

# Virtually Reincarnated

First-person Shooter Video Games/Virtual reality made with Unreal Engine 4

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Computer Science: Game Design & Development

## Introduction

Purpose:

To develop a Virtual Reality game utilizing the Unreal Engine 4 game engine and gain new skills and a greater understanding of the complexities and challenges of this emerging media.

Build a PC-based VR game utilizing Oculus Rift motion controllers to navigate a post-apocalyptic survival game that will use functions, physics and artificial intelligence, Blueprint communication, and audio to create an immersive experience.

Apply game design theory and learn the basics of the Unreal Engine UI through motion controller implementation, basic physics interactions, AI controllers and character animation through the Unreal Engine blueprint scripting interface.

Understand the unique complexities and implications of working in a VR environment and the specific restrictions it imposes on the player in producing a positive user experience.

## ABSTRACT & HYPOTHESIS

In the world of gaming VR is literally a game changer. This new technology continues to rapidly advance allowing game designers to develop a whole new gaming experience. VR technology allows users to truly immerse themselves in a digital environment. The headsets block out all outside visual and auditory stimulus, making it seem as if the user is actually deep within the simulated world in front of them. The added level of being able to actually act within this world via hand controls only further improves how "real" it can feel for the user.

As gamers mature they look for enhanced experiences and competition which VR technology clearly delivers. Wouldn't a platform that offers the even higher challenge of mastering full body movement and immersion be an even greater source of enjoyment? VR essentially changes the term "hand-eye coordination" into "mind-body coordination". Put that entire equation together and now I have a competitive gaming platform that not only does everything I already get from competitive team gaming, but adds in a physical component as well.

At their core, video games are stories, and when developing technology like VR is introduced, stories evolve. Gaming and VR go hand in hand, so along with gripping content and incredible graphics we have a whole new way for games to be enjoyed.

## GAMEPLAY

Below is the starter map where the player begins the game. The player is given directions on how to use the Oculus controls, weapons and how to proceed to the 'Post Apocalyptic Shelter'. The zombie clown guarding the doorway displays the players level and the number of 'Kills' needed to progress to the next level. Each level increments by 5 the number of 'Kills' required. In order to start the game, you must shoot the clown zombie.



The player is now at the 'Post Apocalyptic Shelter', where zombies will be spawned from random locations. Weapons are hidden in the shelter and grounds and the player must find them in order to kill the zombies. The player has a health amount of 5 and is decremented upon contact with a zombie. If player is sent back to the starter map if they are killed or complete their kill mission.

In order to quit the game the player needs to fire the gun at the exit doors.

## MATERIALS

Unreal Engine 4 (UE4)

A game engine developed by EPIC Games in 1998 which offers a complete suite of creation tools to produce powerful visual experiences in a variety of media. As the leader in cutting edge graphics and performance, VR requires complex scenes rendered at very high frame rates and UE4 meets and exceeds the stringent requirements to build VR content on all platforms. Utilized the visual scripting language called "Blueprints" to code all of the components in the game.



Oculus Rift

Virtual-reality headset for playing ultra-immersive video games. Unreal is distributed with Oculus plugins which make it easy to develop application for Oculus Rift platforms. The technology follows the movement of your head in real time; learn in to take a better look at objects as your mind is drawn into the simulation. You can almost believe you are fully there. Powered by an Oculus Ready PC, Rift delivers unparalleled immersion into virtual reality experiences.



Mixamo : used to rapidly create, rig and apply animations to characters.



Unreal Marketplace: e-commerce platform where developers can get game-ready content such as 3D models, audio, and environments.

Alienware : VR Ready PC (GTX 1080) with the recommended specs

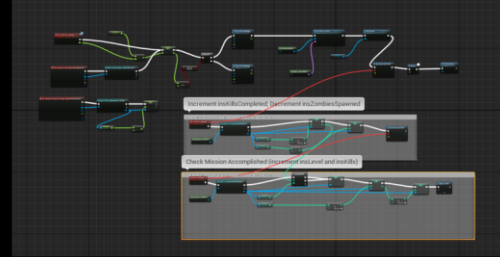


## METHODS

The Blueprints Visual Scripting system in UE4 is a complete gameplay scripting system based on the concept of using a node-based interface to create gameplay elements. It defines object-orientated classes or objects in the engine.

Artificial Intelligence of the zombies was created using Behavior Trees, AI Controllers, Blend Spaces for Idle/Walk/Run animation, and Animation Montages for Hit and Death animations.

Pictured below is a sample of a Character Blueprint:



Skeletal Rig:



Animation Blueprint:



## USER TESTING

Since this was a VR game it was crucial that the user experience (UX) of our play testers was optimal. I tried to follow the Oculus guide on developer guide for VR best practices so that the experience would be enjoyable. Quite often individuals will get motion sickness when they first begin using a VR headset.

Players rated the general UX as very good and they were able to orientate themselves well within the environment after some practice and adjustments.

Players were also able to practice firing the sample weapons in the first level so they felt they were well eased into the actual game and not thrown immediately into an intense game experience.

Those new to VR were shown how to use the Guardian system which shows a grid displaying the players boundaries through the headset. This helped the player stay orientated and safe through the gameplay.

Over-time and with some practice the players were able to use the motion controllers with ease and most found the experience engaging and comfortable.

## OBSERVATIONS & CONCLUSIONS

Overall Outcome:

The game was well received by both players who had both never used experienced VR before and those who had some experience playing games in VR. For those with experience most had used teleportation for locomotion and had to get used to using thumb stick controls. The overall user experience was rated highly and most commented on the realism and excellent graphics as well as engaging gameplay.

Unreal Engine 4 is by far one of the best gaming engines for VR development. While there isn't many text books available on the subject to date there is an abundance of video tutorials on the Unreal Engine website to follow and there is always excellent help from the user community. Graphics are key for a VR experience and UE4 is unrivaled in that area.

Future Improvements:

Users did feel that they couldn't play the game for an extended period of time since using thumb stick control can cause a bit more motion sickness than teleportation of movement of the third person character. To improve the game I could randomize the weapons around the environment to make the game more interesting. Also, I could create a variety of behaviors for each of the zombies and randomly change the speeds at which they run towards the player.

## REFERENCES

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