lich and Skeleton Enemy) is a hard-level enemy, with higher health bar, higher attack damage, higher movement speed and huge size. The boss's spawned location and spawned waves are different from Ghouls.
Non-technical	Map	The map is designed to be large enough for players to fully explore, with uneven terrain, jumping platforms, and so on. We also added some horror and waves sounds to the map to give it a more realistic feel. And also some abandoned houses and blood stains scattered in several areas of the map to add a sense of blood. Players can enter and exit different buildings. We fixed the collision properties of all objects to be more accurate and avoid the situation where the player passes through objects.

Type of feature	Feature name	Description
Technical	Implementation of Stable Bullet Trajectory	The backend algorithms of the bullet were adjusted to ensure that the bullets go in a direct direction trajectory as well as we kept testing it in the real game to ensure the realism of the damage whether it is a body shot or a head shot.
Technical	Implementation of Zombie Game Mode	For the game mode, for each wave of zombies, we intercept different coordinates on the map to generate different zombies in different locations. Through a large cycle and judging the wave number, different numbers of different types of zombies can be generated in different waves.
Technical	Implementation of Zombie Sensing	For the zombie sensing feature, by using the "pawn sensing" function and configuring it, the zombie can recognize the player within the configured range. Once the player is recognized, adjust the animation effect of zombie movement (from walking to running) and adjust the moving speed of the zombie to achieve the effect of accelerated tracking after the zombie recognizes the player.
Non-technical	Goals	The game has two goals: to lose and to win. There is only one condition to trigger winning: kill all zombies to survive the 4 waves of zombie frenzy. There are two conditions to trigger the loss: the player is killed by zombies. Or the player has used up all the bullets and has no energy to use the ability of increasing bullets, so the player has no way to kill the remaining zombies, the player will be triggered in this case 3 seconds later and die and lose the game.

## SECTION B:

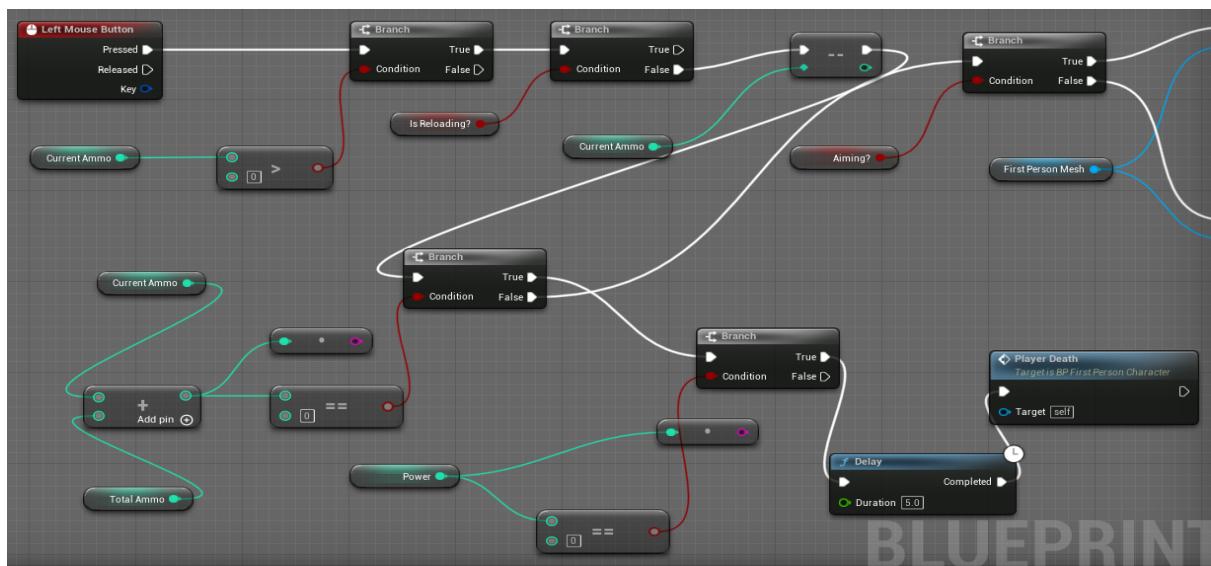
In this section, we will show some key functions in the project, and attach relevant codes and pictures to describe more details. At the same time, we will also use flowchart to show how our game works, and finally, some functions that we fail to implement.

- **Shooting System:**

Since the game we build is a FPS game, the shooting system is the most basic but also the most important part. This system contains 3 subparts: logic, line trace, surface effect and damage.

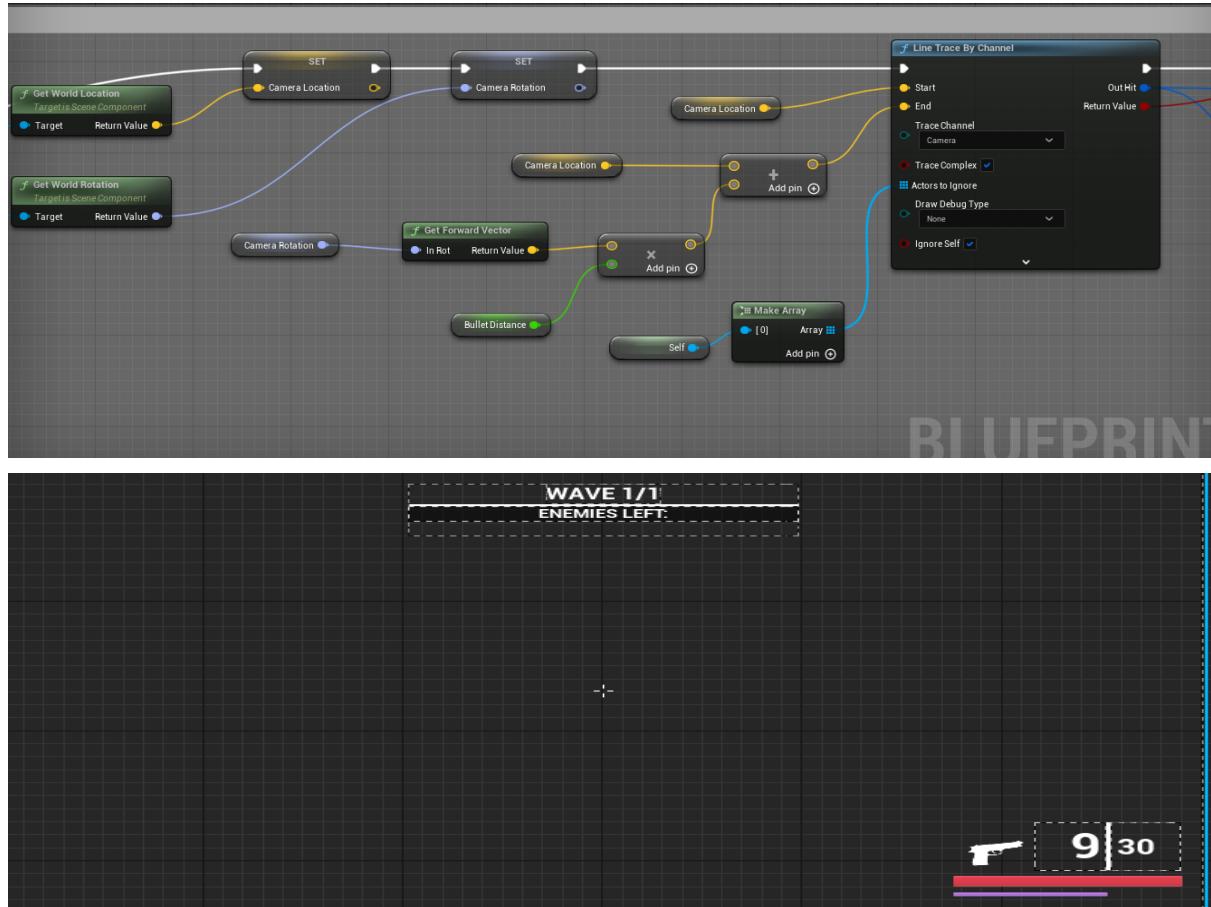
- **Logic:**

The logic of the shooting system is whether it can shoot or not, this is determined by two factors: the number of bullets and whether the player is reloading. By seeing the code of blueprint we can get if the current ammo is zero which means the gun is empty or if the IsReloading boolean is true then the condition of shooting is not met.



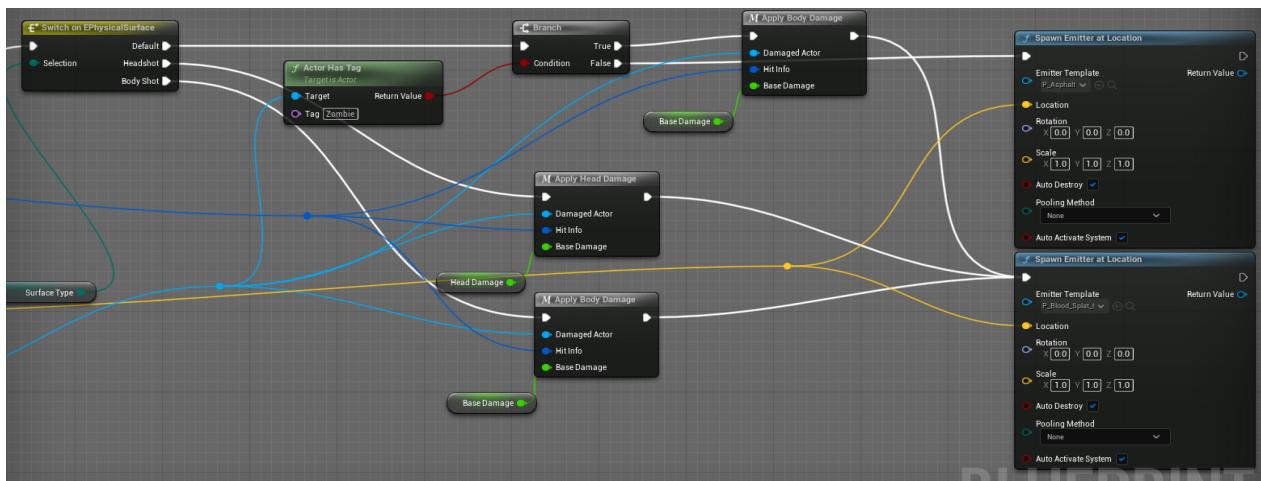
- **Line trace:**

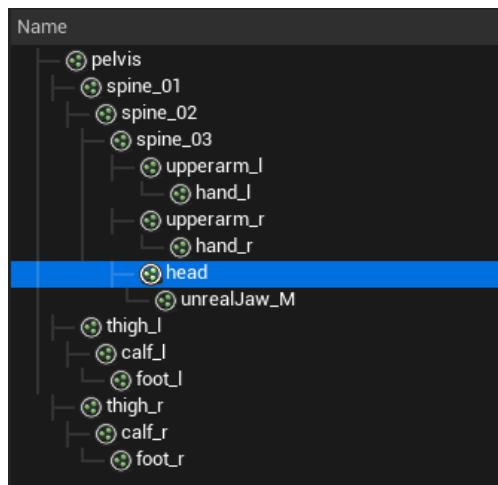
By using the location and rotation of the world and camera, we imply the line trace so the shooting position is the position where the bullet hits, and the trajectory will not fall. Like most games, our game places the shooting position in the center of the screen, and adds a centering widget so that players can know the shooting position more clearly.



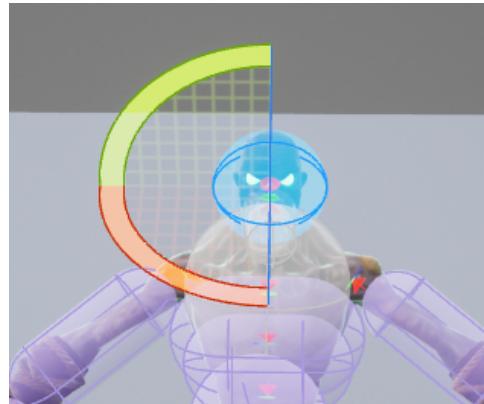
- **Surface effect and damage:**

This function can make bullets have different physical effects when they hit different surfaces. When we hit zombies, they will bleed, and when we hit buildings or the ground, dust will appear. These physical effects are sourced from EPIC market, Realistic Starter VFX Pack Vol 2. We have also implemented two damage systems for zombies: headshot will cause 50 points of damage to zombies and bodyshot will cause 20 points of damage.

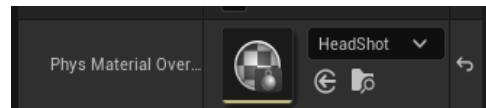




Select the ‘head’ of skeleton tree:



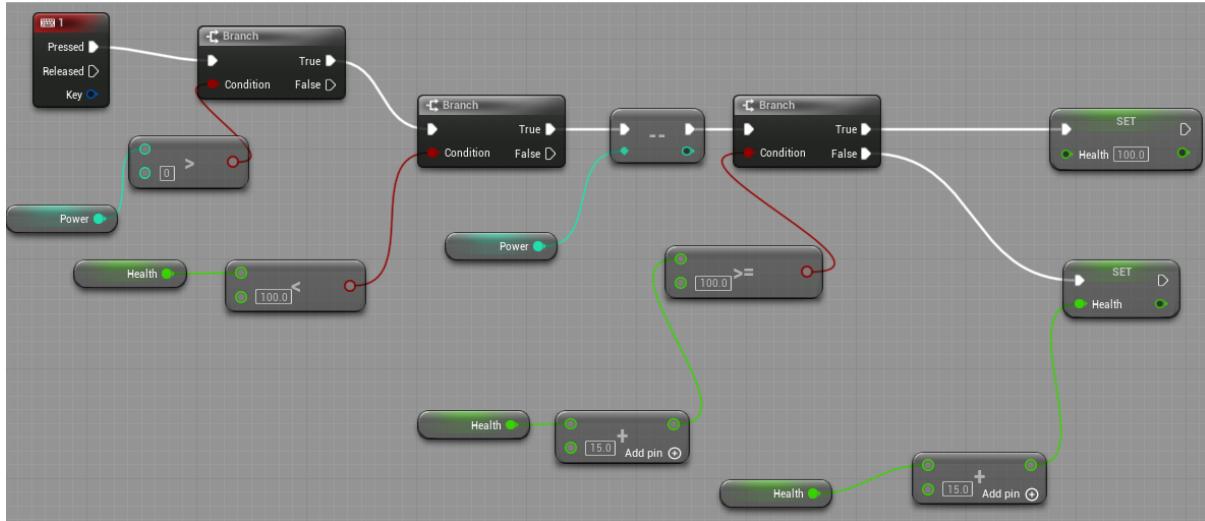
The head of SK\_Ghoul\_Full\_PhysicsAsset:



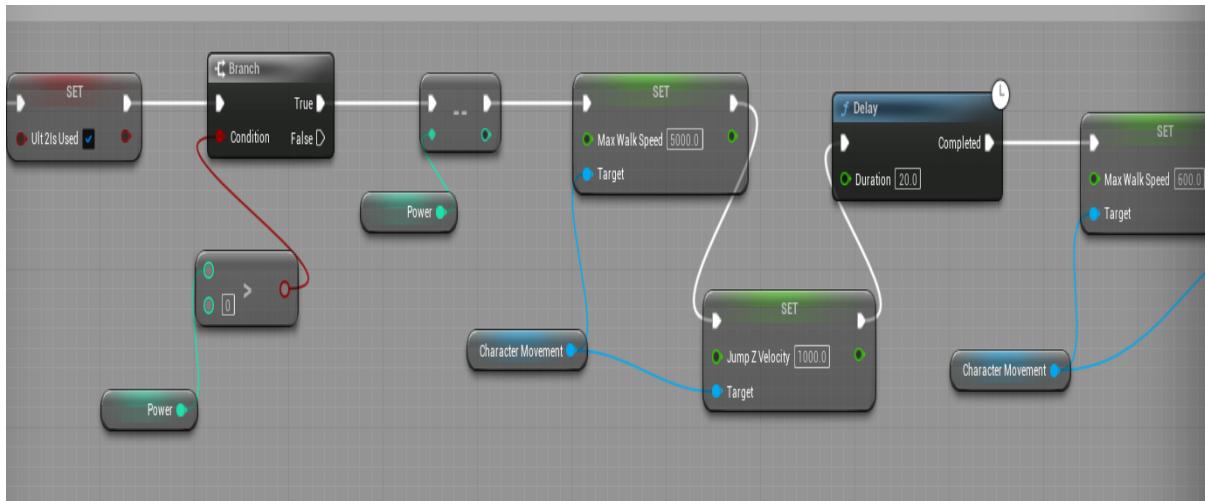
Set the Phys Material Override to “HeadShot”:

- **Ability System:**

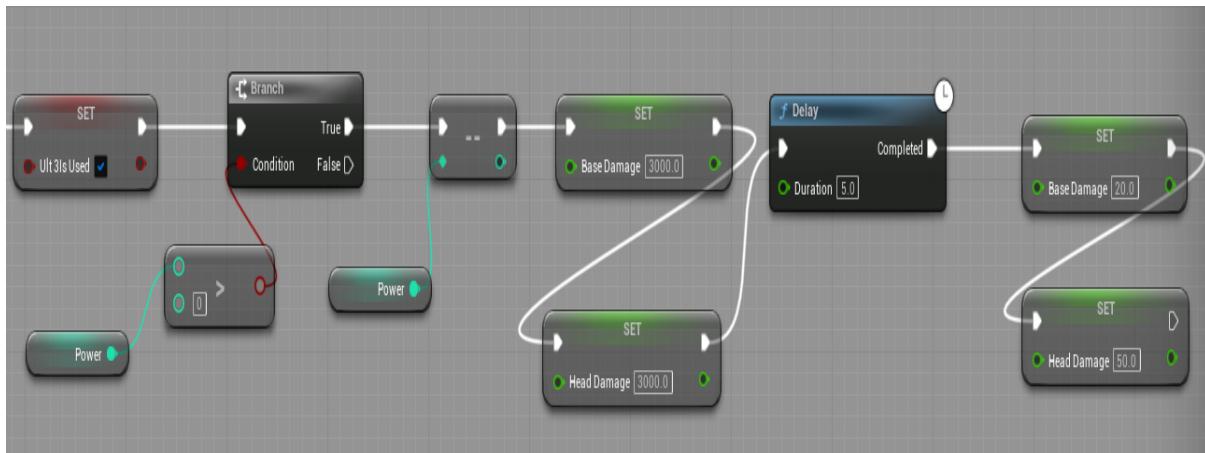
We have designed four abilities to make our characters more powerful, so that he can face groups of zombies and ghoul bosses. The four abilities are: health recovering, gaining super power, one shot anything within 5s, and get ammos. Health recovery will instantly restore your HP by 15 points, making you get rid of the crisis of death.



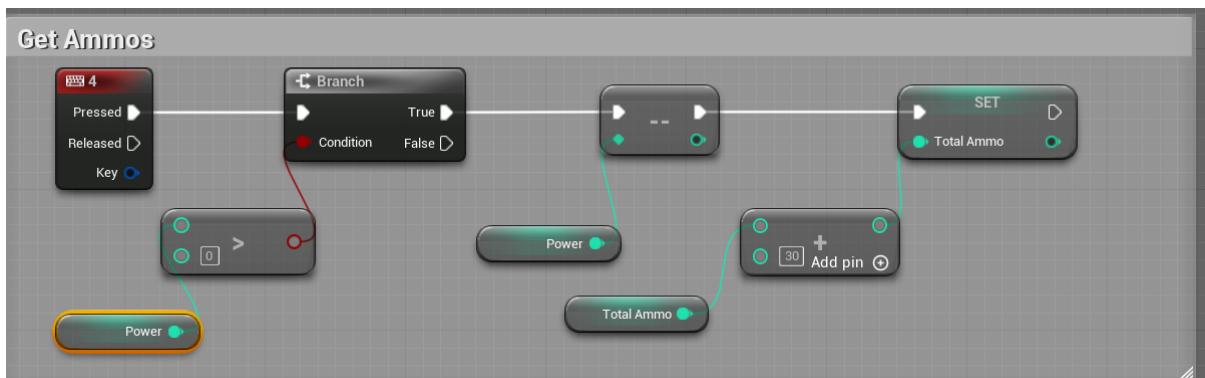
Super power can let the character move faster and jump higher, you can use it when you are surrounded by zombies, you need to escape.



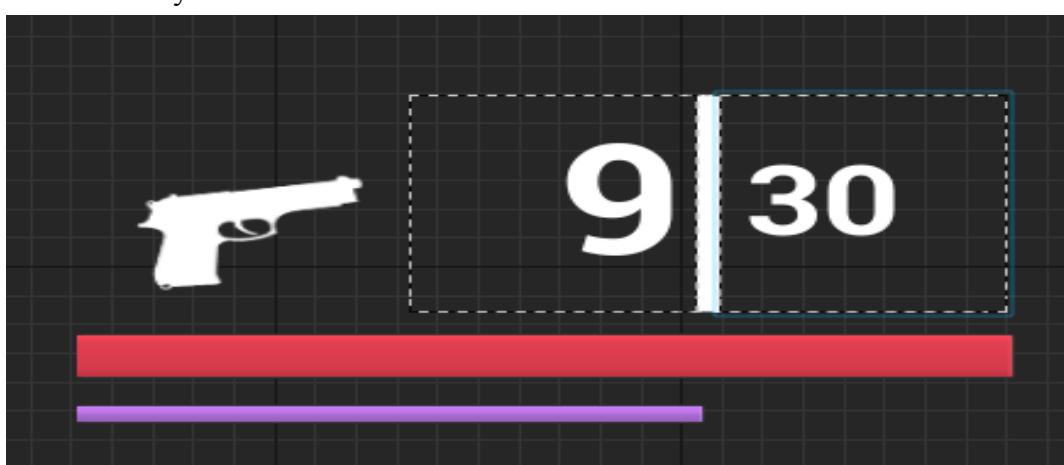
One shot killing anything within 5s will increase your damage so you can kill zombies with one shot. This will be your ultimate skill, you must consider when to use it to maximize benefits.



Gain ammos ability will give you 30 ammos, since our character only has 120 ammos at the beginning. Unless you can shoot the zombie's head with every shot, otherwise ammos will not be enough, so you will need this skill to replenish ammos.



Character's abilities cannot be used indefinitely. Our character initially has 4 grids of energy, and each time you use an ability, one grid of energy will be consumed. Therefore, you need to reasonably arrange your skill release. At the same time, we have added an energy grid widget in the lower right corner of the interface, so that players can clearly know how much energy they have left.



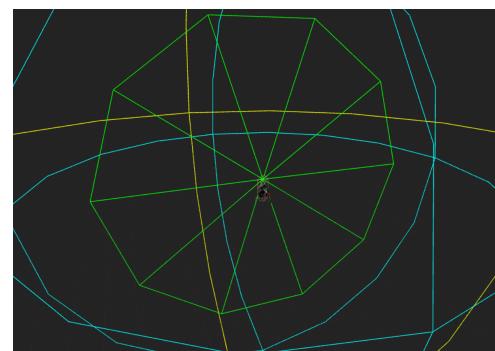
- **Zombies and Boss:**

Zombies and bosses are sourced from EPIC market, undead pack. In this asset, it contains zombie attack, movement, and be attacked animation. We designed some simple AI for them, such as chasing characters and attacking characters, and defined their HP variable and movement speed component. As for Boss, it has higher HP, highest attack power, huge size and more attack methods (for Lich it has 4 attacks effect with random sounds).

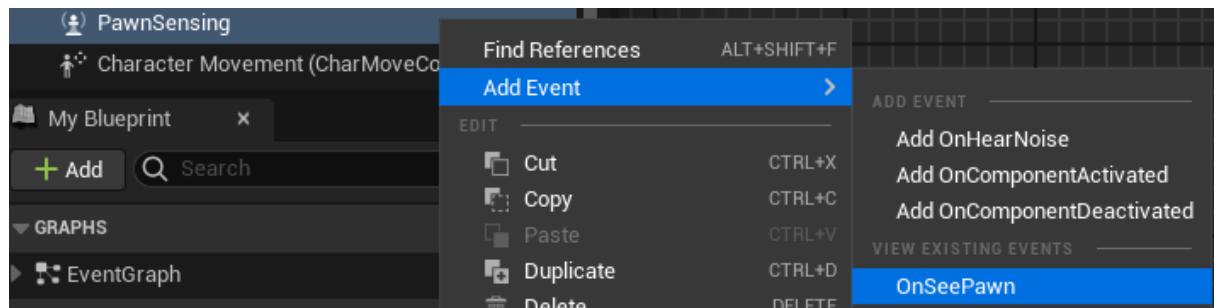
Pawn Sensing Component:

▼ AI	
Hearing Threshold	1400.0
LOSHearing Threshold	2800.0
Sight Radius	1000.0
Sensing Interval	0.5
Hearing Max Sound Age	1.0
Enable Sensing Updates	<input checked="" type="checkbox"/>
Only Sense Players	<input checked="" type="checkbox"/>
See Pawns	<input checked="" type="checkbox"/>
Hear Noises	<input checked="" type="checkbox"/>
Peripheral Vision Angle	90.0

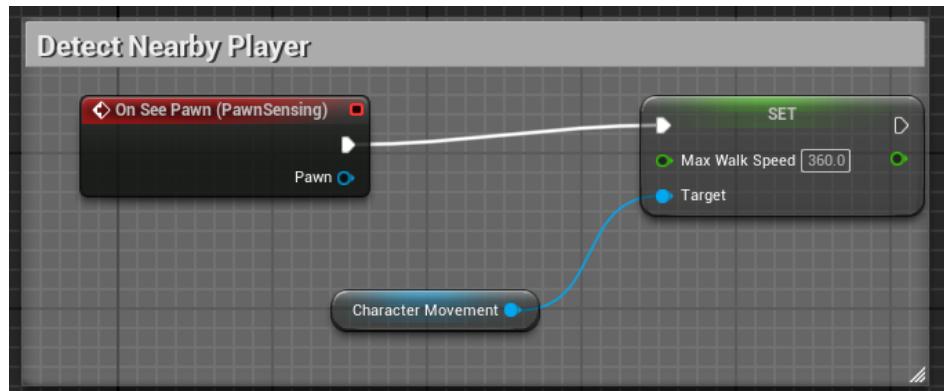
Set the parameters for the ghoul AI:



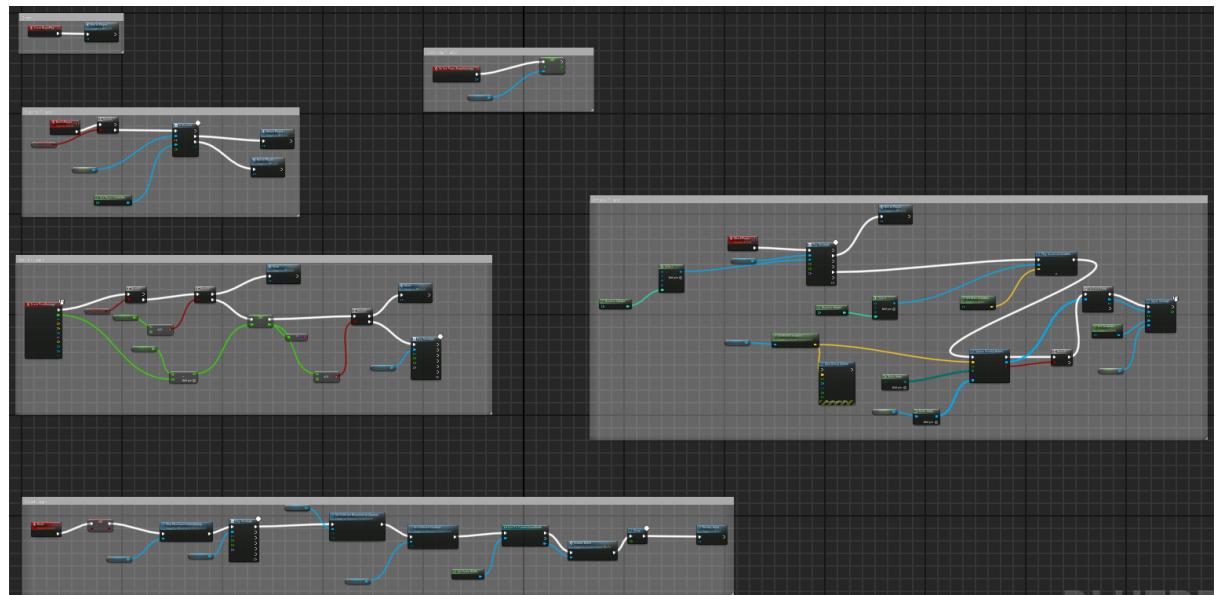
The range that the ghoul can detect the player:



Add an Event called OnSeePawn from PawnSensing component

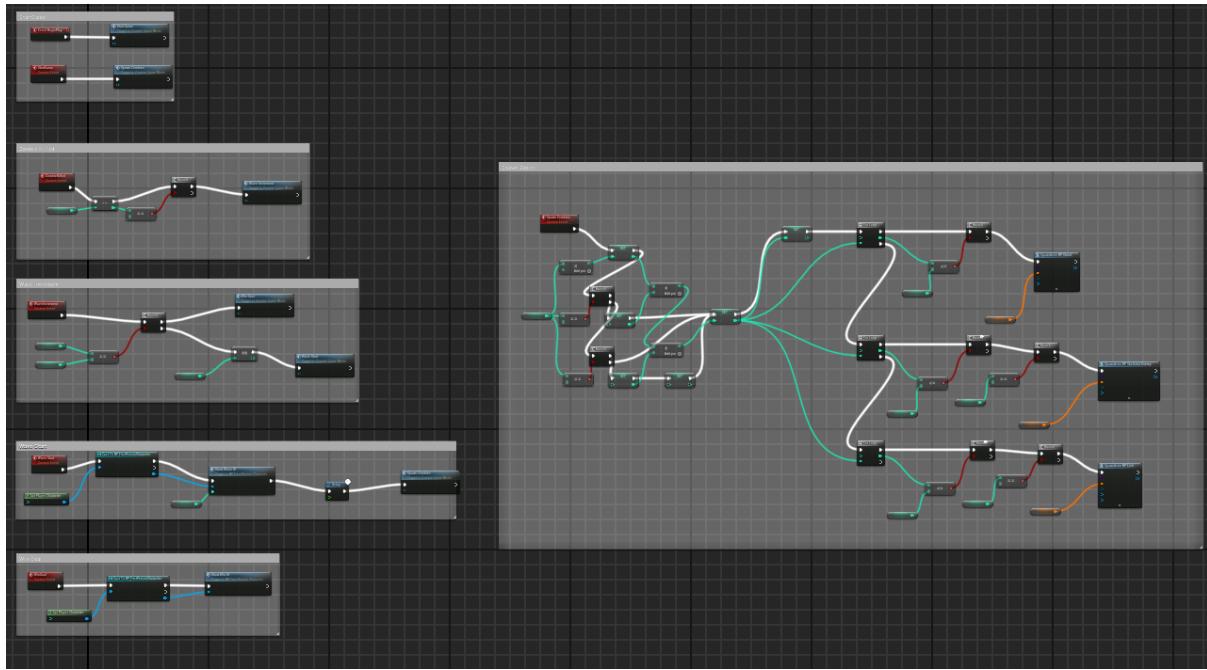


Use OnSeePawn to create a BP for ghouls to chase Player when they detect player.



The whole BP for Lich.

- **Game Mode System:**

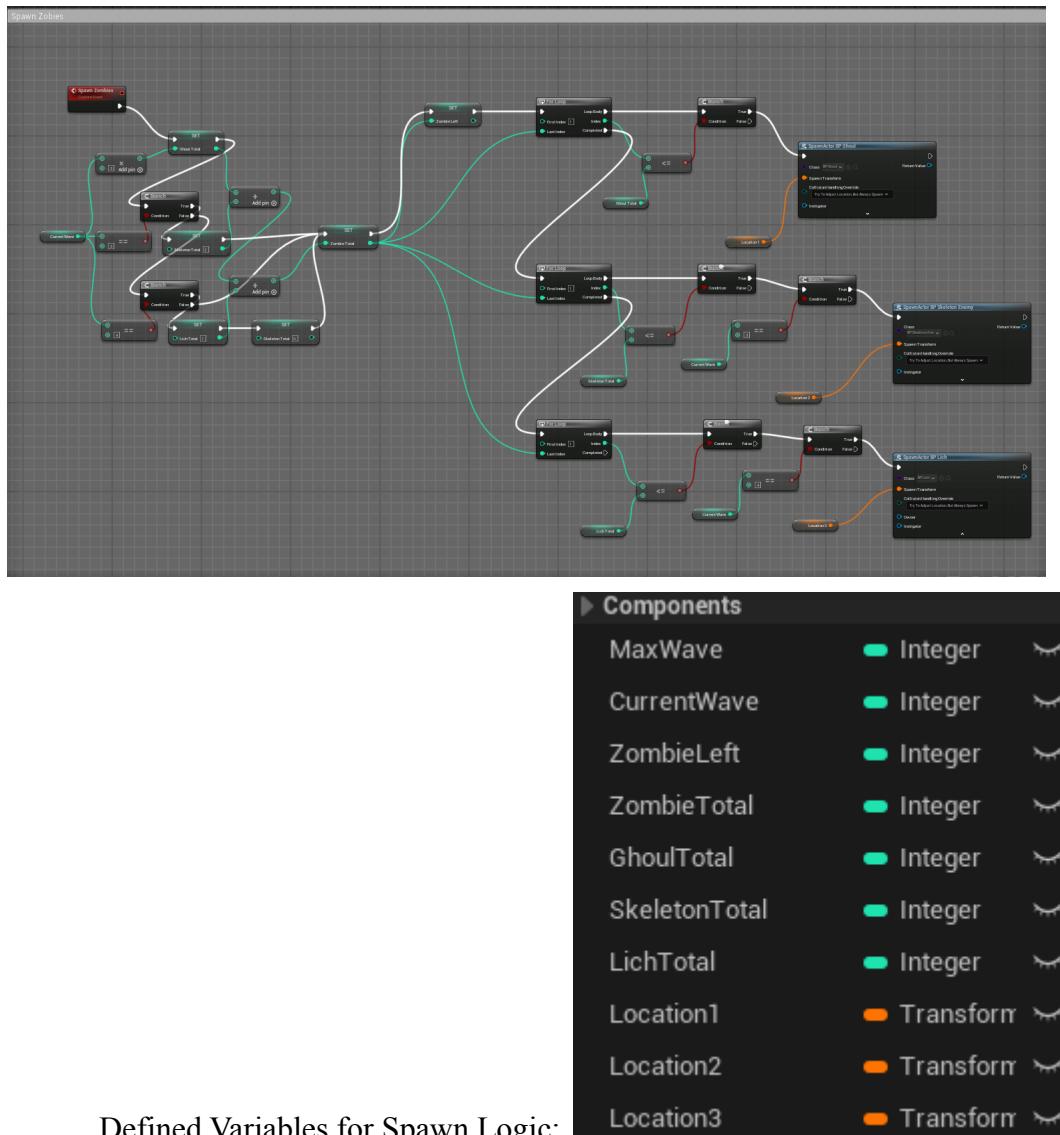


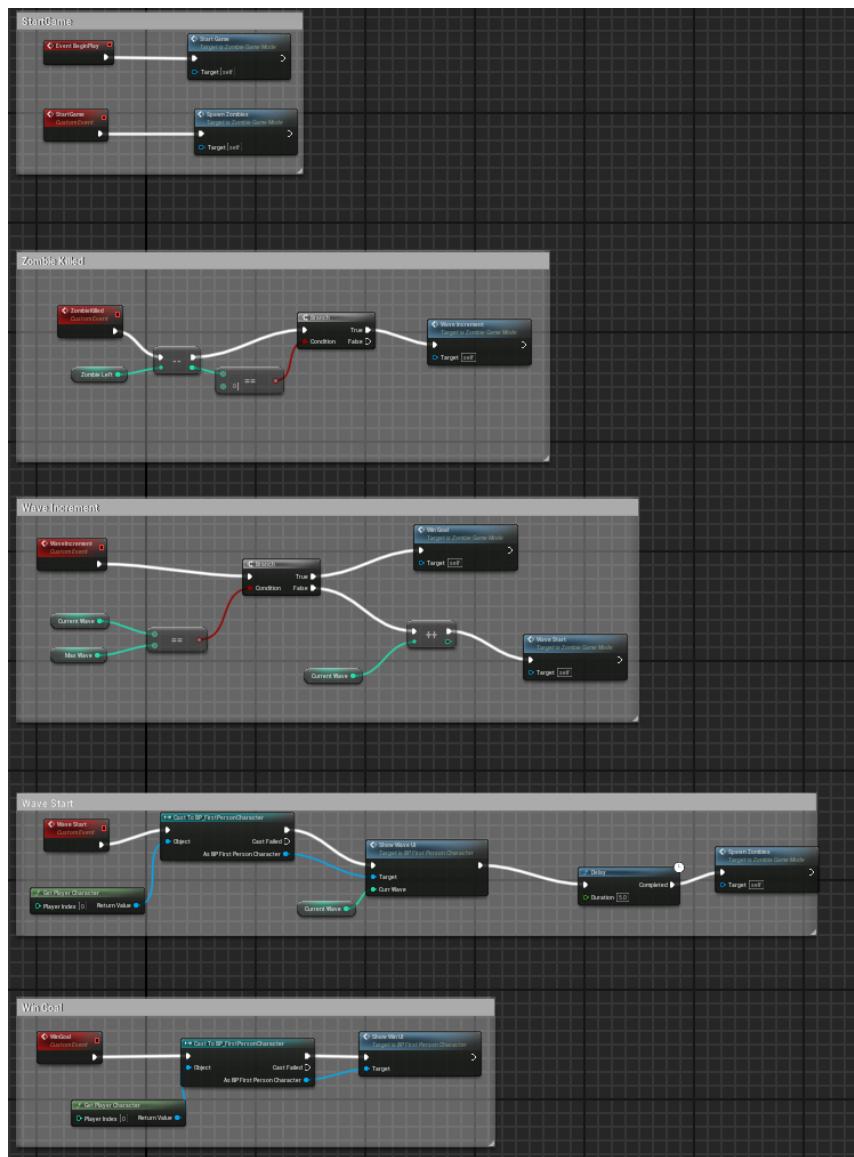
The whole BP of ZombieGameMode

- **Zombies Spawn Logic**

There are 4 waves.

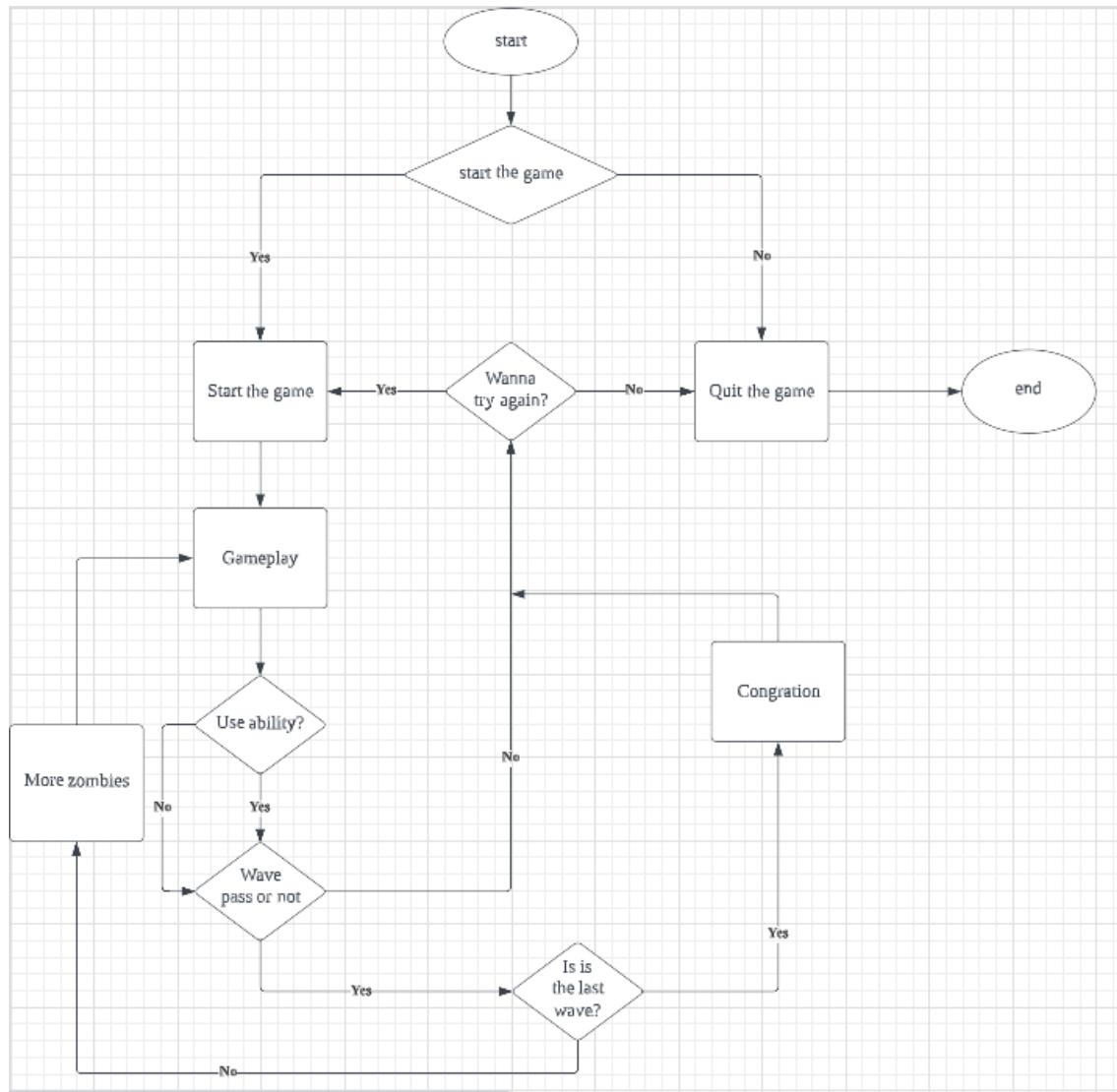
- Each wave contains a different combination of zombies and bosses.
- Each type of zombie spawns at specific coordinates.
- Define many variables such as: currentWave, maxWave, zombieTotal, zombieLeft, ghoulTotal, skeletonTotal, lichTotal, and use branches to make sure the spawn logic is correct.
- Use Location1, Location2, Location3 to make sure different type of zombies spawned in different locations.





Other basic customized Events for Game Mode System.

- **Flowchart:**



When the game starts, you will play a gunman and kill all the zombies on the map. You can choose to use abilities to make it easy to pass the current wave, or you can choose to reserve strength to the next wave. Whenever you kill all the zombies on the map, the game will enter the next wave, and more zombies and even Boss will appear. You need to make rational use of your skills so that you can pass all the waves, or choose to do it again after failure.

- **Unimplemented functions:**

- **Weapon Switching System:**

When drafting the proposal, we originally planned to make a weapon switching system, by making a variety of weapon materials and actions and allowing players to switch weapons through the scroll wheel or numeric keypad. Weapons include melee weapons as well as heavy fire weapons, RPGs, etc. Due to the need for a certain learning curve to make the weapon switching system, and the relatively high priority for completing the MVP, the project time is relatively short. Although we had found a suitable and free weapon package and added it to our "Content" folder, we were ultimately unable to apply it and make our weapon switching system.

- **More interaction:**

We plan to have our game have an interaction system similar to RE7, allowing players to interact with various things. However, due to the complexity of this function, we discussed and conceived that if we want to develop this function, it may take a lot of time to research, develop and debug compared to the development of basic functions, resulting in the inability to deliver the MVP on time, so we finally Choose to implement the basic functions first.

## SECTION C:

In this section we will provide a user manual of how to interact and use our system, a screenshots and description for: system navigate any menus, gameplay, how to win, lose and some essential information for operation.

### 01. TARGET

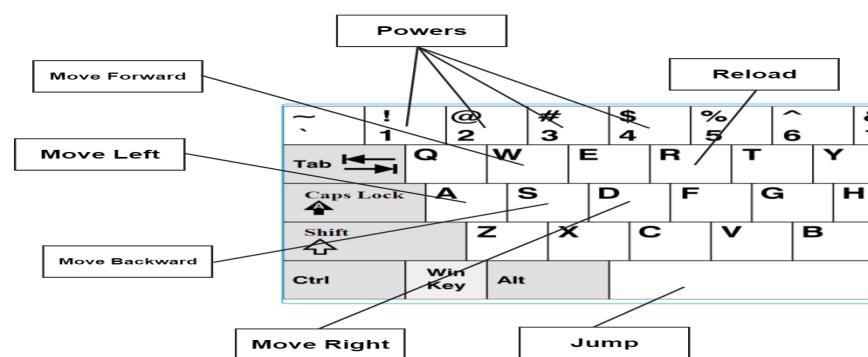
Survive four waves of zombies by killing all zombies and bosses

Before the zombies are eliminated, do not use up all the bullets and power (used to increase the number of bullets), otherwise the player will not be able to defeat the remaining zombies, and the character will be removed from the game 3 seconds after the condition is met.

### 02. CONTROL MANUAL

#### 01. Keyboard:

W	Move Forward	R	Reload
A	Move Left	1	Ability 1: Painkiller
S	Move Backward	2	Ability2: Adrenaline Syringe
D	Move Right	3	Ability 3: Golden Bullet
Space	Jump	4	Ability 4: Arsenal



## 02. Mouse:

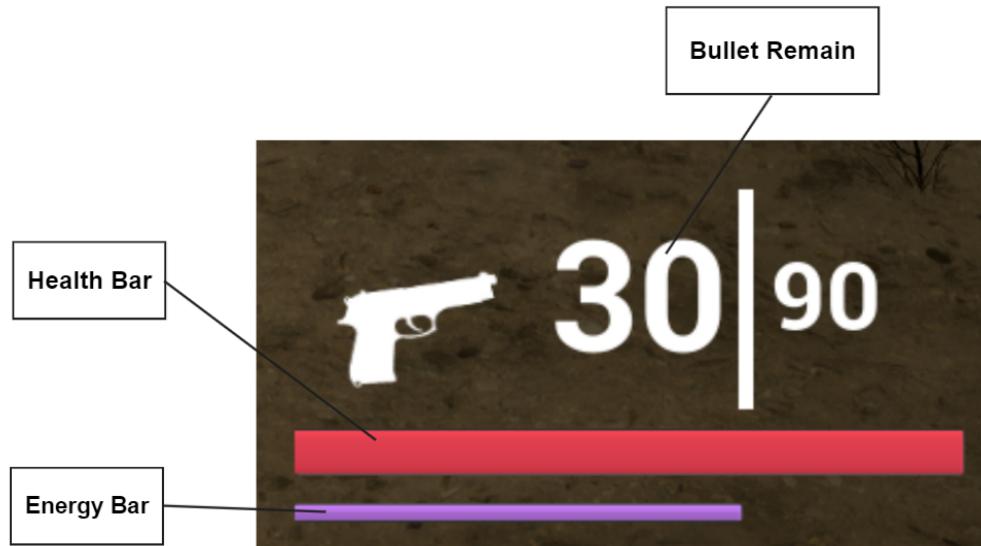
Right Click	Attack	Left Hold	Aim
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## 03. VR-controller:

Left Trigger	Reloading	Right Trigger	Shooting
Left Trackpad	Movement	Right Trackpad	Ability
Left Grip	Jump	Right Grip	Aiming

### 03. PLAYER INFO MENU



- Player have 100 HP value, 4 powers and 120 bullets initially
- Body damage is 20 and headshot damage is 50
- Player can consume 1 power to gain 1 ability

### 04. ABILITIES

Ability 1	Painkiller	Recover HP value
Ability 2	Adrenaline Syringe	Increase moving speed and jumping height for 20 second
Ability 3	Golden Bullet	Oneshot any zombie for 10 second
Ability 4	Arsenal	Get 30 extra bullets

## 05. ZOMBIES

- There are 3 types of zombies with different movement and attack animations.

Name	Photo	Health Value	Attack damage
Ghoul		100	7
Skeleton		800	15
Lich		1000	24

## 06. GAME MODE

- There are 4 waves.
- Each wave contains a different combination of zombies and bosses.
- Each type of zombie spawns at specific coordinates.
- The generation logic of zombies in different waves is shown in the table below.

**The logic of zombies:**

	Ghol	Skeleton	Lich
Wave 1	3	0	0
Wave 2	6	0	0
Wave 3	9	2	0
Wave 4	12	0	1

## 07. MENUS

- The game contains 3 main menus:
  - Main Menu
  - Win Menu
  - Lose Menu

### 01. Main Menu:

- The main menu shows:
  - Game name
  - Start button
  - Quit button - Added hover effects to buttons (when the player's mouse is over them)



## 02. Win Menu:

- The win menu shows:
  - Congratulation message to player
  - Return to main menu button
  - Quit button



## 03. Lose Menu:

- The lose menu shows:
  - Lose message to player
  - Return to main menu button
  - Retry button
  - Quit button

