COMP4801 Final Year Project

A First-Person VR Puzzle Game

Supervised by Dr. T. W. Chim

FYP18015 Detailed Project Plan

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Abbreviations

VR	Virtual Reality
PC	Personal Computer

1. Project Background

Nowadays, there are many games that are designed to be open-ended puzzle games which provide different methods for solving the puzzle in the game to achieve different stages, stories or endings. The design of these game is the major reason to let the players to apply their creativity to solve the same puzzle. Some typical examples are Human: Fall Flat [1] and Portal [2], which allow players to solve the same puzzle with different methods like using the simplest way to reach the goal or making use of different objects in the stage to have a creative clear method.

As the rapid growth of VR technology, there are already tons of applications in different industries, like medical [3], logistics and business [4]. Among all, gaming is one of the field that has been large-scaled affected as VR indeed brings the gaming experience to a next level [5]. Every day, there are VR games coming out on the market, game developers try to explore progressively more innovative ideas to fully utilize the experience that VR technology provides to us. Some work on various game modes and some focus on the hardware support [6] which aim to enhance human senses in the virtual world. Yet, there is not a right answer to tell especially for game development which involves creativity. And for us, we first came up the idea of dream.

People always state that dream is the best VR experience ever [7]. The degree of freedom inside your dream is far greater than what you can achieve in the real world. Saying that without any equipment, people can still feel the same in their dream or even come across something unrealistic. Despite the impressiveness of a dream, such kind of physiological phenomenon still cannot be intentionally reproduced and controlled by anyone. However, it will be a totally different story when it comes to a platform that we are familiar with, that is the computer. Taking the concept of dream, we can reconstruct and imitate what people can experience in the dream all based on how we program it. Our game idea is then inspired base on this. By cooperating with the element of solving puzzle, it gives our players more flexibility to demonstrate their creativity.

The remainder of this project plan proceeds as follows. First, we give the scope and objectives of this project. Then we introduce the equipments and set up, software specifications, locomotion mechanics and highlighted characteristics of this project. Followed with the project's upcoming schedule and milestones. Lastly, we end up with a summary and references.

2. Scope and Objectives

To give our game a solid scope, only an idea is not enough. Considering the concept of dream, we decided to build a First-Person VR puzzle game. When the game is introduced to be unrealistic and emphasize creativity, a puzzle game fits perfectly into the theme of dream. Given that a dream can be beyond our imagination, and everything is possible inside there, we can set the puzzle with even more varieties than those with restrictions. Besides, our puzzle always accepts more than one answer as an open-ended puzzle. We expect our players to explore possibilities themselves after several tutorial stages, in order to offer opportunities for them to demonstrate their creativities. As a result, we will keep our game challengeable and solvable every stage, to provide a brand-new puzzle game experience to our players.

Simply a VR puzzle game can never satisfy our audiences. We decided to include our game with an important element, the storyline. A storyline plays a significant role in every single game, it gives players the virtual meaning of staying in the game, following the instructions and achieving the goals. With the motivation integrated, we believe our game can become more attractive in general. In addition, the storyline in our puzzle game contains another function, which is explanation. Along with the stages passed by players, the storyline will keep progressing and more abilities will have to be available to players. The best way to explain these game elements is through the storyline. Even for the unlocking of multiplayer mode or other systems, they can also be well explained by storyline too. Therefore, everything will have its meaning and the game will look more consistent to our players.

3. Project Methodology

3.1 Equipment and Set Up

This project uses HTC Vive Headset for simulating VR environment, HTC Vive Controllers for controlling motions of the character and HTC Vive Base Stations, for tracking the motions of the player (see Figure 1).

Figure 1 HTC Vive Headset, Controllers and Base Stations [8].

3.2 Software Specifications

3.2.1 The game will be a PC application on Windows Platform

VR game using HTC Vive only supports Windows Operating Systems [9].

3.2.2 C# will be used for the game development

(i) Unity recommends developer to use C# instead of Javascript by removing Java selection from selecting script language since Unity 2017.2 beta [10].

(ii) Better performance than Javascript [10].

3.3 Locomotion Mechanics

We adopt the ninja run locomotion [11] methods in our VR game (see Figure 2). When players pose like a running ninja, they move forwards. Comparing with others such as teleportation or running-like methods [12], the way of ninja run gives a more natural feeling of movement and reduce the chance of getting motion sickness to players. Especially for running-like methods, mimicking the actual movement in real world requires a certain energy consumption which is not suitable for a puzzle game.

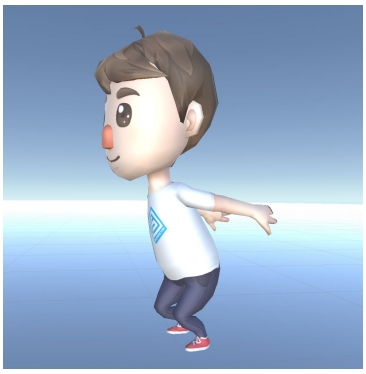

Figure 2 Ninja run locomotion.

3.4 Highlighted characteristics

As be mentioned in previous paragraph, we imitate dream in the game. To present the unrealistic, we make use of gesture for players to summon equipments and tools for solving puzzle. In order to let the players to demonstrate their creativities, the gestures suggested in the game are those where most of the people will agree and feel comfortable with. For example, players can summon a sword when they hold their controller aside their waist, or summon a gun when they hold it in front of them (see Figure 3). For the technique we achieve this gesture detecting, we will simply allocate mesh boxes in the desired positions and check collide between controllers and boxes. So that everything can be easily handled.

Figure 3 Summon Sword Gesture (left), Gun Gesture (right)

4. Schedule and Milestones

Task	Deadline
Study VR related technologies - headset / joystick - Oculus / OpenVr / HTC VIVE (correlated with VR SDK) - Locomotion mechanics	19 September 2018
Deliverables of Phase 1 (Inception) - Detailed project plan - Project web page	30 September 2018
Development of minimum viable product (MVP) - Finish the storyline - Build 3D models - Finish basic game stages - Finish VR Settings	31 December 2018
First presentation	7-11 January 2019

Deliverables of Phase 2 (Elaboration) - Preliminary implementation - Detailed interim report	20 January 2019
Design Enhancement	6 February 2019
Development of Final Product - Save and Load System - Complete game stages - Enhance VR Settings	24 March 2019
Final Amendments	31 March 2019
Deliverables of Phase 3 (Construction) - Finalized tested implementation - Final report	14 April 2019
Final presentation	15-19 April 2019
Project exhibition	29 April 2019
Project competition (for selected projects only)	29 May 2019

5. Conclusion

This paper presents a project plan for developing a First-Person VR Puzzle Game. The goal of the project is to provide a VR experience to players for demonstrating their creativities. Integrating with the idea of dream, we aim to design an innovative and open-ended puzzle by putting interesting elements together in order to provide a best puzzle game ever to our players.

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