# Virtual Reality Obstacle Course

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**ABSTRACT**

This project will provide a playable environment using a VR set, specifically the Quest 2, in which the user will be able to interact with a virtual world as an animated character and enjoy the different challenges the environment will propose to them. The challenges will consist of a set of obstacles different to each other and specific to the different environments. The user will have to pass through all obstacles by jumping, running or moving in order to get to the end of each of the virtual worlds and win each level environment.

**Index Terms:** Virtual reality—Game design—Obstacle course—Interaction;

## 1 INTRODUCTION

This game idea is the result of a common interest in our group of understanding the enjoyment from interaction of the user in a game using VR and the different methods used to achieve this goal. All members of the group have tried gaming with technology and found ourselves interested in applying VR in this setting to create our own interactive environment and challenging ourselves to create an enjoyable game for the user. Our objective is to use Unity to create our own different scenes in which a character controlled by the user will have to get to the end of the map avoiding different obstacles along the way by jumping and running away from the objects created to stop the character.

## 2 RELATED WORK

Previous researches like "Evaluating enjoyment, presence, and emulator sickness in VR games based on first- and third- person viewing perspectives" by Diego Monteiro, Hai-Ning Liang, Wenge Xu, Marvin Brucker, Vijayakumar Nanjappan and Yong Yue have shown that when using VR headset in a virtual environment game based on a first-person perspective can lead to simulator sickness and discomfort from the user. Whereas in a third person perspective it is less likely that simulator sickness occurs. However in a third person display, the immersiveness of the game is lost. Our group was put in the dilemma of doing a third person perspective or a first person perspective. We wanted to make an enjoyable game for all users and not worry about motion sickness, but the virtual reality aspect and immersiveness that we were looking for for the project was not going to be there. Since our project is still in development we are still in discussion on what would be the best solution for this problem.

### 2.1 Research Links

We do research about how to insert a character from Mixamo to Unity 3D. Here is the link for Mixamo: https://www.mixamo.com//?page=1type=MotionWe also figure out how to build and run our scenes on Android platform with headset: https://youtu.be/JeFHgAblEAk Obstacles asset we used for our project: https://assetstore.unity.com/packages/templates/packs/obstacle-course-pack-178169 Asset for scenes build: https://assetstore.unity.com/packages/3d/environments/historic/polylised-medieval-desert-city-94557

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## 3 METHODOLOGY

- The obstacle game has to be played in a safe environment since the user will be immersed in a virtual world and will not have visual contact with the real world. The game will be playable with a Quest 2 VR headset and the user will feel like he or she is inside an virtual world created by our team members trying to get to the end of the level. With the Quest 2 controller buttons to move the character around and interact with the virtual world objects and obstacles of the level environment using the different actions the character will provide. [Alberto Chan Liu]

- There are some interactions used in desert city scene.for current process,users can control character moving,turning and jumping by keyboard. After we set up the headset, users are able to control their moving direction by VR headset.When the character and obstacles collide, the character will fall down and they need to take time to stand up and continue the game.For input devices, we use head tracking to control the moving direction of the character. In addition, the Jump controller is used for our character jumping. Users can adjust the speed and jumping height by physical button controllers.[Zhipeng Yang]

- Throughout the design phase of our VR game, many interaction methods were employed to create a fuller player experience. For interactions, the end goal of our project is to have players complete obstacle challenges in virtual reality through some minimal physical movements. For reference frames, the forest level is intended to use the torso reference frame which moves with both physical and virtual rotation. In terms of user locomotion, we plan to have them walk in place while also having control to character movement through the controller. We aim to minimize user moving range but add as many in-place movements as possible for safe considerations. We use controllers over bare hands because of their features of reliability and capability of adding haptics. [Irene Zhang]

## 4 USER EVALUATION AND RESULTS

The obstacle game will be created using Unity, it will be implemented using assets from Unity Store and other different web resources so that the game will be more interactive and user friendly. Assets will provide specific shape objects related to the different worlds created, as well as different animations needed and controls over objects and characters. Each member of the team will be in charge of creating one different level so that the user can choose between them. Each of the virtual worlds will have a theme desert, city, and forest and every theme will have obstacles associated with them. The playable character will be also associated with the theme it is playing in.

## 5 Discussions and Conclusions

### 5.1 Future Work

For next steps, we will set up our VR headset and test our scenes, and figure out how to apply the interactions when the character is hit by obstacles. Furthermore, we have three different difficulty level scenes, and we need to find out how to make the user get into the next scene after they pass the previous scene. A timer is also on the works to add more interactivity and difficulty to the game, as well as a starting menu in which the user could select the environment or difficulty he or she wants to play in.