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Computer Games Development

Project Thesis

Year IV

After Dusk – A VR Survival Game

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# Project Abstract

Virtual Reality has revolutionized the gaming industry by allowing players to immerse themselves in fully interactive worlds. One genre that has seen a rise in popularity in recent years is the survival game genre. However, many survival games lack the immersive experience that VR can provide, leaving players feeling disconnected from the virtual world.

The problem that this project aims to address is the lack of immersive VR survival games. While there are some VR survival games available, they often fall short in terms of providing a truly immersive experience. Players are limited in their interactions with the virtual world and may find it difficult to feel fully immersed in the game.

To solve this problem, I proposed to create a new VR survival game that offers a fully immersive experience. The game will allow players to interact with the virtual world in a way that feels natural and intuitive. I was able to achieve this by leveraging the capabilities of VR technology to create a game that is not only visually appealing but also one that offers a range of interactive elements.

The game is set in a baron / post-apocalyptic world where the player must navigate a dangerous landscape filled with hazards and obstacles. The player will need to gather resources and fend off dangerous creatures to survive. The game will offer a range of interactive elements such as hunting, combat and inventory system all of which will be designed to feel natural and intuitive in the VR environment.

Overall, The VR survival game aims to provide a truly immersive experience that will leave the players feeling fully immersed in the virtual world. By leveraging the capabilities of VR, I believe I can create a game that sets a new standard for immersive VR survival games.

# Project Introduction and/or Research Question

I have decided to take on the challenge of creating a VR Survival game using Unity Engine. I was eager to learn the intricacies of game development in VR, especially since playing various survival games has piqued my interest in creating my own game. The game is set in a post-apocalyptic world where players must gather resources, fight off enemies, and solve puzzles to progress. The game features multiple bosses and offers a unique challenge to players.

However, creating a VR game poses significant challenges, and I am excited to overcome them. I will need to research VR technology and understand the different input actions associated with different VR headsets. Creating AI enemies with varying behaviours will be another challenge, as they must provide an appropriate level of difficulty without overwhelming players. Finally, the movement and fidelity of the game are critical factors that must be optimized to avoid motion sickness and ensure smooth gameplay. I must balance texture quality and level of detail to prevent stuttering and optimize the game's performance.

Overall, this project represents an exciting challenge, and I look forward to creating a unique and immersive VR Survival game that offers an exciting experience for players.

Summarize the main contributions of the project.

Main contributions of this project are:

* A Behaviour Tree – this allows for a more intelligent AI in the game, this allows to create a level of difficulty for the player without overwhelming them.
* A custom wrist pocket inventory system – this allows the player to carry various items during the game ranging all the way from objective items and consumables such as healing items.
* A stronghold system – this is where enemy bosses spawn and the player will need to defeat them in order to continue with their objectives to survive the game.
* Random map generation on startup – Every time the player plays the game, a new map generates, creating a new seed each time with various mountain ranges with its own set of trees each time.
* Repairing of getaway vehicle – player must collect various car parts to repair a vehicle in order to escape and survive the game.

# Literature Review

A VR survival game is characterized by players navigating through a post-apocalyptic or wilder environment, collecting resources while avoiding or fighting off enemies, using a VR headset and hand-held controllers, creating an immersive and engaging experience(1).

The game mechanics and environment must provide a sense of immersion and urgency, encouraging exploration while maintaining a sense of danger and risk. (1) The game must provide a realistic and compelling world that encourages exploration, while also maintaining a sense of danger and risk. The player must feel a sense of responsibility for their survival and must be constantly engaged in the game to maintain their progress. In addition, the game must be designed to minimize motion sickness and other negative side effects that can be associated with VR experiences.

VR survival games have been explored in such games as “The Forest” (4), “Subnautica” (5) and “ARK:Survival Evolved” (6). These games have all explored different aspects of the VR survival genre, and have provided valuable insights into the challenges and opportunities associated with this type of game.

Environmental storytelling and exploration are key trends in VR survival games (2,5), creating a sense of progression and growth (5). Games like "The Forest" and "Subnautica" have created immersive, detailed worlds that encourage players to explore and discover new things. These games have also focused on creating a sense of progression and growth, as players collect resources and craft new items to help them survive in the harsh environment.

Another trend in recent VR survival games has been the use of AI enemies and combat. The use of AI enemies and combat also adds a sense of challenge and danger, with different creatures and enemies having unique behaviours and strengths (2,6) Games like "ARK: Survival Evolved" have included a variety of different creatures and enemies, each with their own unique AI Behviours. This has created a sense of challenge and danger, as players must learn to navigate the environment and avoid or fight off these threats.

The existing work in the VR survival game genre has had a significant influence on the development of this project. The game will draw inspiration from games like "The Forest" and "Subnautica," incorporating elements of exploration and environmental storytelling into the game design. The game will also include AI enemies and combat, inspired by games like "ARK: Survival Evolved," in order to create a sense of challenge and danger for the player. The AI used in the “ARK: Survival Evolved” would have great influence on the AI in this project, each enemy type has their own kind of behaviour and all act differently to each other which gives quite a unique feeling while playing.

In addition, this project will address some of the challenges associated with creating a VR survival game, such as motion sickness and the need for engaging gameplay mechanics. The game will be designed to minimize motion sickness by carefully controlling camera. The player should always have different options of controlling the camera and regular movement as when players immerse themselves in VR more frequently, they become more accustomed to feeling experienced in the virtual world. The game will also be designed to provide engaging and compelling gameplay, with a focus on realistic survival mechanics.

In conclusion, the VR survival game genre presents a unique set of challenges and opportunities for game developers. The existing work in this area has provided valuable insights into the key concepts and mechanics associated with this type of game. The project will draw on these insights and build upon them, incorporating elements of exploration, AI enemies and engaging gameplay mechanics into the game design. By addressing the challenges associated with creating a VR survival game, the project aims to create a compelling and immersive gaming experience for players.

# Evaluation and Discussion

Developing a project, whether it's a game, software program, or any other type of project, can be an arduous undertaking that demands a significant amount of time, energy, and proficiency. Throughout the development process, you may encounter a multitude of obstacles that have the potential to severely impede the success of the project. As you may know, even minor issues can escalate into significant complications that can drain valuable resources and time.

One issue I had ran into was pretty early on in the development of the game when I was adding VR plugins to the project. I had originally integrated the Steam VR plugin to the project in order to create the player character for the game. Not long after I added this plugin, I had quickly found out that the plugin was no longer being supported and as a result it would cause issues later on in the project while developing the different movement types for the game. After doing additional research I had opted to move from the Steam plugin to Unitys in-built system for VR support

After integrating the new plugin for the VR support, I went through the process of testing that all the features that I had previously implemented were still functioning as expected. There were some modifications needed to the previously implemented movement system for the player as the previous plugin required a different method in order to move the character model in the virtual world. This process set me back some time in the development but it was a necessary step to take in order to avoid any other future problems down the road related to my player or VR support.

# To summarize, identifying the appropriate open-source library / appropriate plugins for integration into a project can prove to be a difficult task. Moreover, even after selecting the suitable plugin, there may be complications that demand a substantial investment of time and resources to overcome. For instance, I personally had to dedicate a significant amount of time at the start of the project to overcome the issue with the plugins. Although it was a laborious process, it was crucial to guarantee the stability and efficacy of my project.

**Project Milestones**

While I never set hard deadlines or milestones for the project, I did have some general goals for progress.

The first milestone of sorts was after adding the VR plugin to the project, this was pretty big at the start of the project as it allowed me to experience the start of an immersive and interactive virtual world. The process of adding Steam VR was not so easy, When I first added the plugin, I was getting various errors from Unity about the plugin and after some more research, I then found out that the plugin was no longer being supported which meant it would not receive any further updates. This was a bit of a problem so after doing more research about different plugins for VR, I opted to use the XR Toolkit from Unity themselves. Through using the XR toolkit it allowed me to develop the game for than one headset which was a big factor of using it. After setting up the plugin I decided to focus on creating a sandbox for the player to test various things in the game.

After creating the sandbox I focused my attention on creating different movement types in the game, through clicking the menu button, the player would be able to change their movement types from Continuous movement from the joystick or to using a teleportation ray to move around the game world. After the movement was finished I then turned my attention to camera movement, I allowed the player to choose from two different options, snap turn movement or continuous movement. Snap turn would allow the player to use the analogue stick and rotate the camera 45 degrees each time. Continuous would allow the player to move the camera like a normal console controller movement.

The Creation of the random world generation dragged on longer than I had originally anticipated, it took me a few weeks to get it working in a basic format, I had been following various tutorials on YouTube and looking in online forums for creating the heatmaps, and then spawning prefabs on the world.

In the last month or so of the project, I put a lot more focus on creating mini deadlines for myself, which helped in keeping me motivated, If I were to start the project again, I would definitely put more focus on scheduling, as I did not do enough of it during the process of this project.

**Major Technical Achievements – complete this section.**

In the dynamic field of game development, it is crucial for developers to constantly enhance their knowledge and skills to keep up with the latest trends and technologies. My recent experience working with virtual reality (VR) systems has been highly beneficial in this regard. Working with VR systems and input devices has helped me gain a better understanding of the unique challenges and opportunities involved in designing and implementing games for VR. It has also allowed me to explore the potential of different input devices to create immersive and engaging experiences for players.

The following technical achievements helped me create that immersive and interactive experience for players: **Random map generation, AI – Behaviour Trees, Wrist pocket inventory system** and **strongholds**. I had spent quite a reasonable amount of time on each of these features as they all came with their own little problems that I needed to solve before I could go any further.

The hardest one to complete was the random map generation, as I had to make sure there was no unrealistic terrain formations such as floating islands or steep cliffs that are impossible to climb which would negatively impact the players immersion and enjoyment of the game. Another issue I encountered was when generating the terrain at runtime, as if the terrain becomes to big it will also negatively impact the performance of the game, which would increase load times, and lower framerates which would be terrible to experience in VR.

AI – Creating the AI in the game was a bit of a fun process as I got to learn how to create a behaviour tree for the AI and would be able to create a more ‘intelligent’ AI that what I would have created previously in the past. Each of the AI in the game have taken some inspiration from other survival games where each of the AI should feel unique and different to each other.

Inventory System – I was particularly proud of this feature, I wanted to create an inventory system in the game without creating a typical inventory seen in games, I gained much inspiration for this feature from the VR game ‘Half-Life: Alyx’, they hand created something similar to this. Some things I needed to keep in mind while creating this feature was the original scale of the object before the player placed an object inside, additionally I also needed to scale objects down when they were placed inside.

Overall, the knowledge and insights gained from these experiences will be invaluable for future projects, enabling me to stay abreast of the latest advancements and create innovative and captivating games.

**Project Review**

**What went right?**

Firstly, and most importantly, the project as a whole went right. It went well and despite some hiccups and issues along the way the project ended up in a satisfying state. I was able to deal with those issues in a smooth and professional manner allowing me to have a final submission which reflects well all the work which I have put into the project.

I am quite happy with how features turned out in the game. I was quite nervous at the start developing some of them as I wasn’t sure how the final result would turn out but overall I am quite happy with them.

Overall, I am proud of the work that I accomplished and the progress that I made. It was a journey filled with ups and downs, but I emerged from it with a greater understanding of these technologies and a renewed sense of determination.

**What went wrong?**

As I continued to work on the project, I encountered a plethora of obstacles that I had not anticipated when I first began. The complexities of working with VR became apparent, and I realized that I needed to dig deeper and learn more in order to succeed. It was a challenging journey, but it ultimately helped me to grow as a developer.

Some of the challenges I faced during this project were related to the map generation and trying to use that inside of the main scene, my original plan was to generate the map when first loading the game, and then bring that terrain into the main level. Through a lot of research, I found out, that it was not possible to do so, I now had to come up with a way of making sure how to spawn different types of objects onto the terrain depending on the height and steepness of the map. I eventually came up with a way of shooting a raycast down from the object and only spawn if the ground was at suitable to do so. I had spent quite a lot of time on this feature and if I were to go back, I would have tried to not have spent as long.

**What (if anything) is still outstanding/missing (i.e., still left to do)?**

The one outstanding piece of content in my project would have been to create a proper crafting system inside of the game. I would have enjoyed allowing the player to craft various items in the game ranging from health items to additional ammo. I feel like this would have been a great feature to have implemented in the game to add to the level of realistic survival game mechanics.

**If starting again, how would you approach this project differently?**

**What advice would you have for someone attempting a similar project in the future?**

**Were your technology choices the right or wrong ones?**

My technology choices were the right choices. I wanted to create a VR survival game. Choosing Unity was a great choice as it is an engine that is very often used by smaller and indie studios as well as students and enthusiasts like myself. Unity has its own VR plugin which is constantly being updated and allows developers to do marvellous things with it and also allows developers to create games that are compatible with a variety of VR headsets.

Unity has a large and active community of developers, which means there are many resources available for learning and problem-solving. This can be especially helpful for indie developers and students like us.

Finally, Unity is a cross-platform engine, meaning that games developed in Unity can be deployed to a variety of platforms, including PC, console and mobile. This can be especially important for VR survival games which require high performance hardware to run smoothly.

# Conclusions

In conclusion, creating a VR survival game is a complex and challenging task that requires careful consideration of game mechanics, environment design, and VR technology. The game must be designed in such a way that it provides a sense of immersion and urgency while maintaining an engaging and compelling gameplay experience. The VR technology has opened up new horizons for game development, and the VR survival game genre presents exciting opportunities for developers to create innovative and exciting games that will push the boundaries of gaming experience.

If I were attempting a project such as this again, proper scheduling is necessary to achieve a desired result, if you neglect scheduling, you run the risk of not implementing important features that should have been given priority.

**Future Work**

One feature that would have been pretty successful in this game is a proper crafting system, where the player could pick up more resources and craft different items such as weapons or even health items, instead of just having them randomly spawn in the game world like what is currently happening in the game.

Other features that would be very fun to play around with and to add an additional level of immersion would be to create a VR physics system where, different items would have their own properties and as a result they would react differently, i.e. buoyancy of a healing property in water, Long rifles being heavier than the pistols in the game and so on.

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