

COMP4801
Final Year Project

VR Gamification of Open World Games

Project Plan

Group: FYP23091



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1. Introduction

This document serves as a detailed project plan regarding the project *VR gamification of open world game*. We will first try to derive the prospect of VR gaming by introducing the industry background as of 2023. Then we will discuss the criteria of combining VR technology with different kinds of games as an endorsement of our choice and practice, that is, virtual-realizing open world games.

As the focus of our discussion shift from the industry to our specific project, we will first explain the *objective* of the project which covers how to play the game and descriptions on specific gaming systems which will be implemented. In the next session *Implementation*, we will propose the technical stack involved in the project and, how we plan to achieve the objectives.

Also, this project is carefully scheduled after considering the hard deadline of the presentations and submission of deliverables. The project timeline can be found in the *Schedule & Milestone* session.

2. Background

2.1. Rise of Virtual Reality Gaming

The blowout of Virtual Reality technology in the 2010s has re-ignited the dream a world with every possibility in people's heart towards as the development of display technology, data transmission throughput and computing power. This inevitably bolsters one of the most common ways people seek for leisure, games. According to William J. et al (2017), VR games have psychometrically taken the upper hand from their traditional counterparts with respect to satisfaction level of the players, specifically, in the Game User Experience Satisfaction Scale (GUESS).

2.2. Adaptation of VR on Different Genres of Games

There is no denying that VR has its sweet spots on certain types of games due to its inherent interactable and immersive feature. According to SteamDB (2023), the daily active user of steam VR (one of the most commonly used VR game distribution platform) has reached 20 million as of Oct 2023. We could draw conclusion from the category of the top 10 steam VR games that the most welcomed VR games categories are: action (War Thunder), interactive (VRChat) and open world (No Man's Sky).

In view of the analysis on the popularity on open world action game, this project aims to bring out such a game with Unity, as the objectives mentioned in the following sections.

3. Objective

In view of the advantages of combining VR with open world games, this project aims to bring out an VR game application which allows the players to explore the immersive game world, with the ability to interact with NPCs and other objects. Specifically, we aim to implement the following systems:

3.1. Basic game framework

This section is about the basic instructions the player can achieve.

3.1.1. Player

The *player* in this game is defined as an entity that is able to feel the world (with eyes and ears), move in it (with controller) and interact with other objects in the world. Also, the player is able to switch to different skill sets for combat when picking up different equipment and switching roles.

3.1.2. Environment

With a carefully designed and refined environment, the player can fully enjoy the immersive feature of VR. We plan to first create a small piece of demo scene where other gaming logics can be tested, then we will iterate the scene to a spherical world which is large enough for a player to walk around, chat with NPCs, take quests and combat with enemies.

3.1.3. Interaction

Thanks to the Unity XR Toolkit, we can utilize some out-of-the-box interactions such as picking up objects. However, we need to further exploit the complexity of interactions to trigger events with certain series of actions, such as those used to trigger respective skills depending on the player's roles, which is discussed in the *Combat System* below.

3.2. Combat System

3.2.1. Attributes

The fighting capacity in this game applies similarly to both the player and the enemies, in a set of quantitative attributes. For simplicity, the project currently aims to implement basic attributes such as HP (Health Points), ATK (Attack), DEF (Defence) and Critical Hit Rate & Critical Damage.

3.2.2. Equipment

The equipment system contains of interactable weapons and non-interactable equipment which could enhance the player's fighting capacity.

3.2.3. Combat Interaction

In order to fight with enemies, the play can use:

- a. Weapons: world-spawned objects that can be picked up and not bounded by the role of the player.
- b. Active Skills: inherent skills that is bounded by the role of player which requires certain interactions (i.e., hand gestures) to trigger.

3.3. Optimization

The optimization is vital since an open world game definitely causes much heavier loads to the devices. Also, the VR version usually requires a higher framerate to avoid causing sickness for the player. The target optimization is to make the game playable on the oculus quest 2, with a higher priority on framerate performance than on graphics quality.

4. Methodology

This project is planned to be built on the renowned Unity game engine in C#. We also adopt the XR Interaction Toolkit by Unity for VR controller interaction and cross-platform support. As a result, this project should theoretically run on any VR headsets. However, due to the limited number of devices we have, we would constrain the running and testing console to Oculus quest 2, unless further hardware support is received from the department.

We will implement the combat system based by referencing some of the mature action games with respect to weapon logic, skill sets and numerical balance. As for optimization, we will

first try out the out-of-the-box optimization approaches provided by Unity such as light baking and occlusion culling.

Also, this project involves artworks that cannot be completed on our own. For such resources, we would try to find alternatives from 3d model stores such as Unity Asset Store.

5. Schedule & Milestone

Date	Content
8 Oct 2023	First Deliverables – Detailed project plan
Oct 2023	R&D session: refining the game framework, conducting feasibility research on proposed game systems (i.e., equipment, battle), completing local environment setup and CS server database setup, preparing artwork resources.
1-7 Nov 2023	Completing the demo scene: a VR enabled interactive scenario
7 Nov – Dec 2023	Implementing session: Test the scalability of the demo scene to an open-world one, spawn interactive NPCs, and implement basic combat system.
1-7 Jan 2024	Preparing for the first presentation
8-12 Jan 2024	First Presentation
21 Jan 2024	Phase 2 Deliverables – Preliminary implementation, Detailed interim report
Mid Jan – Feb 2024	Implement session: Implement remaining systems such as mission system,
Mar 2024	Refining the artworks such as lighting and texture, design the lore for the game.
Early Apr 2024	Preparing for final presentation and deliverables
15-19 Apr 2024	Final Presentation
23 Apr 2024	Phase 3 Deliverables – Finalized tested implementation, Final report
26 Apr 2024	Project exhibition

Reference

Learn game development with Unity | Courses & tutorials in game design, VR, AR, & Real-time 3D | Unity Learn. (n.d.). Unity Learn. <https://learn.unity.com>

Most played VR games. (n.d.). SteamDB. <https://steamdb.info/charts/?tagid=21978>

Shelstad, W. J., Smith, D. C., & Chaparro, B. S. (2017, September). Gaming on the Rift: How Virtual Reality Affects Game User Satisfaction. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 61(1), 2072–2076. <https://doi.org/10.1177/1541931213602001>