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BSc in Computing
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Nostalgic Path

Technical Report



Declaration Cover Sheet for Project Submission

SECTION 1

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Executive Summary

Nostalgic Path is an open world, exploration type roleplaying game built on Unreal Engine 4. The game aims to make the player intrigued in the surroundings and the story itself.

The player will be placed in a first person perspective, which will assist in the game immersion. This is also what is preferred in most games which utilise any type of VR device. The game will be available to run on the PC standalone or on a VR device too.

When first starting the game, the player will find themselves to be in a dark environment. There will be voice narration implemented to keep the story going as the player takes control and explores. The player eventually will find a way out of the dark environment and into a calmer, brighter scenery. In this area the player must explore, figure out puzzles and progress in the story and by doing so, finding out what is happening and why.

There will be hostiles, so the player will have to be prepared to fight back anything that may be dangerous. The player will be equipped with a weapon to fend for themselves with and may even find more as they progress.

The game will have the following features below:

- Night and day cycle: This adds to the immersion effect for the player so that it does feel like time is passing by in-game too although time will be much faster in the game.
- Player versus Environment: The player will be able to fend for themselves from enemies in the game environment.
- Virtual Reality: This adds to the immersion effect for the player again and allows a better gaming experience.
- Maps and puzzles: The player will have to explore different maps and areas to progress in the story. Some areas will potentially have puzzles.

1 Introduction to Nostalgic Path

1.1 Initial Game Concept

Nostalgic Path is a first person roleplaying game where the player first finds themselves in a dark and unknown environment. The story slowly starts to unfold as the player explores and progresses through the different parts of the game. The aim of the game is to make the player want to explore and find out what is happening in the world they find themselves in.

The twist is as the story unfolds and the player gets further and further into the story, it starts to get darker and darker. The story slowly takes a dark turn and ultimately it is revealed that the player is in grave danger and must find a way of surviving and potentially escaping.

The game does get a nice and brighter scenery after the introduction area which gives the player a false sense of safety. Since there is a day and night cycle in the game, even the calm scenery and become a bit menacing looking at night time. The scenery does change and get darker as the story progresses and as the truth behind what is happening is revealed.

Some areas will require the player to solve little puzzles to progress but they will not be insanely difficult or close to impossible.

1.2 *Changes to Game Concept*

The game idea has changed over the course of creating the game itself as views changed and different ideas emerged. The story aspect is less important now and an exploration is concentrated on more.

1.3 Background and Research

The initial research stage for my project started back in September. I first looked at the gaming industry and what seemed to be the next big thing in that industry. In this initial research I looked at different technologies and engines too which I could potentially build my game on.

In the second stage, I looked at games themselves to see what types of games are popular right now and where the market seems to be heading. It is important to understand what genres are big right now and also what is it that makes games unique, stand out and successful.

There was some research into things that make a game successful, little things and aspects found in games that have proven themselves to be successful and such. A lot of the time it is the little things that count and that the players are fond quite fond of.

1.3.1 Technology

Virtual Reality

Virtual Reality is what the gaming industry is heading towards currently. Microsoft and Sony are already on the idea of it and have moved forward in releasing their own VR devices. PlayStation have a VR product already which was released this year officially. For the game, VR will be implemented into it.

There are a few Virtual Reality devices which are already out there available in the market. These would be:

Oculus Rift	HTC Vive
Samsung Gear VR*	

PlayStation VR	
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*Samsung Gear VR – For mobile applications only and utilizes phone CPU and also the VR device built in CPU power.

With Virtual Reality devices, players are able to use it to immerse themselves into in-game environments and experience things as if they were there in that world. With most games right now available for VR, a lot of the time the player is kept or trapped within a small space or environment. With Nostalgic Path this will somewhat not be the case. The game itself will be “open world” but it will not all just be one map as this will require more power from the pc running it.

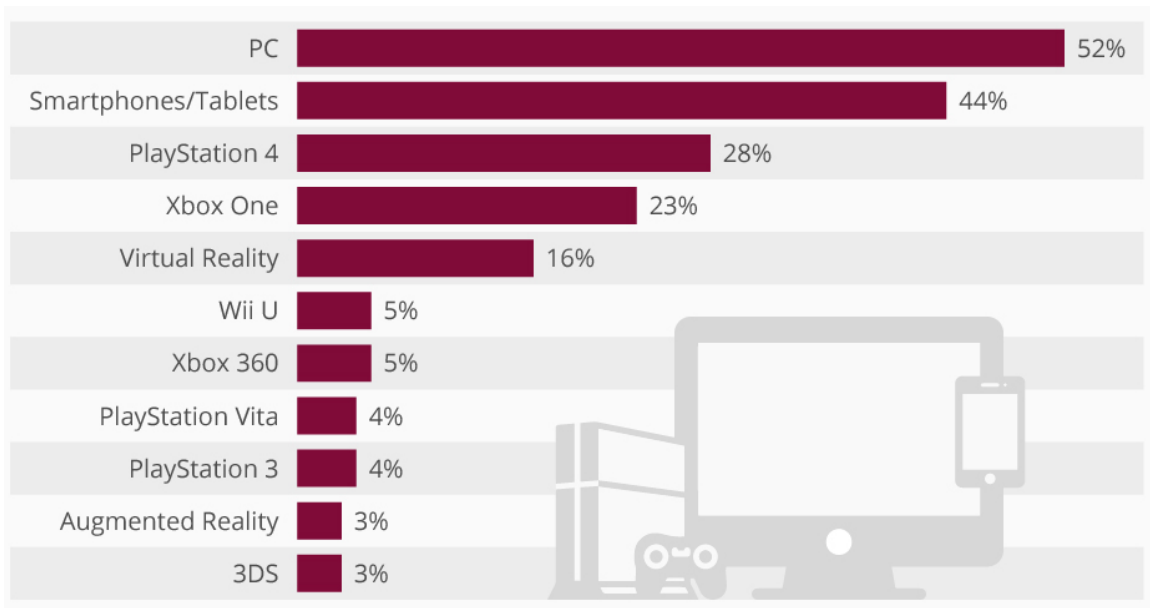
Instead the world will be segmented into multiple different maps for different areas which will need to be loaded when the player enters it. Basically it is cutting the world into segments as different maps. Each map will have a trigger where if activated by player interaction or simply by the player walking on top of an area, the new map will load and it is as if the player just walked into a new area for example.

Game Engines

For game engines, the most viable ones that are available would be Unreal Engine 4 by Epic Games, Unity 5 or the Source Engine by Valve. I chose to use Unreal 4 due to the fact that it is visually very powerful and excels in graphics and such. After looking at a few tutorials and seeing what it could do, it was not a difficult choice to use Unreal Engine 4.

1.3.2 Gaming Market Research

Game Platforms – How are people playing their games?



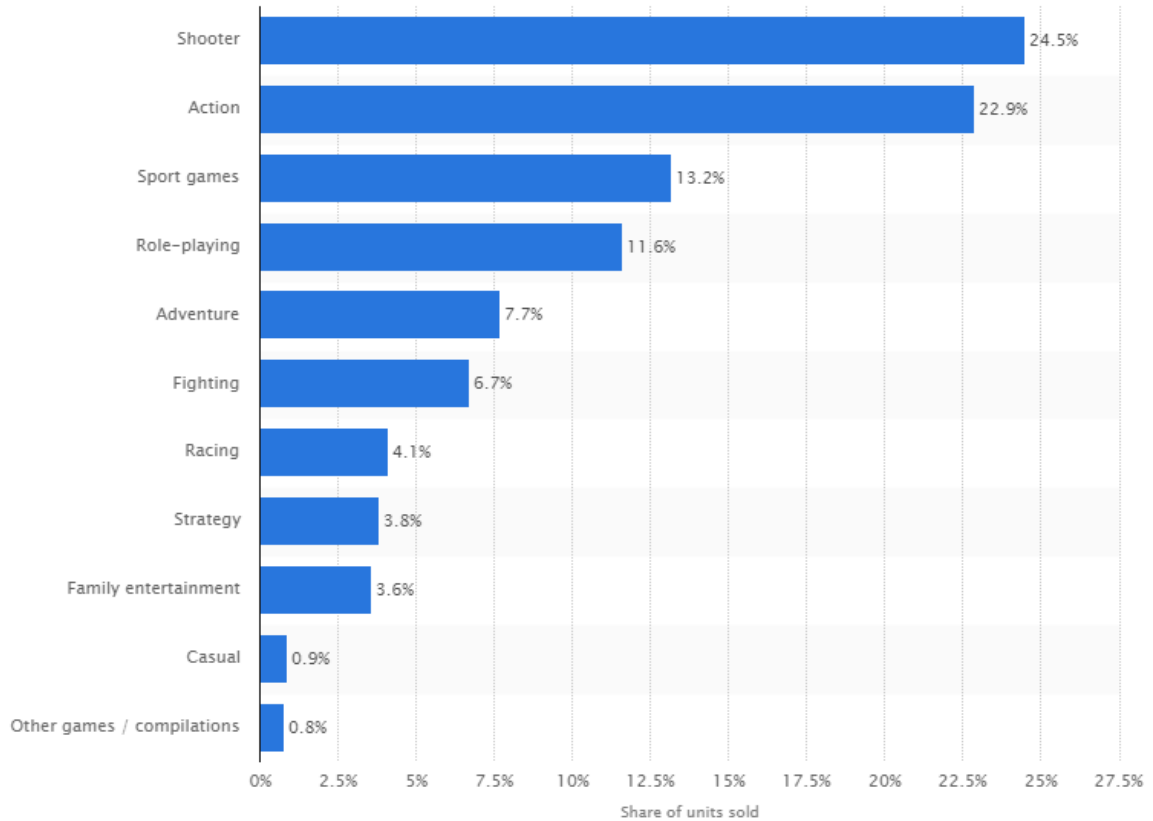
Graph provided by Statista.com

The graph above shows the most popular platforms for gaming in the year 2016. From the above graph we can see that PC is still the most used platform for gaming today, followed by mobile devices/tablets and then the PlayStation console and Xbox. After all that in fifth place is VR devices.

For Nostalgic Path, the game will be running on the PC and also utilizing Virtual Reality. It is not surprising that Smartphones and tablets have hit second place and it is expected that mobile and tablets could take first place soon as mobile gaming is getting bigger. This is due to the fact that most people have a Smartphone or tablet or even both and also due to how convenient and mobile the devices can be.

PC are also moving forward over the years as gaming laptops are becoming better. This is due to the improvement of graphic cards available for laptops, making it possible for laptops to have graphic cards almost on par to desktop versions.

Game types – Popular Genres



Graph provided by Statista.com

The above graph shows the most popular genres of games in the year of 2015. As you can see, the top five genres are: Shooter, Action, Sport games, Role-playing and Adventure.

From these five genres, Nostalgic Path utilizes fully or partially from 4 of the above. The game has shooter aspects as the weapon of choice for the player to use is a gun to shoot hostiles with. The game will have action, role-playing and is also an adventure game where the player must explore the world and find puzzles and secrets to solve.

Aspects of a good game – What to keep in mind when developing

A good game depends on a player's taste and their own preferences but there are a few aspects that a game should almost always embody for it to be good or successful.

Challenging experience

A game should be challenging and not be simple to the point where the player finds it boring and feels unmotivated to keep going. It is important to make the game somewhat challenging and difficult but to also not overdo the difficulty to the point where it may discourage the player from wanting to continue.

Freedom – An open experience

A player should not feel too confined in the game environment and should have some freedom in the movements and actions within an environment.

Visuals

Visuals can be quite important for many gamers today. A lot of gamers would shun games that have very bad graphics or outdated graphics.

Motivation

There should be something in the game that motivates the player to keep going. A good storyline for example or a good challenge or reward. A game must have a goal.

Self-improvement and Learning

A game should be challenging to a certain point where there is something to learn for the player or a mechanic the player can improve on which will benefit them in the game.

1.4 Aims

The aim of this project is to create a game which compels the player to figure out what is going on in the game. A narrative will be available to assist in the story telling as the player explores the environment, unlocks secrets and figures out the dark truth behind what is happening and why the player is there.

The game will let the player move around quite freely and will also have hostiles. The player will have to learn to fend for themselves while also traversing the different areas and delving deeper into the story.

1.5 Technologies

1.5.1 Software

- Unreal Engine 4
 - Map and level design
 - Cut scene creation
 - Character model rigging
 - Game mechanics – attacking etc.
- Autodesk (Maya, Mudbox) and also Blender
 - Character model
 - Enemy model
 - Environment/Assets model
- Photoshop
 - Logo creation and other imaging needs

1.5.2 Hardware

- PC / Laptop
 - For running the game itself and also for the player to play it with mouse and keyboard controls.
- Mouse and keyboard (Controls)
 - For playing the game and controlling the in-game character. Movements will be the popular Mouse and WASD controls.
- Game Controller (Console controllers)
 - Optional alternative for playing the game.
 - Examples would be Xbox controller or PlayStation controller.
- Oculus Rift (Virtual Reality)
 - Optional for gameplay, not fully required for the game to be played.
 - Allows the player to be immersed into the game.

2 Definitions, Acronyms, and Abbreviations

VR	Virtual Reality
NPC	Non-player character
GE	Game Engine
ORD2	Oculus Rift D2
UE4	Unreal Engine 4
GUI	Graphical User Interface
AI	Artificial Intelligence

3 System

3.1 Requirements

Requirements

1. There will be a main menu which allows the player to start the game, potentially load from a checkpoint and change sound options such as the master volume of the game. Since there is going to be narration incorporated into the game, it is important to have an option for the volume for within the game.
 - 1.1. Other options such as screen options may also be made available.
2. When player loads into the game, on-screen instructions will inform the player of the keys used for movements. Example would be by default “WASD” movements and the mouse will be utilized to turn the camera and face different directions.
 - 2.1. Possible hotkey rebinding implementation.
3. Narration will guide the player along the story, giving the player an idea of what should be done and what is currently happening in a sense.
 - 3.1. Narration possibly with subtitles that appear on screen too.
4. Game can be paused and a pause menu should be available, giving the player the option to quit and adjust options from here.
 - 4.1. Other menus can be accessed from the pause menu.
5. Environment interactions will be available to the player.
 - 5.1. Some items in the world are able to be used or interacted by the player or taken by the player for use.
6. There will be some enemies eventually as the player progresses through the storyline.
 - 6.1. Enemies will scale in difficulty and threat as the player progresses further into the story. The player will have some way of defending themselves.
7. Virtual reality will be made available for use with the game. Controls will still be keyboard and mouse based.
 - 7.1. There will be some problems with working with this, as I do not own my own VR device and will have to borrow the college VR devices which is the Oculus Rift D2.

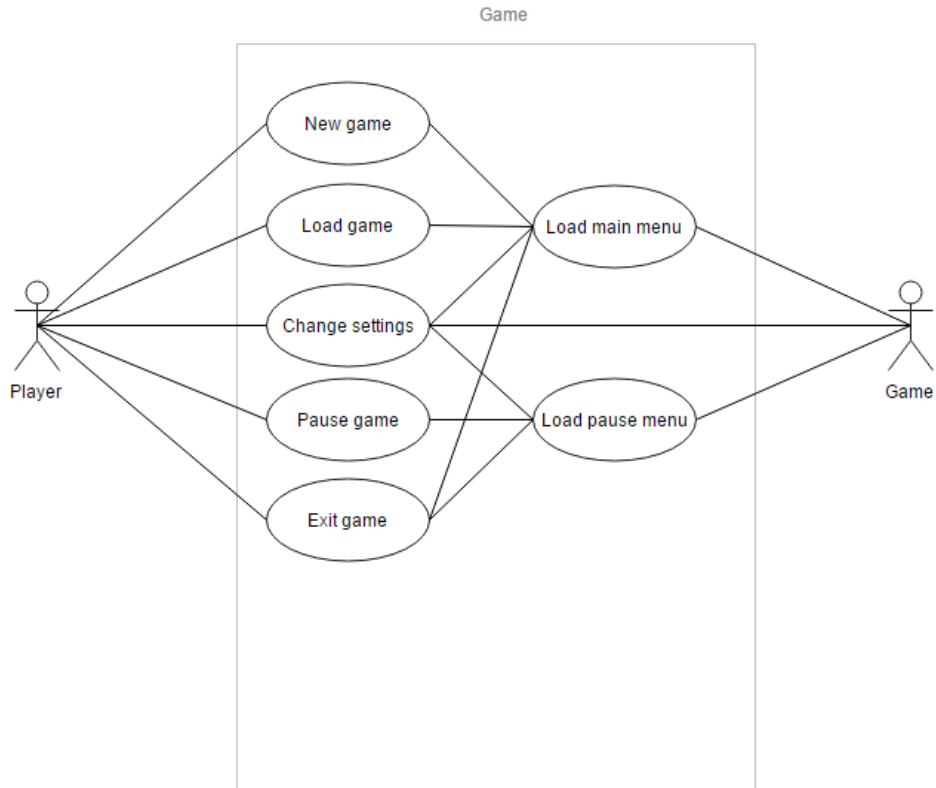
3.1.1 Functional requirements

ID	Requirement	Comment
FR01	The game shall allow the player to start a new game	Players must be able to start the game from a new start or from a checkpoint
FR02	The game shall allow the player to load from a checkpoint	Players can be loaded into the game, starting at a checkpoint
FR03	The game shall allow the player to move within the environment in which the character is restricted within	Players is able to move the character within the world with controls
FR04	The game shall allow the player to interact with certain objects in the environment	Players is able to interact with some objects they find in the environment
FR05	The game shall allow the player to change sound settings and potentially graphic settings	Players is able to adjust the sound and graphic options to suit their own need
FR06	The game shall allow the player to quit the game whenever they want	The game can be quit at any time through the pause menu
FR07	The game shall allow the player to pause the game whenever they want and to be able to access other options from the pause menu	Players can access other menus at the pause menu such as options and also the option to quit the game

Restrictions

1. Checkpoints may only be loaded with the condition of a load being available. This means that an existing checkpoint from a previous session must be available first.
2. Not all objects will be possible for interaction. Only select items will be made available for player interaction.
3. Player movements may be restricted in some scenarios and areas within the game.
4. The environment will have restrictions in which the player is not able to go into some areas.

3.1.2 Requirements – Use Case Diagrams



Player is able to:

Select new game from the main menu

Load game from main menu

Change settings from main menu AND pause menu

Able to pause the game, bringing up the pause menu

Exit the game from the main or pause menu

Game:

Loads main menu when game is started

Loads pause menu when game is paused

Changes to game done through settings by the player is registered

3.1.3 Requirement 1: Play game (Movements)

3.1.3.1 Description & Priority

The player is able to play the game once new game or load game is selected. The player should be able to move within the environment the character is restricted within.

3.1.3.2 Use Case

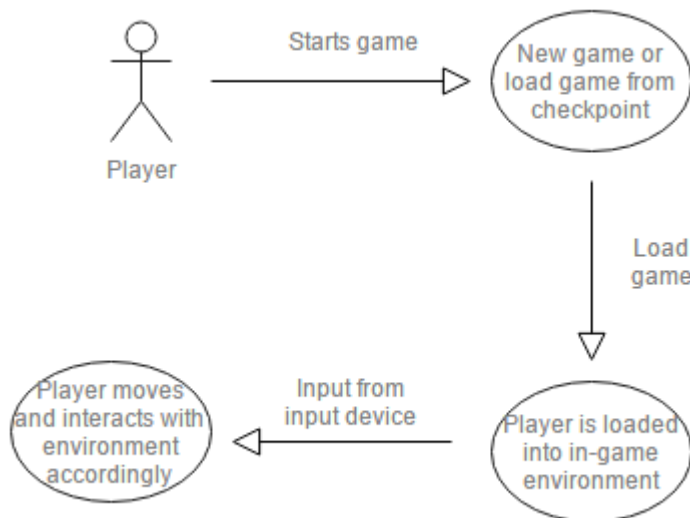
Scope

The scope of this use case is to allow the player to play the game and to explore the game too. This is why movements are important.

Description

This use case describes the movements the player should be able to do so they may explore and enjoy the game.

Use Case Diagram



Flow Description

Precondition

The game is available on the machine and game is open on main menu. New game or load game is selected and player is loaded into the world.

Activation

This use case starts when the player uses the input devices to move the character within the in-game environment or tries to interact with an object.

Main flow

1. The game loads the character into the in-game environment.
2. The player uses mouse and keyboard to send input to the game.
3. The game receives and reads the input sent and moves the character accordingly.
4. The process of sending and receiving the input has no delay.

Alternate flow

[No application]

Exceptional flow

1. Player is stuck in an unmovable area
2. Player is stuck in a mesh

Termination

Process stops when no input is sent to the game.

Post condition

No post condition. Game is always require movements for the game to be played properly.

3.1.4 Requirement 2: New game

3.1.4.1 Description & Priority

The player starts a new session of the game, playing from the very beginning of the game.

3.1.4.2 Use Case

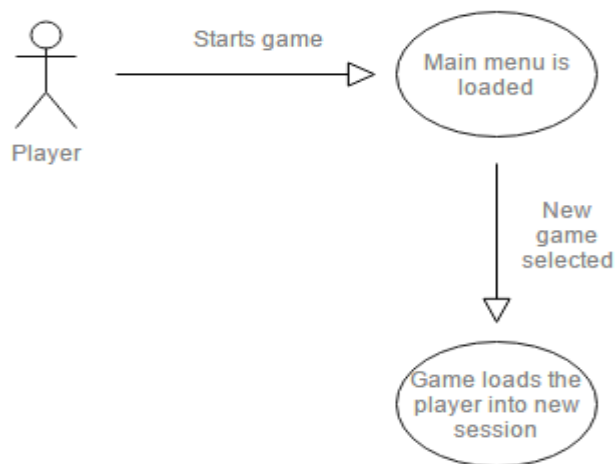
Scope

The scope of this use case is to allow the player to start a new session of the game, starting from the beginning of the story.

Description

This use case describes the process of loading the player into a new session of the game.

Use Case Diagram



Flow Description

Precondition

The game is available on the machine and game is open on main menu. New game is selected and player is loaded into the world.

Activation

This use case starts when the player clicks “New game” on the main menu which is loaded upon initialization of the game.

Main flow

1. The game is initialized
2. The main menu is loaded
3. New game is selected by the player
4. A new session is created and player is loaded into a new game

Alternate flow

[No application]

Exceptional flow

[No application]

Termination

The game finishes with creating new session and player is loaded into the game.

Post condition

This process is inaction during gameplay.

3.1.5 Requirement 3: Load game

3.1.5.1 Description & Priority

The player loads a previous session of the game, playing from a certain point of the game.

3.1.5.2 Use Case

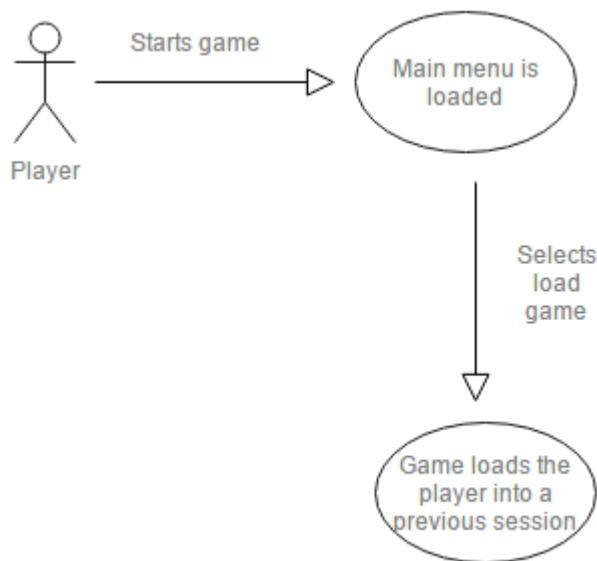
Scope

The scope of this use case is to allow the player to load a previous session of the game, starting from a certain point of the game.

Description

This use case describes the process of loading the player into a previous session of the game.

Use Case Diagram



Flow Description

Precondition

The game is available on the machine and game is open on main menu. Load game is selected and player is loaded into the world.

Activation

This use case starts when the player clicks “Load game” on the main menu which is loaded upon initialization of the game.

Main flow

1. The game is initialized
2. The main menu is loaded
3. Load game is selected by the player
4. A previous session is loaded

Alternate flow

[No application]

Exceptional flow

1. No previous session to load.

Termination

The game finishes with loading previous session and player is loaded into the game.

Post condition

This process is inaction during gameplay.

3.1.6 Requirement 4: Change Settings

3.1.6.1 Description & Priority

The player changes settings to best suit their own preference and needs.

3.1.6.2 Use Case

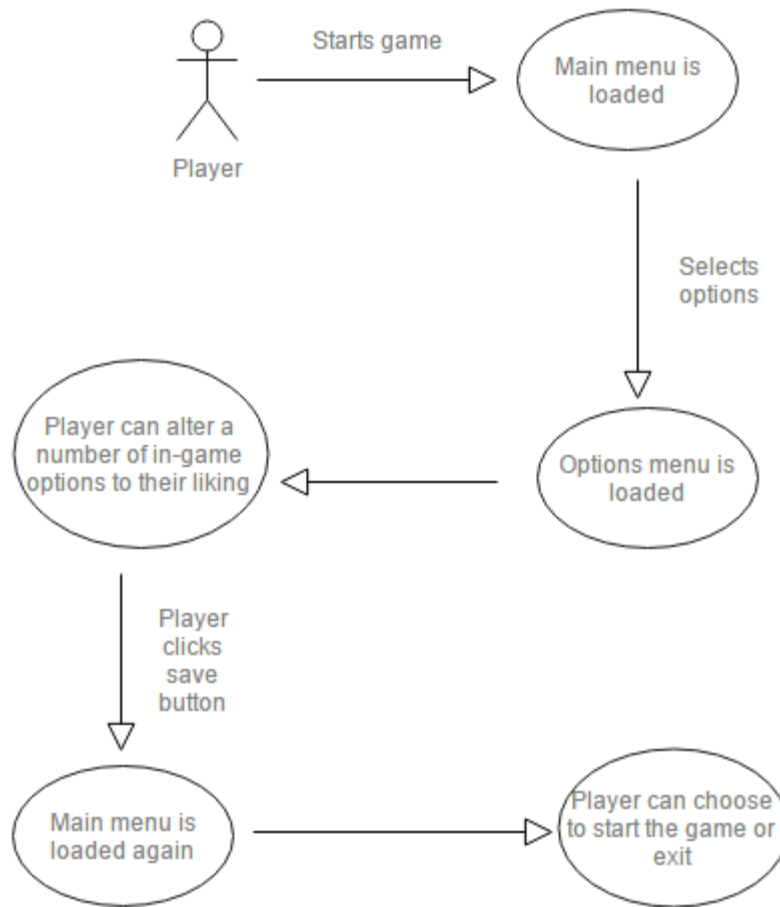
Scope

The scope of this use case is to allow the player to change in-game options as needed to their own liking.

Description

This use case describes the process of changing the settings in the game, such as audio and graphic settings.

Use Case Diagram



Flow Description

Precondition

The game is available on the machine and game is open on main menu.

Activation

This use case starts when the player clicks “Options” on the main menu which is loaded upon initialization of the game or in the pause menu.

Main flow

1. The game is initialized
2. The main menu is loaded
3. Options is selected by the player
4. Options are modified and saved

5. Main menu is loaded again

Alternate flow

1. The game is initialized
2. The main menu is loaded
3. Player loads into game from new game or load game
4. Player pauses the game to bring up pause menu
5. Options is selected by the player
6. Options are modified and saved
7. Pause menu is loaded again

Exceptional flow

[No application]

Termination

The game is closed through the main menu or pause menu.

Post condition

The game is in waiting state.

3.1.7 Requirement 5: Pause game

3.1.7.1 Description & Priority

The player pauses the ongoing game.

3.1.7.2 Use Case

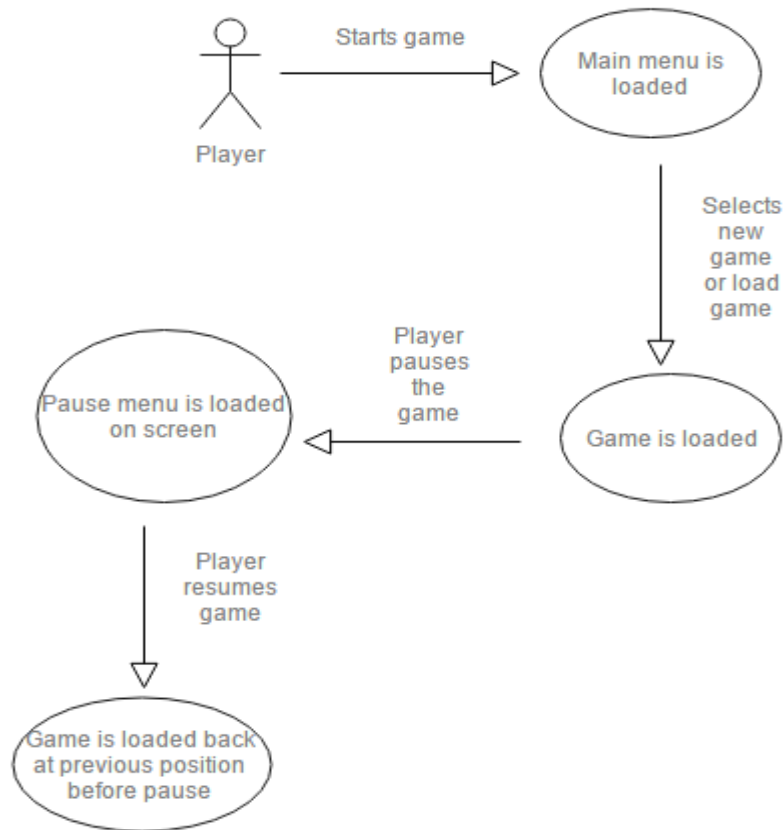
Scope

The scope of this use case is to allow the player to pause the game while they are playing.

Description

This use case describes the process of pausing the game while the game is ongoing.

Use Case Diagram



Flow Description

Precondition

The game is available on the machine and game session is already running, the player playing the game.

Activation

This use case starts when the player clicks the pause button while playing the game.

Main flow

1. The game is initialized
2. The player is loaded into the in-game environment
3. Player presses pause button

4. Pause menu is loaded
5. Player resumes game
6. Game is loaded back

Alternate flow

[No application]

Exceptional flow

[No application]

Termination

The pause menu is closed and game is resumed.

Post condition

The game is in an ongoing state.

3.1.8 Requirement 6: Exit game

3.1.8.1 Description & Priority

The player exits the game.

3.1.8.2 Use Case

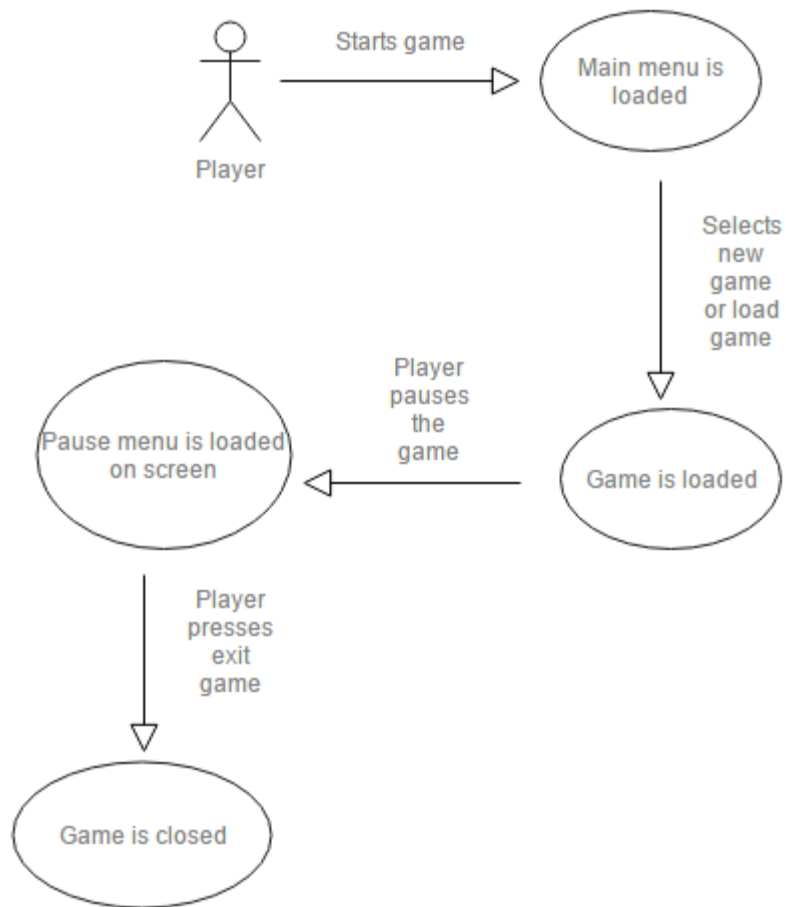
Scope

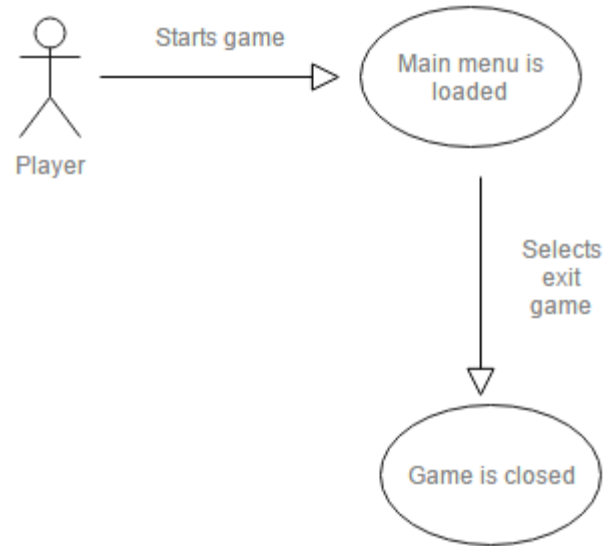
The scope of this use case is to allow the player to exit the game.

Description

This use case describes the process of exiting the game.

Use Case Diagram





Flow Description

Precondition

The game is available on the machine and game session is already running.

Activation

This use case starts when the player clicks the pause button while playing the game and presses exit game or presses exit game on the main menu

Main flow

1. The game is initialized
2. The player is loaded into the in-game environment
3. Player presses pause button
4. Pause menu is loaded
5. Player presses exit game
6. Game is closed

Alternate flow

1. The game is initialized
2. The main menu is loaded
3. Player presses exit game
4. Game is closed

Exceptional flow

[No application]

Termination

When exit game is selected

Post condition

The game is closed and inactive.

3.1.9 Requirement 7: Play game (Interaction with objects)

3.1.9.1 Description & Priority

The player is able to interact with certain objects from within the game.

3.1.9.2 Use Case

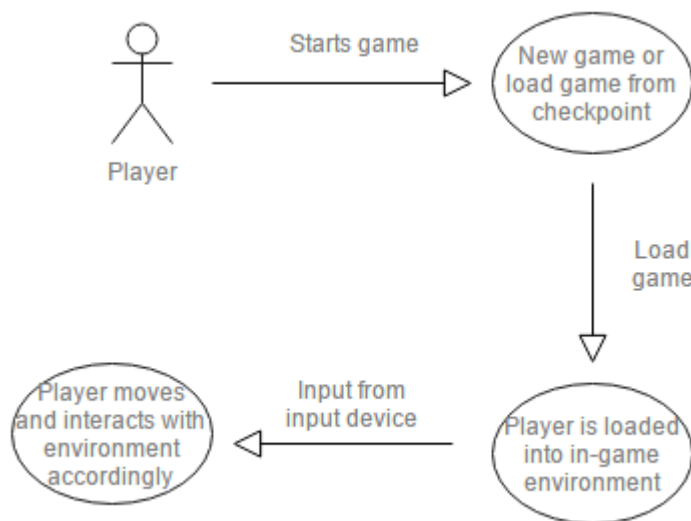
Scope

The scope of this use case is to allow the player to interact with different items within the game.

Description

This use case describes the process of interacting with objects from within the game.

Use Case Diagram



Flow Description

Precondition

The game is available on the machine and game session is already running, the player playing the game.

Activation

This use case starts when the player is in-game and the player finds an object which they can interact with.

Main flow

1. The game is initialized
2. The player is loaded into the in-game environment
3. The user finds an object in-game which they can interact with
4. Game allows user to interact with the object
5. Player resumes game
6. Game is loaded back

Alternate flow

[No application]

Exceptional flow

[No application]

Termination

Item is interacted with and process is ended.

Post condition

The game is in an ongoing state.

3.2 Non-Functional Requirements

3.2.1 Performance/Response time requirement

1. The game should not take longer than 1 minute to boot
2. The game should not take longer than 1 minute to load a game
3. The game should not take longer than 30 seconds to start a new session

3.2.2 Availability requirement

1. The game will be available to PC devices which run windows.
2. The game should be available anytime to the user once it is installed on the device.

3.2.3 Recover requirement

1. The game should be able to load from a previous checkpoint if the game does crash as a recovery option.

3.2.4 Security requirement

1. The game must not hold or keep any personal data of the user.
2. The game runs without internet connection and runs as a standalone application.

3.2.5 Reliability requirement

1. Running on Unreal Engine 4, the game should be able to run on most average PCs. It can be run anytime even without internet connection.

3.2.6 Portability requirement

1. Porting the game to other operating systems is possible but for now it will be aimed towards windows only.

3.2.7 User requirements

- The user must have a controller or mouse and keyboard to play the game.
- The user must have the game installed on their desktop.
- The user must have a VR device if they wish to utilize it. (Optional)
- The user must have a game controller such as an Xbox one. (Optional)
- The user must have a PC to run it on.

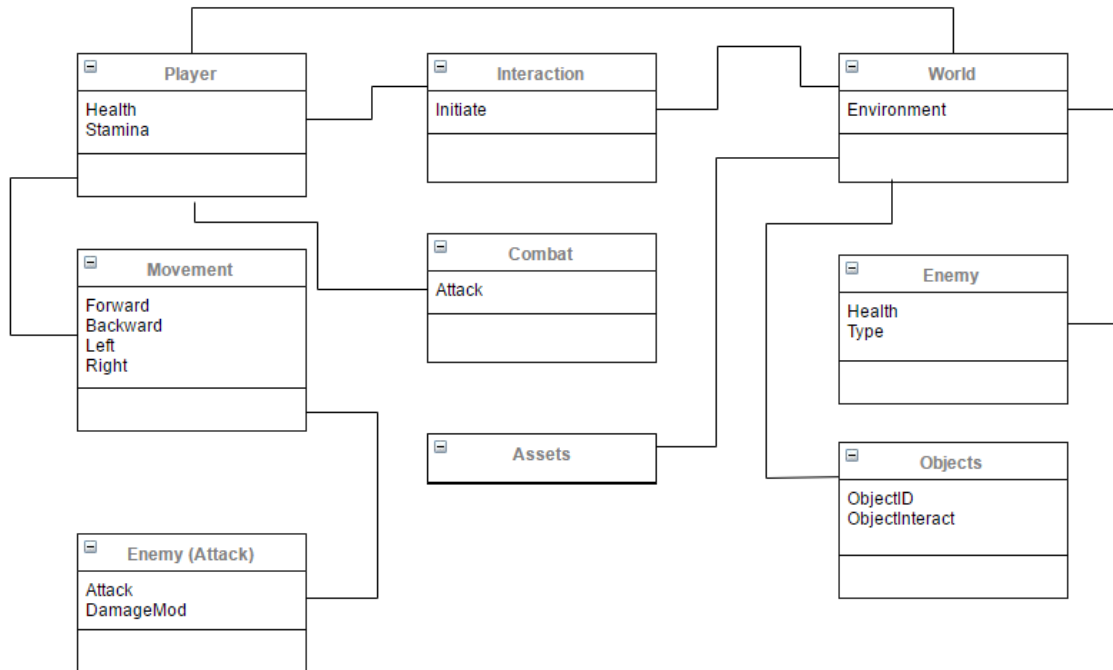
Some minimal requirements for the user and their machine to run the game are:

- Operating system: At least windows 7
- Ram: 4GB – 6GB
- Graphics card: AMD HD 6870 or higher / NVidia GeForce GTX 470 or higher
- CPU: Intel Dual Core or AMD at least

For optimal running of the game:

- Operating system: At least windows 7
- Ram: 4GB – 8GB
- CPU: Quad-Core AMD / Intel i5 – i7
- Graphics card: NVidia 970m upwards (laptop) or 760 for desktop

3.3 Design and Architecture



World assets include textures and such for objects and enemies. Players will be able to interact with the world and the objects that exist in the game world. This also includes enemies.

3.4 Implementation

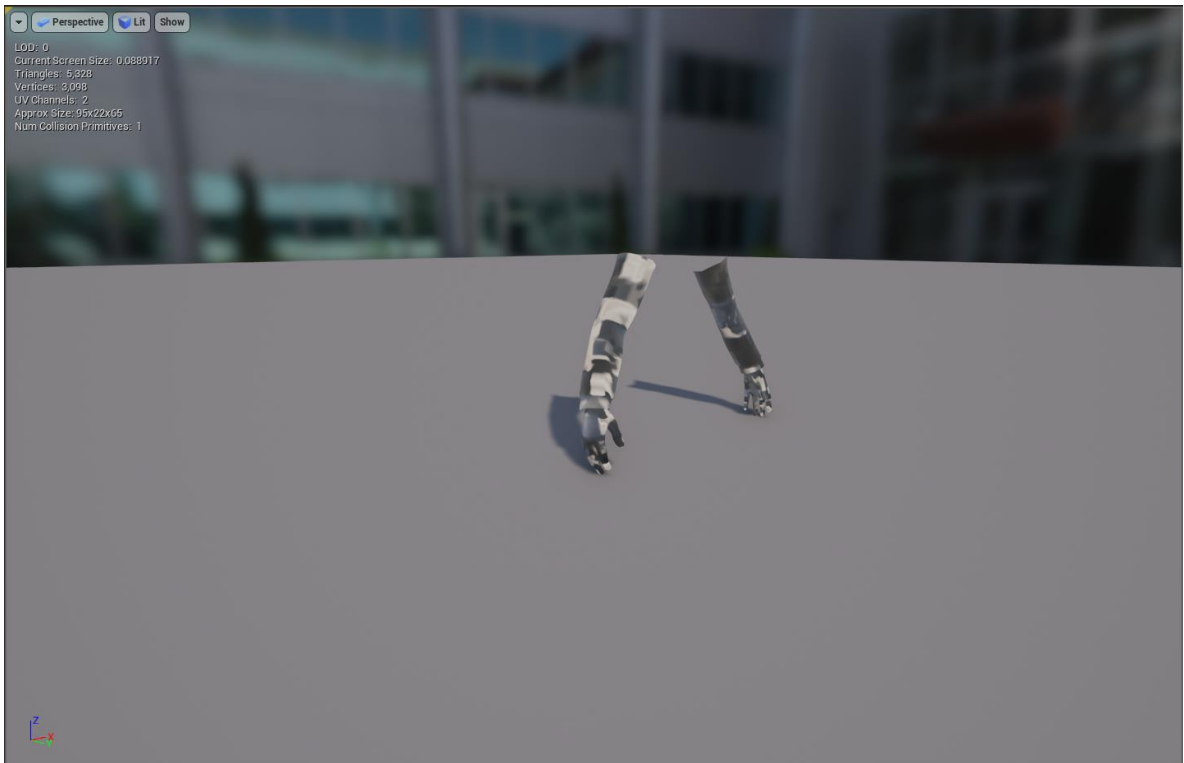
Environment – Map

The maps itself is meant to be open and quite free. A main part of the game is to allow the player to explore the areas and find puzzles and secrets while uncovering more about the story itself. Some areas will be lightly guided for the player's convenience but the player usually has a choice in the matter of following the provided guidance or not within game. The map will be quite open, not too restricting as it is to promote the sense of adventure and to have the player explore the map themselves.



Game – Character

The character will be put into a first person perspective. This means that it will be as if the player is looking through the eyes of the character. The camera will be propped to the models head. This allows the player to again feel more immersed into the game. The model itself comprises of only arms as this requires less resources and only the arms are seen 90% of the time in a first-person view within the game.



The arms were created in Maya 2016/2017 versions. The textures were created through Photoshop and rigging were also done in Maya as Maya has an Unreal Engine plugin for rigging for the engine itself.

3.4.1 Models Implementation

For the creation of the game I have made models and props to be used in game.

The technology used in this process are:

- Autodesk Maya
 - Maya Bonus Tools Plugin 2014 - 2017
 - Unreal Engine Plugin for Maya
- Autodesk MudBox
- Adobe Photoshop
 - OrangeBox Plugin – Seamless Textures Creation
 - NVIDIA texture tools Plugin
- Blender
- Unreal Engine 4

Preparation

For the preparation phase I made sure to have references of objects that I would like or want to model for use within the game. Some of the images would later possibly be used as actual in-game textures for materials applied to meshes.

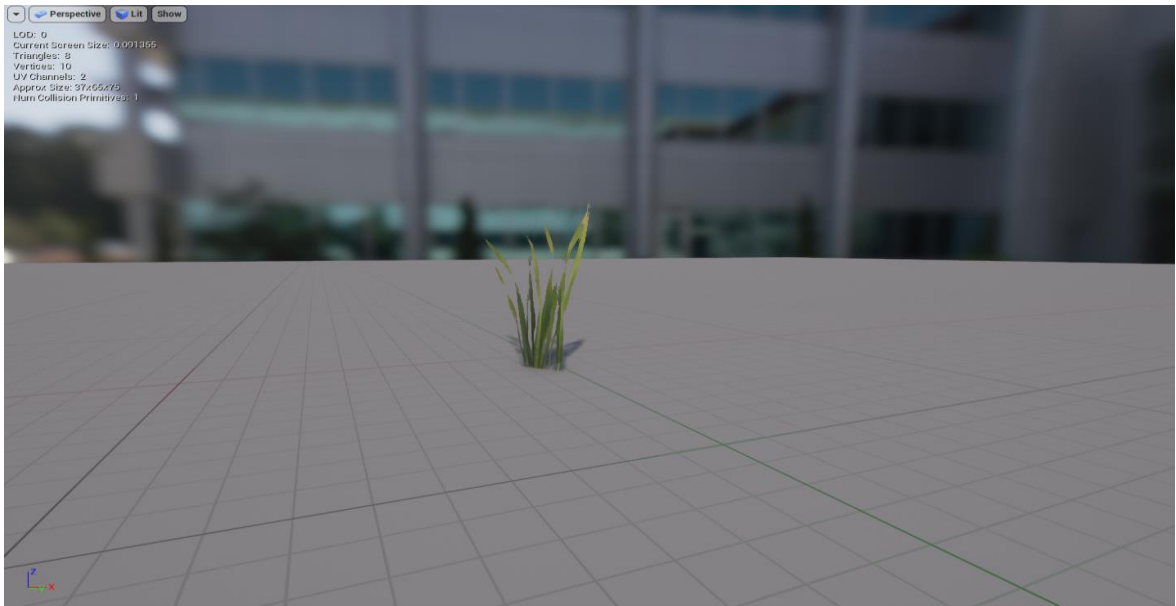


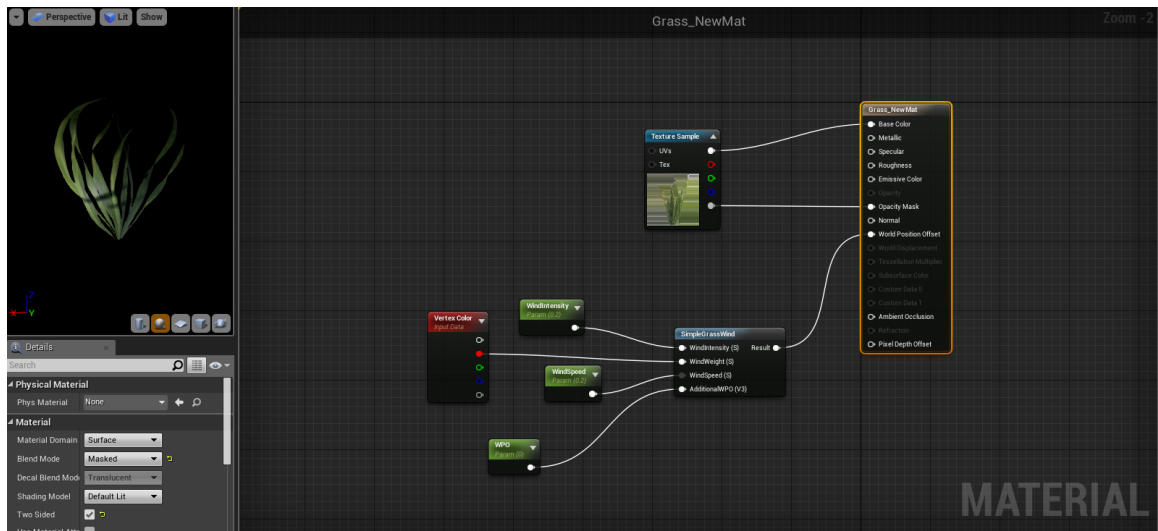




Above are some of the examples of the items I took pictures of to create foliage that I would require to make the jungle/forest area for my game.

The grass picture from earlier in this case was directly used in-game after preparations made through Adobe Photoshop and converting the image into a .png file and making it a diffuse type texture to be used for in-game material.





The flower and dead leaves are also used in-game for materials and the leaf on stem are used on some fern type plants. All textures were also made through the assistance of Photoshop along with OrangeBox plugin for Adobe Photoshop and MudBox/Maya 2016 – 2017 for alpha files and normal maps for material textures.

The idea for me is to create models which are low poly since I work on a laptop and low poly meshes will require less resources but to retain detail on the models too. To do this I make use of normal maps for textures and making the materials that are applied onto the mesh.

Previously I wanted to try out Photogrammetry techniques but after some research and advice it seems that it would be too time consuming and with the restricted time I have to work on the project I decided not to delve too much into that.

Plants and Trees

Leafed Plant



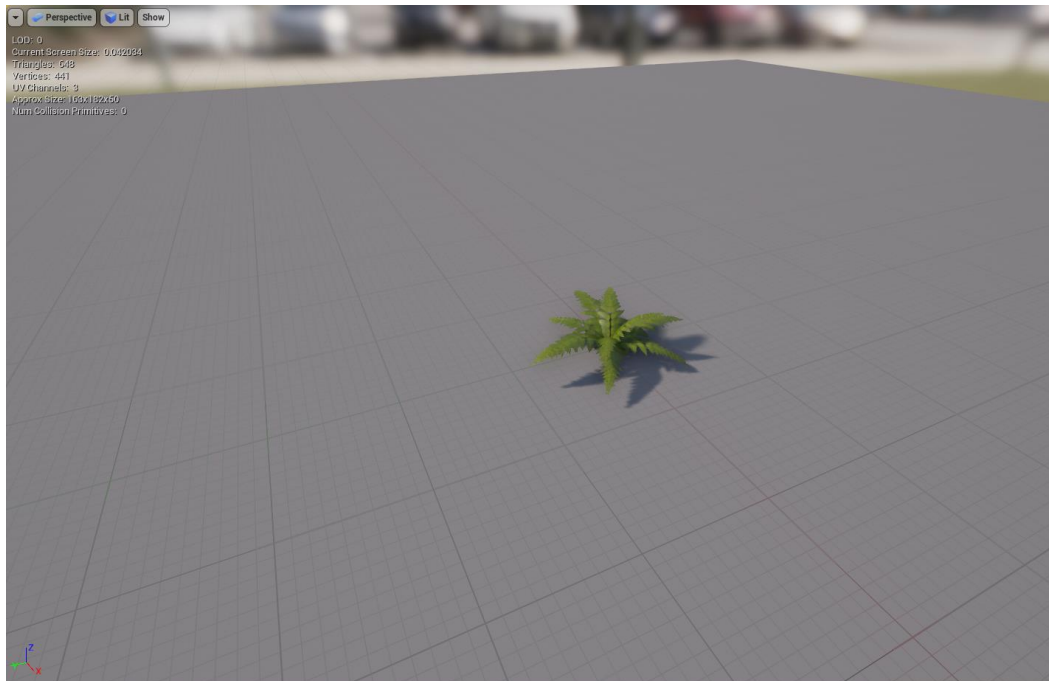
Jungle Tree



Fern (A)



Fern (1)



Fern (2)



Palm (1)



Palm (2)



Palm (3)

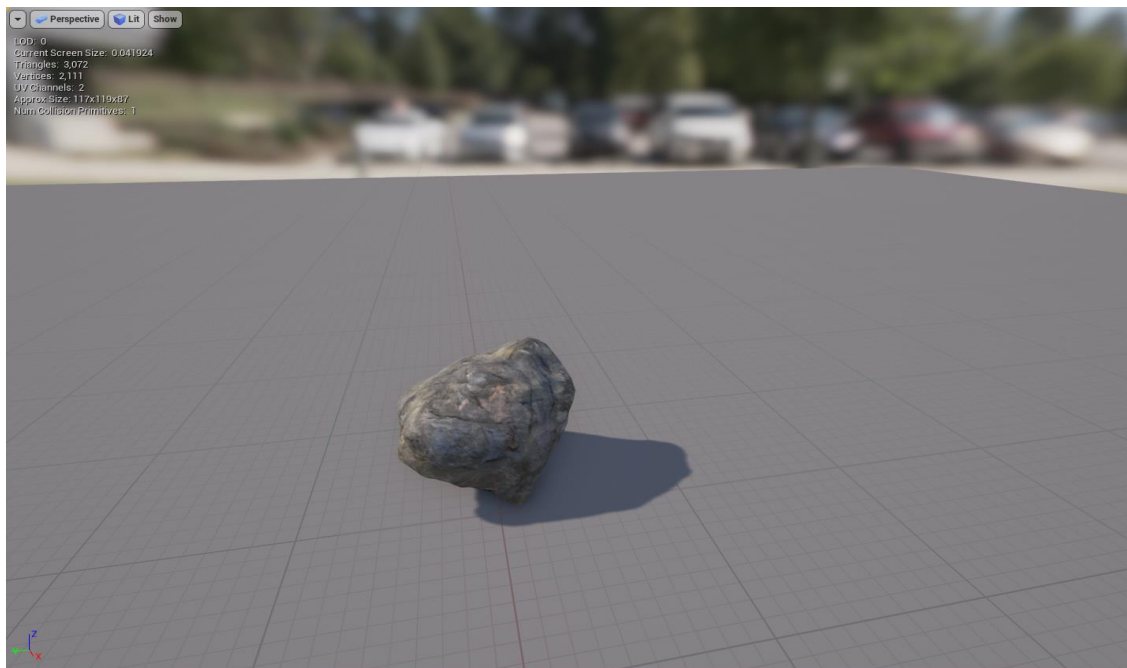


Palm (4)

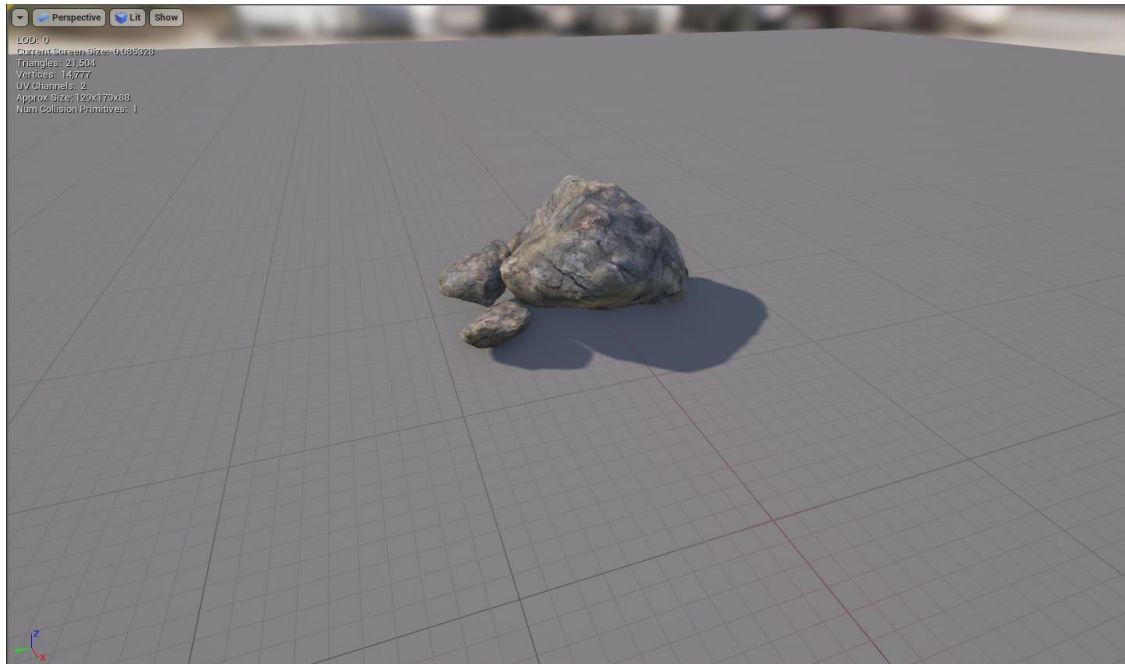


Rocks

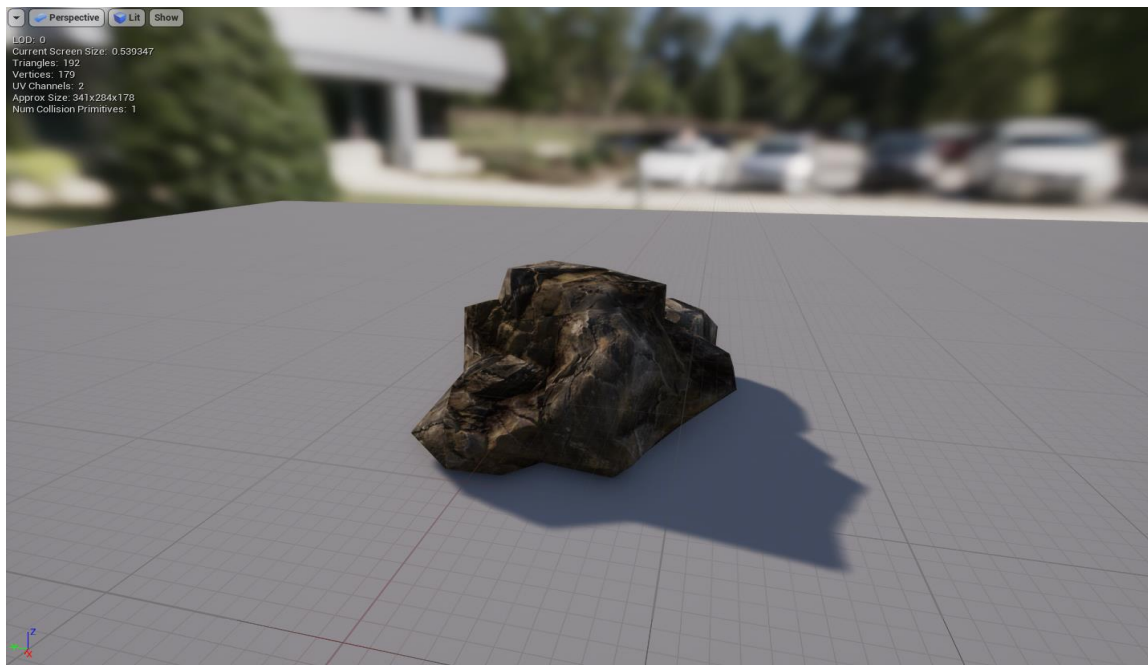
Rock (1)



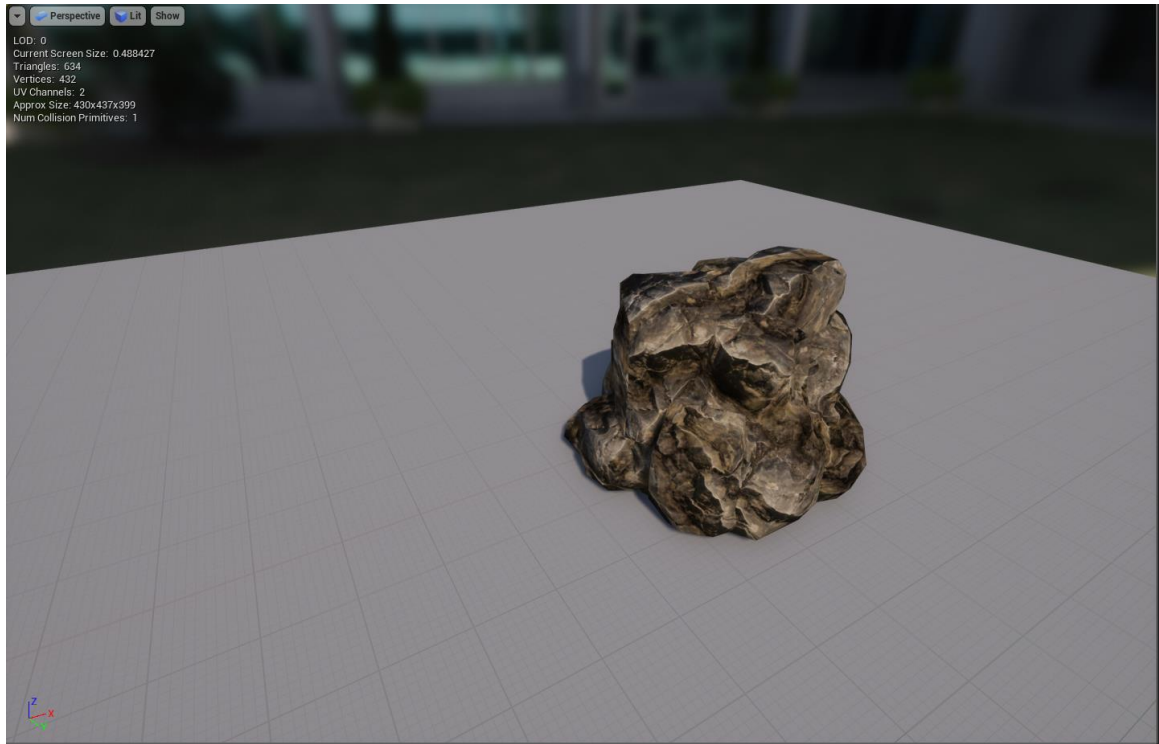
Rock (2)



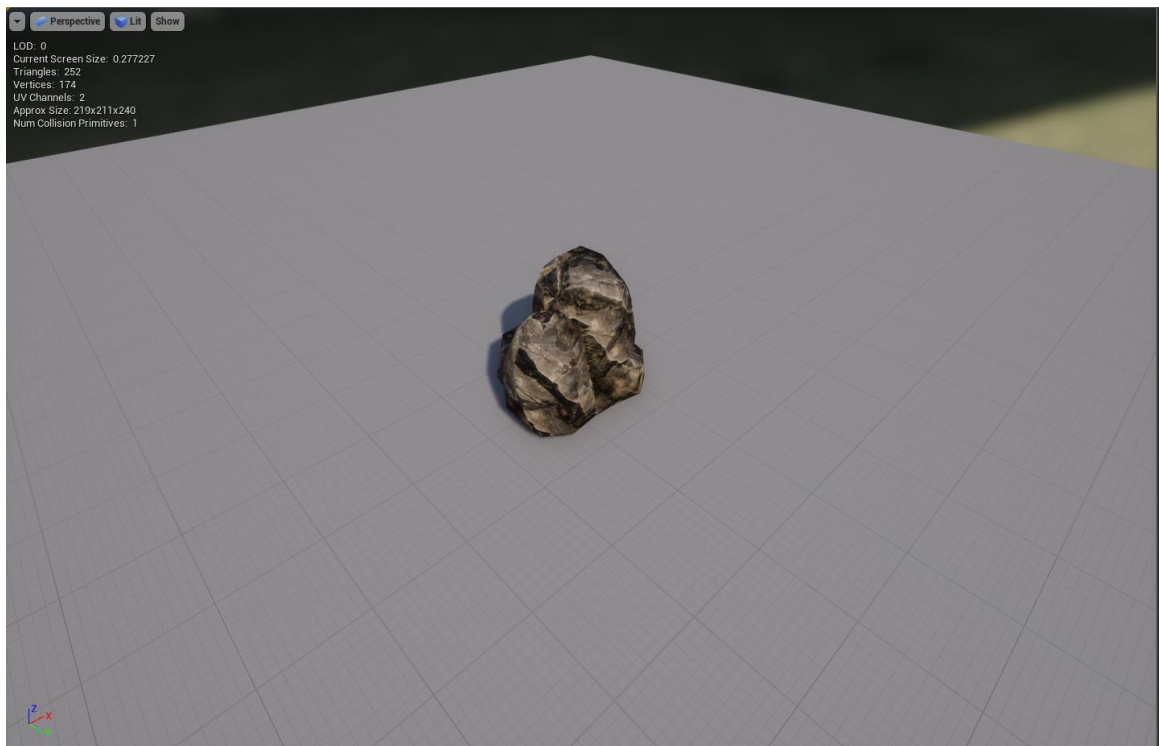
Rock (3)



Rock (4)

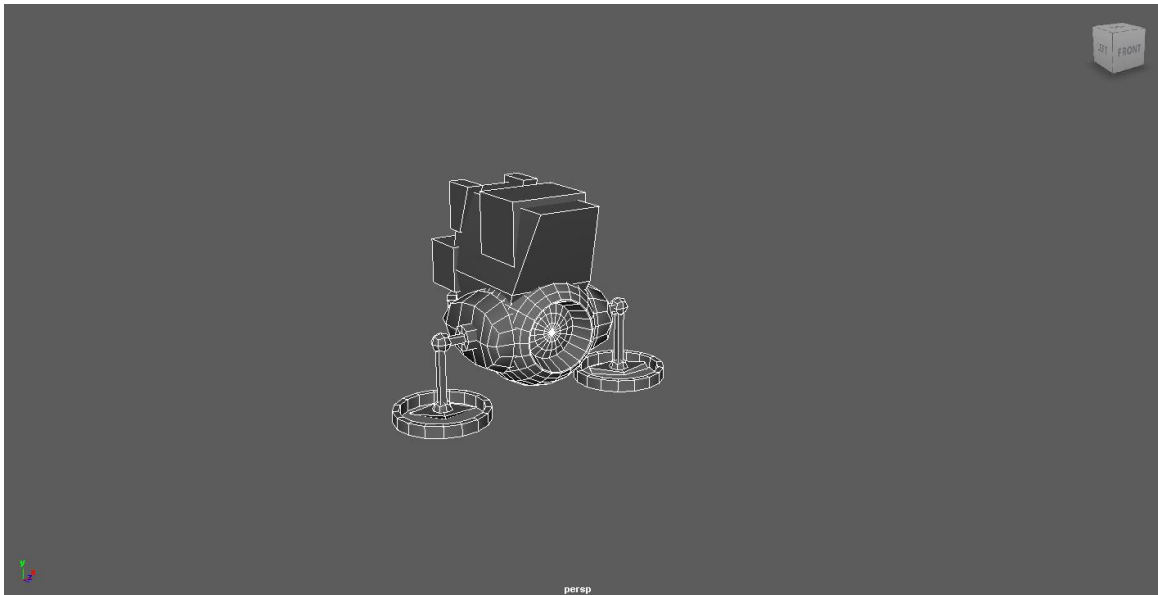


Rock (5)

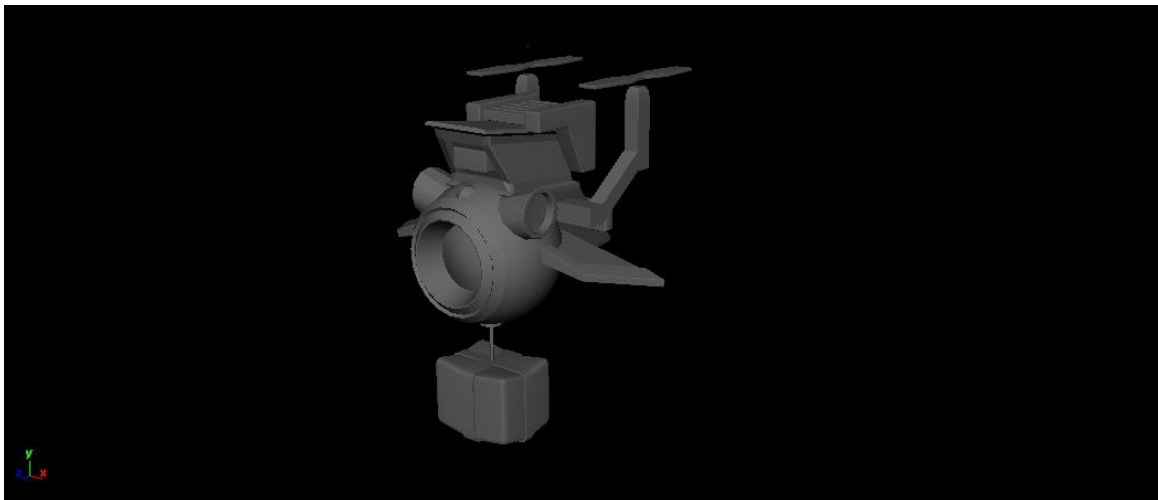


Enemy Model

Early Phase



Later Phase and design changes



Animations of the enemy were also done within Maya.

Labyrinth Model



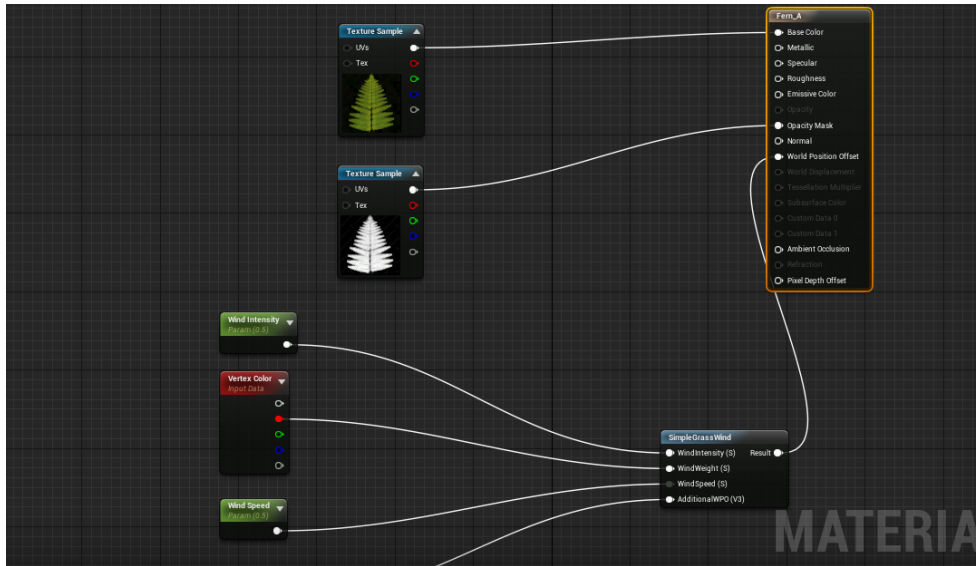
This is to be used in-game at a later stage of the level where the player must find their way to the middle without having their health depleted to 0 first by the enemies lurking within the labyrinth. This was created by getting a black and white image of a labyrinth in .svg format and porting it into Autodesk Maya. In Maya I then extruded it and then applied collision before saving it as an .fbx file and importing it into Unreal Engine 4 to use.

Animations – Environment

For the animations of the environment objects such as trees and plants I applied wind to the materials used on the meshes. Wind holds parameters of wind intensity, speed and the object weight. For smooth and controlled animations, it is important to get the object weight correct or else the full texture would be effected by the wind when you do not want it to. For example, we do not want the grass to dance wildly from top to bottom.

To avoid this problem, vertex paint can be applied to the model in Maya beforehand. After this, when I imported the .fbx files from Maya into Unreal Engine

4 I made sure to keep the vertex paint from Maya when given the option at import. In the blueprint for the grass or any model that has vertex paint applied, I just used a vertex paint node to be attached to the object weight. This means that the areas with vertex paint are not affected by the wind effects at all.



3.4.2 Enemy Implementation

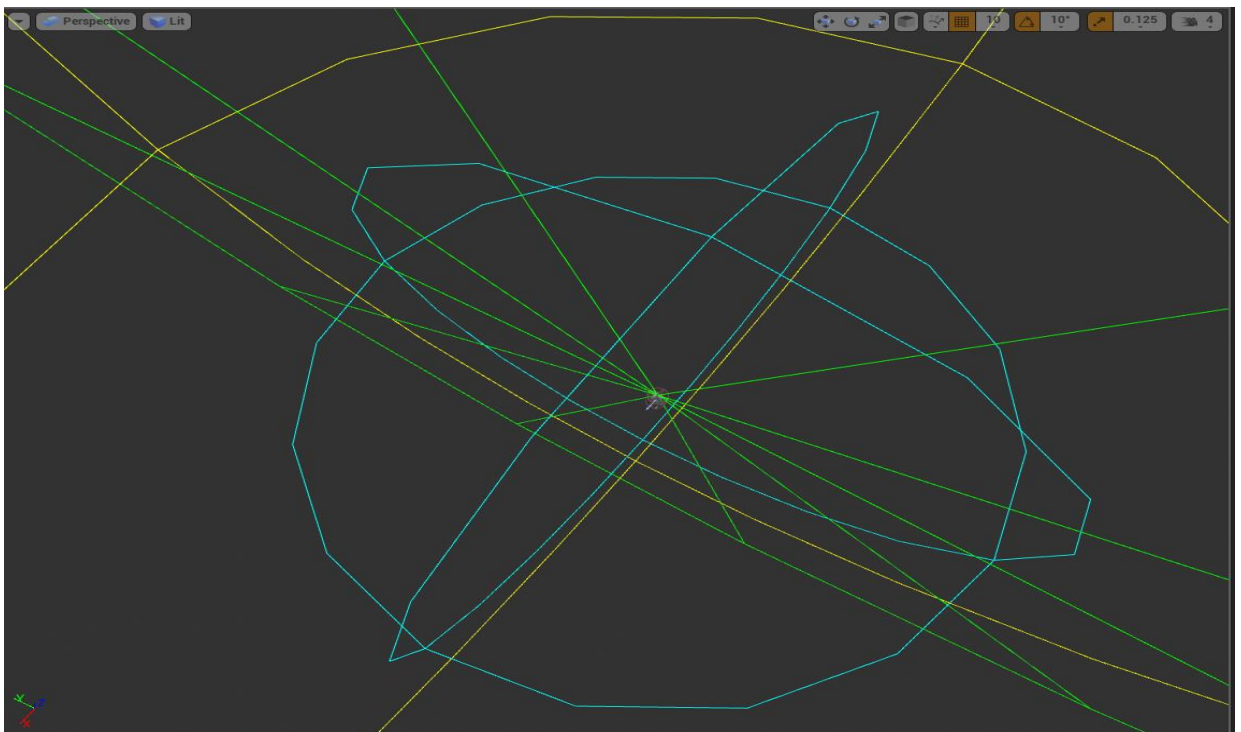


The idea behind the enemy is that the enemy will fly towards the player and explode to deal damage to the player. The player is able to withstand ten total hits before it is game over.

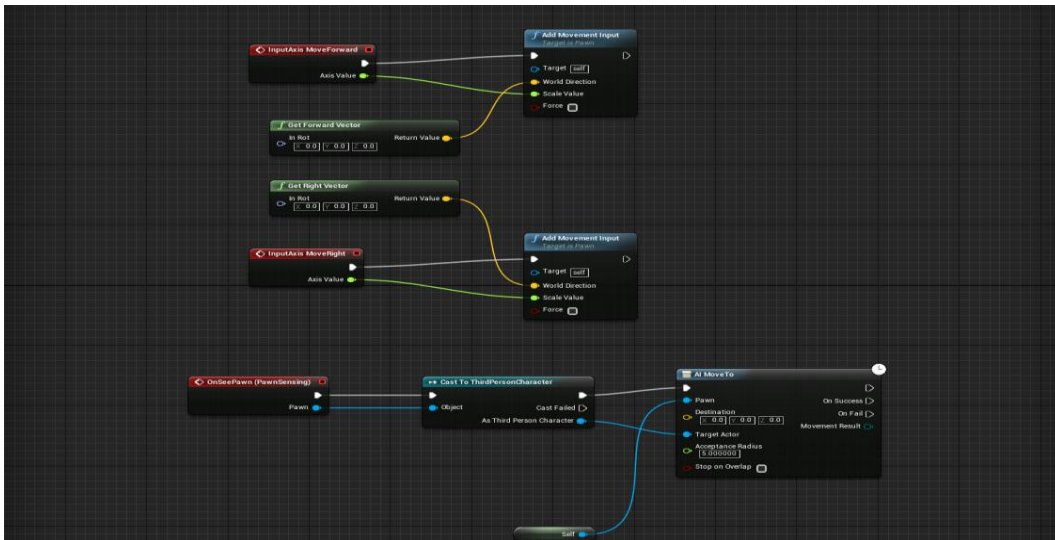
The design idea behind the enemy is that it is a droid of sorts that carries an explosive package. To counteract and prevent taking damage, the player must use their gun and shoot these enemies down before they get too close. In the beginning of the game it is not too hard but as the player progresses more and more will be targeting the player all at the same time, making it more difficult and requires faster shooting and reaction from the player.

The player has the choice of either following the main open path or venture into the denser forest areas to explore. While following the path is safer as there is more open space and time to react to enemies, if the player chooses to explore in the denser areas of the map they could potentially be ambushed by these enemies and because of the dense and tight locations the player will have a harder time surviving. It is important to note that it is not impossible to survive if the player chooses to take the more difficult route though.

These enemies are also found within the labyrinth area once the player finds the entrance to the labyrinth. They lurk and hide in dead ends of the labyrinth and will not hesitate in attacking the player once the player is detected.

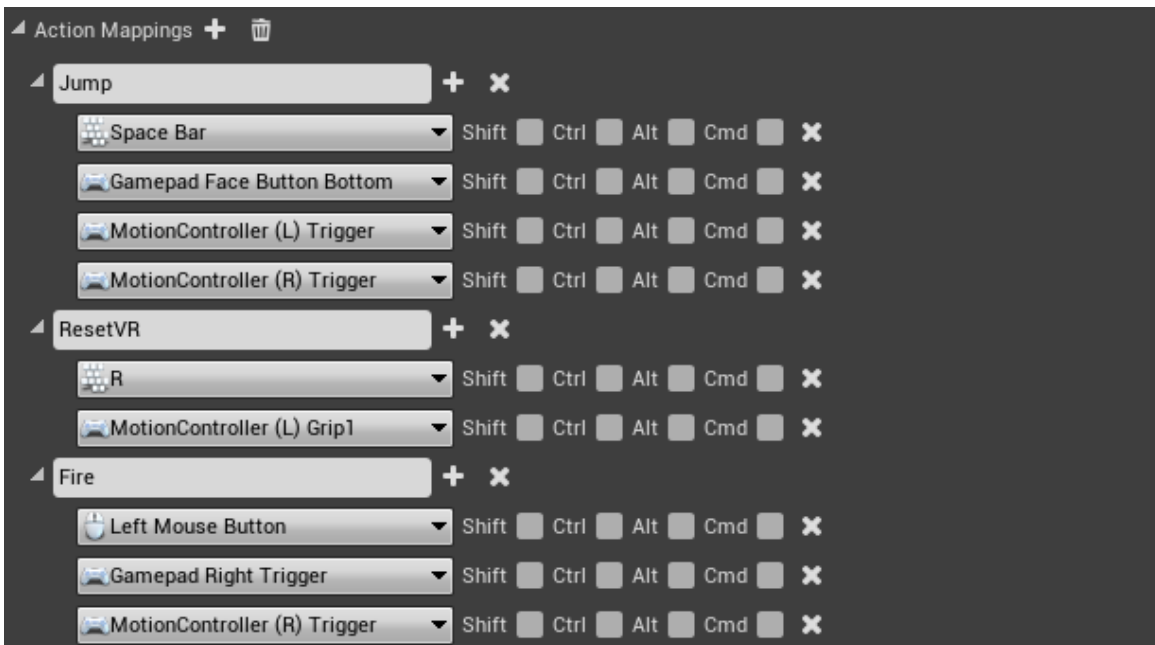


If the player is in the range of detection applied to the enemy AI, then they will move towards the player to attack.

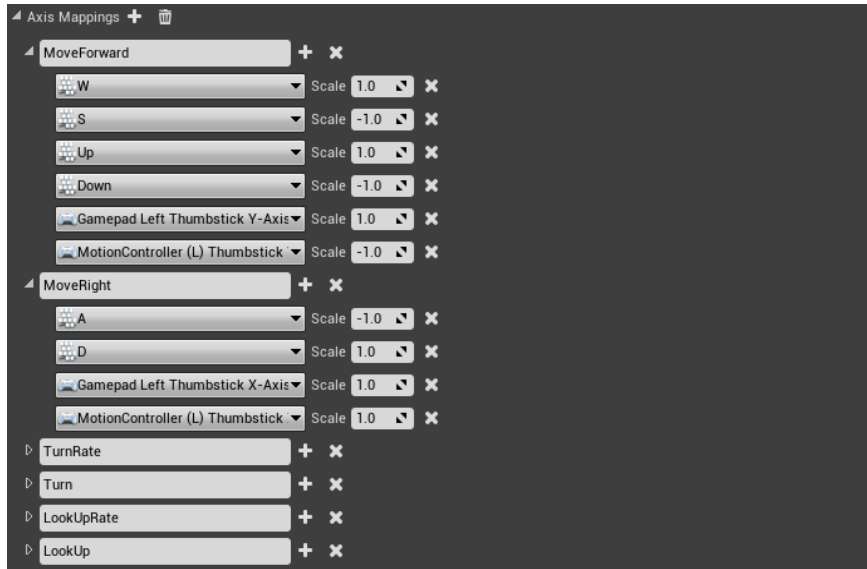


Detection blueprint and move towards target.

3.4.3 Movement Implementation



Movements are linked to input types and set to certain inputs from valid devices in the action mappings and input settings inside the project. The above are the controls set up for jumping, firing the gun and resetting VR positioning.

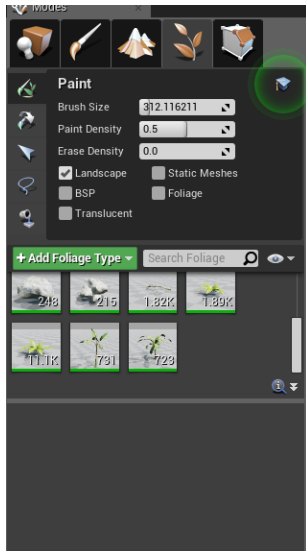


For actual movements like moving forward or moving to the right, the same idea applies in this scenario too.

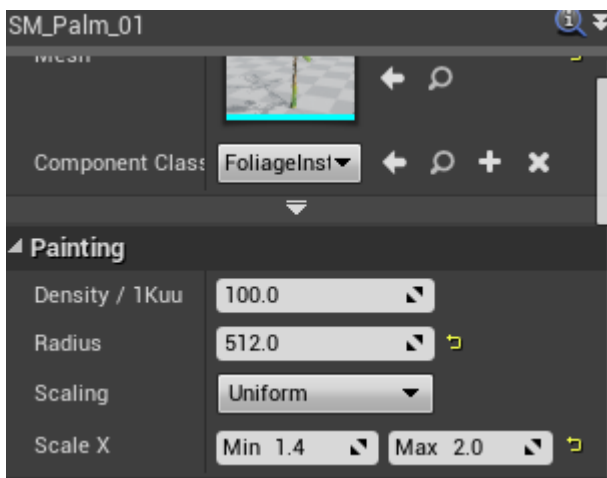
3.4.4 Paint Foliage – Implementation

For my game, I have some trees and plants of my own along with a few free assets and also some foliage from “Matt Geard Crane” whom I graciously donated to so that I can show my support.

With this, I put all the foliage I want to apply to my map into my foliage paint area.



The important thing to note is that each thing added in to be painted onto the landscape needs some settings applied to them first. For example, from a single tree we are able to get a variety of different ones of different sizes. This was done by changing the scale values of which the tree can be randomized as when painting onto the landscape.



The radius is also important so that there is no overpopulating of one type of tree in one small area. The scale has a min and max value in which the player can set so that different variations of the single tree can appear. I did this to all the things I painted onto my landscape and applied values which works well for what I wanted to achieve.



As seen above, the same rock and some ferns are coming out as different sizes of the original mesh which gives a feeling of variety to the landscape instead of having just one same size of everything as that would be unrealistic. This is how I achieved different height levels in areas and trees too for the jungle and forest feeling.

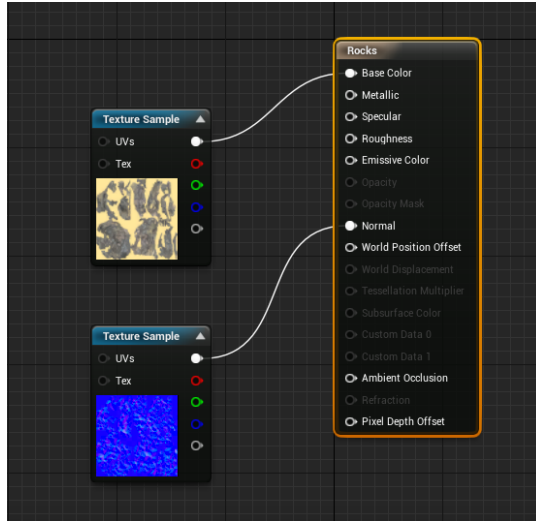
3.4.5 Making normal map for materials – Implementation

A normal map is what holds the detail of a texture without needing to have the large resource drain from an actual high-poly model. To make these I used the NVIDIA texture tools plugin for Adobe Photoshop.

The steps I would take are:

- First get the image of the texture with high detail
- Convert the image to black and white

- Adjust the brightness levels to make a black and white image of the texture with as much high detail as possible
- Once that is done, go to “Filter” tab, then select NVIDIA tool and then select “Normal”.
- On the new window select based on height



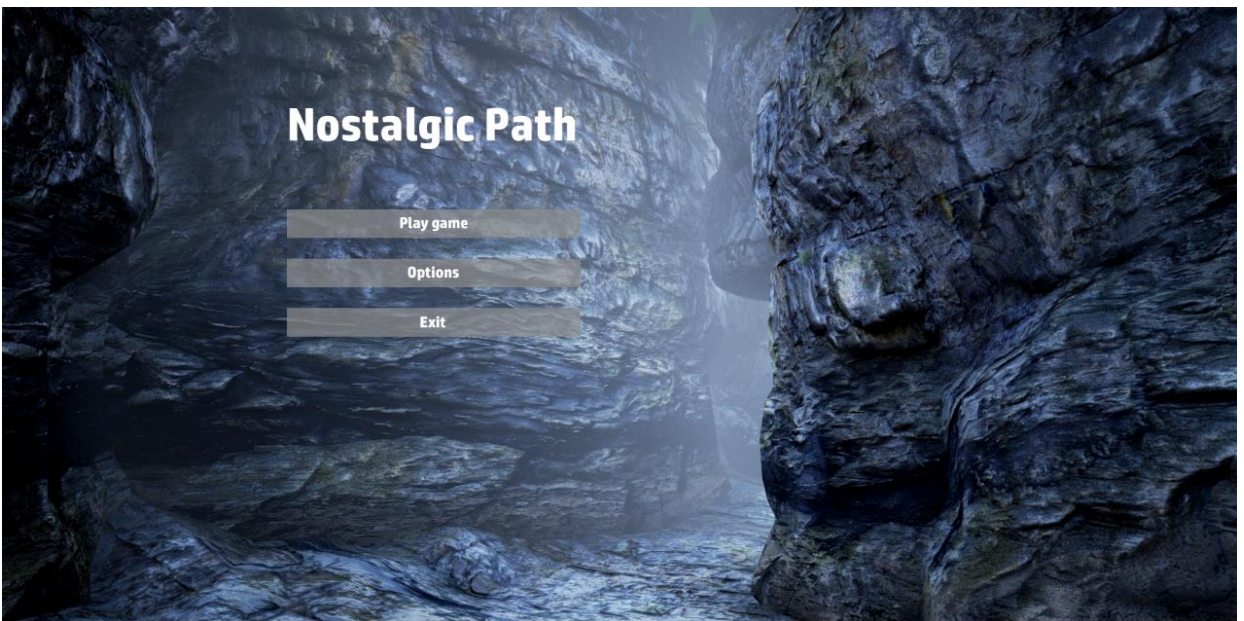
I then use the normal alongside the main texture or diffuse when making the material for a specific model. The above example is for some of my rocks.

3.5 Graphical User Interface (GUI) Layout

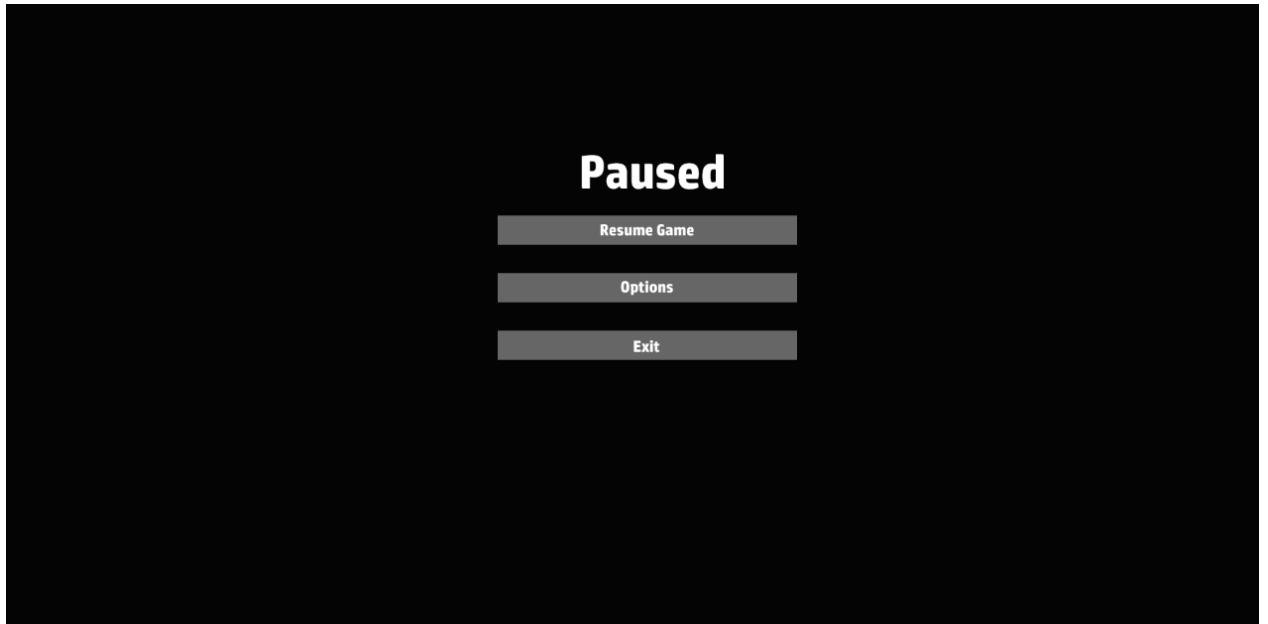


In game the player will be able to see how much health the character still has. The player is able to take ten damage before the character dies and the game ends.

Title Screen



Pause Menu



Pause menu is simple and allows the player to:

- Resume back to the game
- Change options
- Exit the game

3.6 Development Testing

Usability Testing

The early testing survey was done before the prototype was ready. This was used to get a grasp of what people and target audience wanted and preferred.

Early Testing:

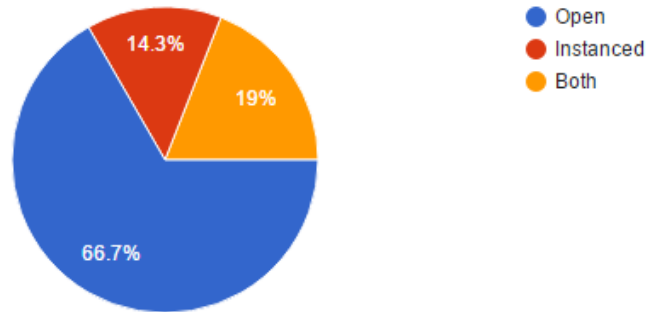
The questions for the early test survey were:

- 1) Do you prefer a big open map in which you can roam or small instanced maps?
 - a. Open
 - b. Instanced
 - c. Both
- 2) Do you prefer a casual or hardcore gameplay?
 - a. Casual
 - b. Hardcore
 - c. Balance of both
- 3) Do you prefer first-person view or third-person view in a game?
 - a. First-person
 - b. Third-person
- 4) Does virtual reality intrigue you?
 - a. Yes
 - b. No

Results for Early Testing survey

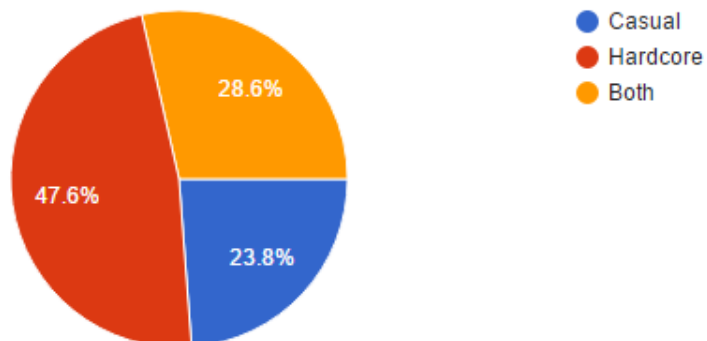
1) Do you prefer a big open map in which you can roam or small instanced maps?

21 responses



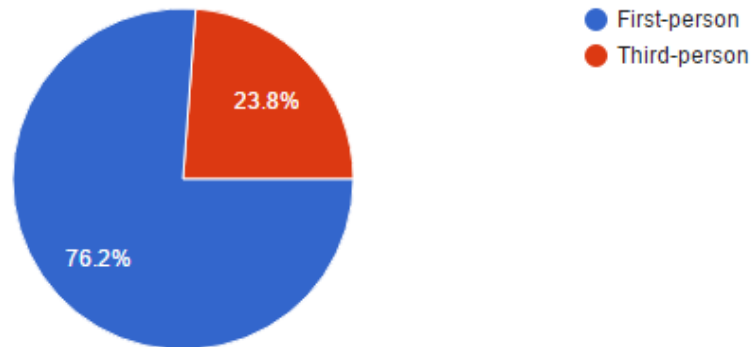
2) Do you prefer a casual or hardcore gameplay?

21 responses



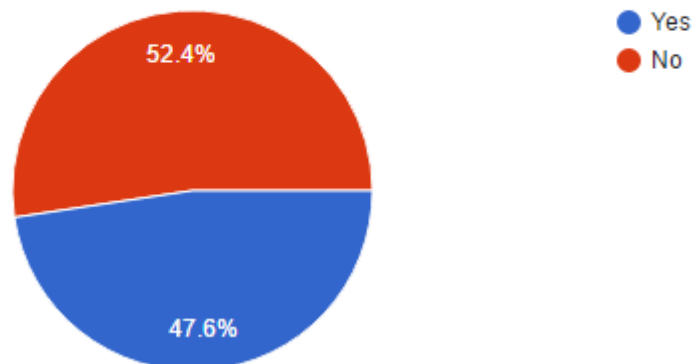
3) Do you prefer first-person view or third-person view in a game?

21 responses



4) Does virtual reality intrigue you?

21 responses



From the following responses I was able to identify that:

- Most people prefer the freedom of an open world over instanced based
- Most people prefer hardcore gameplay or a mix of both
- Most people prefer first-person view
- It is a split between the interest of virtual reality

3.7 Customer and prototype testing

After allowing a few people to play the first rough prototype, a think aloud test was carried out. Three participants took part in this test phase. The participants were asked questions throughout the prototype testing phase.

“What is your impression of the open map?”

Participant One: “The map is vast and not too limiting, it gives a good feeling of exploring and stuff.”

Participant Two: “I feel a bit overwhelmed, I don’t know what I am doing”

Participant Three: “It’s cool, I like it. I feel pretty free.”

“Do you think this is challenging?”

Participant One: “It’s pretty alright, I haven’t died yet so”.

Participant Two: “It’s kind of a bit hard, don’t you think?”

Participant Three: “I think its fine how it is, maybe a nudge higher in difficulty though wouldn’t be so bad”.

“Do you like the theme and look of the area?”

Participant One: “Yeah, it looks nice but the frames are a bit low”.

Participant Two: “It is okay but I think it can be improved on”.

Participant Three: “The lighting is a bit jittery at times but other than that, I think it is fine”.

“Are the controls to your liking?”

Participant One: “Yeah, the controls are fine, I’m pretty used to these controls”.

Participant Two: “These are pretty generic controls”.

Participant Three: “Yeah, it’s grand enough”.

Results of the prototype testing

Most people found the open map to give a good vibe when playing the game. One participant felt it was a bit overwhelming. The difficulty is okay but it seems that I need to increase the difficulty a bit more. The theme and look of the area seems to be okay for most people. The controls also seem fine and it is to most people's liking.

Afterwards I asked the participants to rate some aspects of the game out of 5 in person. Here are the recorded results.

“How would you rate the area visually out of 5?”

Participant 1: 3

Participant 2: 4

Participant 3: 3

“How would you rate your enjoyment of the game out of 5?”

Participant 1: 3

Participant 2: 4

Participant 3: 3

“How would you rate the controls out of 5?”

Participant 1: 4

Participant 2: 4

Participant 3: 4

“How would you rate the combat out of 5?”

Participant 1: 3

Participant 2: 4

Participant 3: 4

“How would you rate the difficulty out of 5?”

Participant 1: 3

Participant 2: 5

Participant 3: 4

Results of rating test:

Everyone found everything to be either average or above average.

3.8 Unit Testing

For unit-testing I basically took out functions and aspects from my main project and imported them to my second laptop to test the functions on. If they work with no errors on my second machine with test cases achieved then it is fine to use.

AI Test:

Imported AI blueprints into second machine to test.

Test was successful – AI detected player actor and attacked.

Movement of AI was successful.

Explosion of AI was successful.

Combat and movement Test:

Imported Main Character Actor and blueprints into second machine to test.

Movement was successful.

Firing weapon was successful.

Damaging AI was successful.

Mesh Test:

Import Mesh of objects being used in main project into second machine to test.

Import was successful.

Population onto landscape was successful.

No graphical glitches or errors.

3.9 Final Survey

A final survey was given to testers at the end of the development stage for the prototype. After playing the latest prototype the participants answered the following questions in the survey:

“Are you satisfied with the end-product?”

“Would you play this game more in the future if it is expanded upon again?”

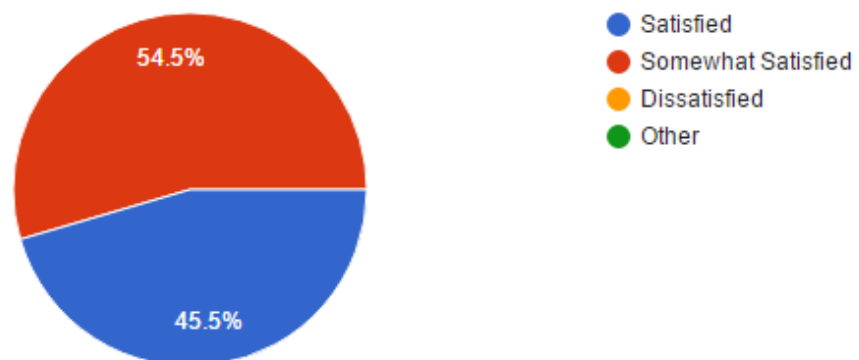
“Did you find it enjoyable to play?”

“Was the difficulty of the gameplay just right?”

The results are found below:

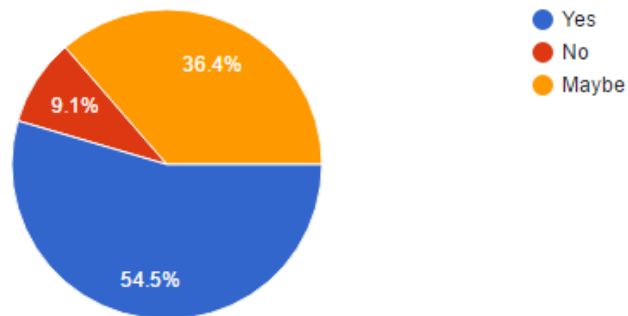
Are you satisfied with the end-product?

11 responses



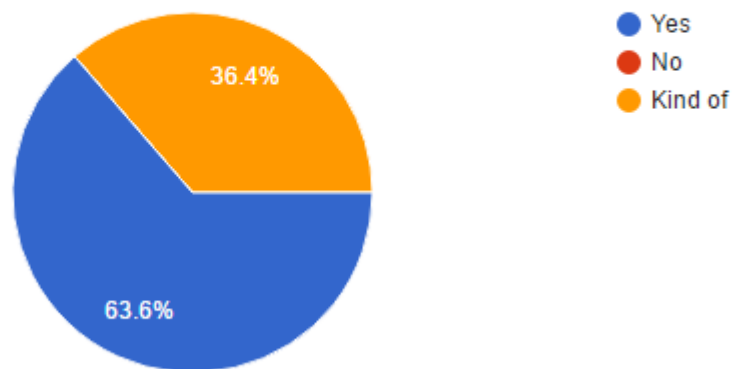
Would you play this game more in the future if it is expanded upon again?

11 responses



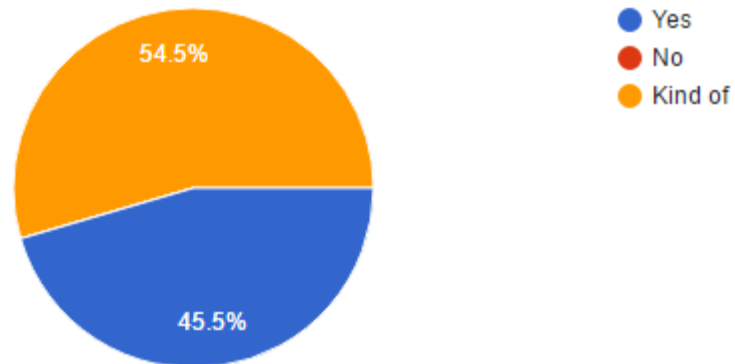
Did you find it enjoyable to play?"

11 responses



Was the difficulty of the gameplay just right?

11 responses



Result analysis:

Most people were somewhat satisfied with the end prototype and would like to play it again in the future with further expansions. Most people found it an enjoyable experience if not somewhat an enjoyable experience for them. The difficulty seems to be okay for the prototype.

4 Conclusions

The project itself is aiming to be a successful game, applying the popular genres and the some key aspects of what makes a game successful.

It also has the option to utilize Virtual Reality. The limitations are the time limit I have to complete this project and also the amount of time I can dedicate to this project. In this year, there is an extra module on top of what we were meant to have and there are many projects to keep up with. It is difficult to split our time evenly to so many tasks and I am not able to put as much time and effort into this as I would prefer.

Problems that arose:

There were a few hurdles in the learning of the technology I used. Making my own textures and normal maps for the models I created along with actually creating the models too and animating them. Rigging the arms were a little difficult but was achievable with the help of Maya and the Unreal Engine 4 plugin that is available to it.

There were also some personal problems too that arose for me as I had a lot of personal family problems this year of college which was basically just bad timing. My main work machine broke for a while too and I had to switch to my older machine to continue work on the project as my main machine was being fixed.

This also led to some problems as my older machine was not very capable of using the new rendering engine that was introduced in Maya 2017 called the “Arnold Engine”. To combat this, I had to go back to using Maya 2016 since that version still uses the Mentalray rendering engine which requires less resources and fits machines that do not have high end specs better.

5 Further and Future Development

There is more that can be done and that I want to do for this game. I will continue to work on it in my own free time.

5.1 AI Improvement and additions

There is more to do for different AI's and different enemies, perhaps a boss enemy too.

5.2 Virtual Reality

Due to time restraints and problems arisen, the VR implementation had to be postponed

5.3 Further textures – Lighting

More details in textures and lighting can be done. Currently I am using a laptop which isn't too powerful so I currently have limitations on what I can do, keeping in mind the frames per second of the game running on my machine.

5.4 Sound effects

More and better sounds effects can be added into the project

6 References

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YouTube. (2017). Unreal Engine 4 - AI Roam. [online] Available at: <https://www.youtube.com/watch?v=eBjtKsgurLU> [Accessed Nov. 2016].

YouTube. (2017). Unreal Engine 4 - Import from Blender and Maya. [online] Available at: <https://www.youtube.com/watch?v=dbtKN0bvqps&list=PLtpNaPTkjdL6mbqv1JArSa4Ns67sFz1S7> [Accessed Nov. 2016].

Some models and such were used from UE4 asset store along with my own models.

7 Appendix

7.1 Project Proposal

Objectives

The objective of the idea is to give the user a unique and enjoyable experience in this game. The game itself will be visually enjoyable, there will be a story to the game and much exploring.

As the player progresses and explores, they will understand what is happening more and more. Things will begin to make sense to the player and the environment will somewhat give the player a sense of security and calmness. There will possibly be voice overs or a narrative voice as the game progresses. This is to contribute to the storytelling aspect of the game.

The idea is to give the player a sense of security but as the game nears its end, things become darker and the story takes a more sinister approach. Things slowly seem less safe and calm and it slowly transitions into a darker theme much like a horror game.

The player will most likely have a way of defending themselves but a limited way as well. This is to make the player feel like there is a factor of risk at hand, even if they have a way of defending themselves from any danger found in the game.

This game will be a 3D game.

Background

Horror games have been popular over the years but due to a large amount of them, a lot of these games have lost their touch. Horror games began to get very popular in the early 2000's, blowing up through sites such as YouTube as people played them.

The current idea for the project is inspired from many different games, taking what was good from certain games and then expanding on those ideas.

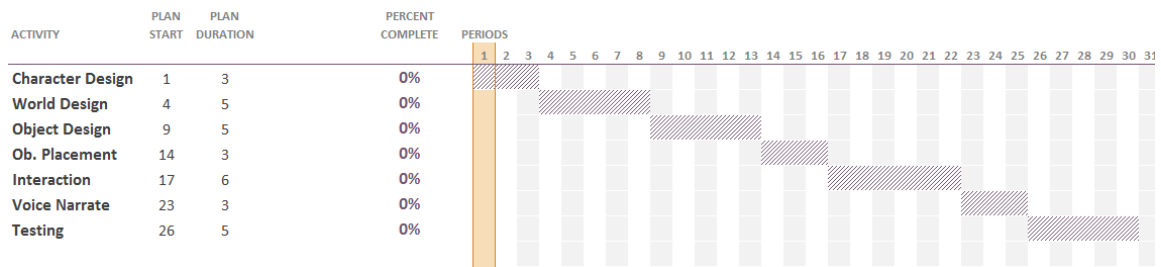
Technical Approach

The engine used will be Unreal Engine. Unreal Engine is a powerful engine and is visually very good.

Models will be used on Maya and also on MudBox.

There is also a possibility of implementing Virtual Reality to this game in the end.

Project Plan



Evaluation

The game will be tested in the end by a few users. Test cases will be made and after test cases have been complete the users may explore the game without any limitation to check for any bugs that may occur.

The game idea is simple and has a twist but it will take a good bit of work to make.

7.2 Monthly Journals

September

In the time frame of when we came back into college until now, we were basically preparing our ideas to be able to pitch to the lecturers.

For me it was not an easy process as I had a few ideas in my head that I have collected over the summer. The idea had to have a somewhat unique aspect that would make it stand out from other games that are already out there. It had to be something a bit fresher and not just a copy of an already existing game.

It was a difficult choice and in the end I had brought it down to two ideas that I really wanted to do as a project. It was either a 2D, in-depth side-scrolling game but it would be designed around an old-school classic J-RPG type. It was to show how a simple, old-school looking game could play with much depth of game systems and mechanics that exist today too. I decided on doing a 3D game in the end which will most likely be made on the Unreal Engine 4. I was debating to use this engine or not for a while but from how things look right now, it seems like I will be using Unreal Engine 4. The game idea is basically a psychological type of game which plays with the player's sense of security and calmness.

The game is based around giving the player a false sense of security, exploring a beautiful world that seems semi-harmless as the player advances and uncovers why they are there and what is actually happening slowly. In the end it will turn much darker and as time progresses the player will slowly see that things are not as they seem. At the end it will become a full-fledged horror in a sense, as the truth is uncovered.

I am considering a voice narration to the game. A calming voice which in a way gives the world a voice and kind of tells what is happening as the player plays the game and tells the story as the player progresses. The voice will follow the player

as they play and in the end when things get darker the voice will continue to describe things and the way it talks will become a little more sinister. This will really give the world life within the game too.

Currently I have pitched the idea to the lecturers and it seems they are quite on board with this idea. I am unsure if we will receive an email or not if our project idea are confirmed or should we just assume our ideas have been deemed okay if they did not say no to us. I was extremely happy that the lecturers seem to like my idea anyway. I was quite nervous beforehand but I knew what I wanted to do and what my ideas for the project was so I was ready to talk about it. It was more the idea of thinking they may have not liked my idea.

I have already been looking through tutorials and such for the Unreal Engine 4 to prepare. Another thing to note is that I have not used the Unreal Engine 4 much before, so this will be a good learning experience for me too and I am sure I will enjoy working with this engine and on this project.

I will most likely be using MudBox or Maya 3D for the creation of my 3D models and such, and potentially some environment objects as well.

October

Since the previous journal not a lot of development progress has been made. It has mostly been more planning and some character models design with some tutorials to practice with. It has been a little bit hectic the last week and a bit due to other CAs clashing and coming together near the same times.

I have further looked into some virtual reality stuff as I was browsing articles and videos on virtual reality anyway for my own self-interest. The idea of implementing my game with virtual reality in the end is still a thing and I have not given up on the idea. It is quite possible to achieve but the only problem is I do not actually own my own virtual reality headset of any sorts. This means I will have to borrow the DK Oculus Rift the college has to offer for us students to use. The DK version is a version of the Oculus Rift I don't fully like, as it is not as well optimized.

Character designing from scratch is quite difficult but mostly due to having to give the model a skeleton and hooking it up with movements and animations. I will need to look further into this early on while I still have time to make sure that I understand it completely or look at different ways and techniques other people may use or suggest.

As my game revolves heavily on a sort of a story and relies on good story-telling and such, I have been thinking and writing down ideas of different stories and scenarios. I already have the general idea of how the story will go but I need to think of ideas which are a bit more detailed now.

On return of the mid-term break, I will need to ask to borrow the college Oculus Rift. I should send an email to my lecturer first, to make sure it is okay and confirm for me to borrow the Oculus Rift. This is so I can set up some configuration settings and such on my computer so that it can work with the Oculus Rift and then try to set up the virtual reality for games to test out how it is and what it is capable of.

World design for the game is still at a minimal. Sketches and ideas of the general shape of the map and world has been worked on a little, along with the storyline. Objects for the world still have to be made if required.

After another week at most, I expect to move into more development of the game itself slowly.

November

Technical report for the project is going smoothly and the prototype development is going at a decent pace. It has been difficult to cope with everything this year since there was an extra module thrown onto us with a project in it that is taking up too much time to complete. It has made it difficult to balance our time over this project and that one.

I have been doing a good bit of research for the technical report of the project. Research into commercial opportunities, genre and popularity in such genres and technologies used for the project in more detail. Functions and such with use cases for each one have also been made. There is a lot of documenting for this project and I guess it is normal in a sense, since development in any area requires documenting of how it was made and such. I am not too happy with the time I have had for actually working on the prototype though, I plan on using more time now to concentrate on it since the final part of my AI project is finally submitted.

I have changed some aspects of my original idea for the game. I will include the different versions and changes for each one in my technical document. The virtual reality idea is still going ahead, although I am unsure about using the DK Oculus. I have been trying to find alternatives which I could use instead.

So far in the prototype I have not finished with a character model yet but I have been working more on the world itself and the landscapes and scenery, basically the map or world where the game will take place in. There will be multiple different maps though instead of one big one. Different areas will be separate maps as this is more suitable for most devices since it requires less resources to run multiple smaller maps than one consistent large one.

The sheer amount of projects is a lot and it is difficult to juggle between it all this year. Having AI in fourth year definitely did not help (when we were originally meant to have it in 3rd year). I just hope next semester will be an improvement.

Talked with supervisor about potential map sizes and ideas that were of some concern along with another classmate.

December

Working more on the prototype of the first open map which will be the map I show at the mid-point presentation. Document is almost complete now too. Surveys have been sent out and I am gathering the results now. Landscape for the map has been done and will be spending some time painting it. I should be able to get the terrain painted for the presentation. I will leave the ocean / water animations to add in until after I have the other functionalities I want finished.

AI is something I will be putting into the prototype just to show what I have in mind for that map. The AI will be an enemy one where it will chase the player down and attempt to deplete the player's health to zero and killing the player. In this scenario, this is the open area the player first goes into after escaping the small cave map. The player is unarmed and can only run from the enemies.

The small cave area where the player starts in is half done, there is some lighting glitches that needs to be fixed. Character model is still in work too, I have decided to leave that for now to work more on the prototype open map and AI.

It has been difficult to get everything I wanted done, as there are also other deadlines for this month too. The presentation slides for the midpoint presentation is done but may need further modifications later.

Talked with supervisor to talk about alternatives of uploading our game as our game size is pretty big in comparison to some other project types and some other concerns I had along with another classmate.

January

This month I decided against making smaller maps and went back to the idea of one big map for exploration. Loading screens kind of ruin the immersion for a lot of people, I asked around and did a little survey about it. Removed the ocean on my map and putting in placeholders for all the tree areas I want. Lighting bug for cave is fixed now and character is almost complete. The arms is the only things I need now as there is no need for a full body character model, it only takes more resources and 90% of the time the player will only see the arms and the gun.

I will need to work on a gun model soon and the enemy model. Already started on some preparations for foliage and trees and grass. Took some pictures as reference and to use as textures too if possible. Started getting used to some of the tools on Photoshop that will help me make the textures I want and need like OrangeBox and the NVIDIA tool.

Got better textures now to use to paint my landscape too, will be repainting my landscape soon as well.

February

My main machine broke down this month again. Using my older machine now and limited to using Maya 2016 due to my older machine not being able to cope with the new rendering engine that was implemented in Maya 2017 version. Maya 2017 uses Arnold engine which requires more powerful CPU while 2016 still uses Mentalray which is more forgiving.

Luckily I had backups of all my work so I can continue working on some things while I wait for my main machine to be fixed. The arms are complete now for my character, textures can come later as I want to decide on what kind of texture and material I want to apply to the arms still. I am not working on the enemy model which is a flying droid robot of sorts that explodes on impact with the main character actor in the game. I am also starting to make some ferns on the side and grass. I used the referenced grass picture I took a while ago to make the grass, using a paper sheet mesh made in Maya and applying the grass .png file as a mask of itself too when using it as a material. I want to make a normal map for it too for detail but that is something I might do in the future.

Some trees and ferns are almost done but it is a bit difficult to work due to some personal problems at home. Did some testing this month too, with my rough prototype. Gathered some results back and will help with developing my game further in the right direction.

March

Ferns and trees are mostly done and I have started to populate my map with the trees and foliage. I also found two free asset trees that works well with the ones I made so I added those in too along with some free asset rocks and such.

I am mostly done with the enemy model now and I have also made a labyrinth to be used in my game too. I will have to further work on more AI blueprints now, to improve my enemy's movements and actions. Might look into some behavior trees as well if possible for the enemies.

Revamped the cave area on the map where the player starts in and also improved some of the mountain scenery around the map. I have put in some fitting ambient sounds of birds chirping into the scene too in areas with trees and foliage like a forest. Going to make a new prototype soon that is near completion for testing in the new week or two and then I will use the rest of the time I have to optimize the game and make changes that are relevant to the results I will get from the additional testing phase of the new version of the prototype.