EE267 Final Project
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Shiny Space Coaster

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1. Introduction

This project is a VR game created by Unity and EE267 ViewMaster VR package(edited from Google Cardboard SDK). We are buiding a roller coaster in space with shooting options while the player is moving along the rails. The player can just sit in the roller coaster, looking around and enjoy the scene with fancy music, but can also interact with the environment on a shooting game. Apart from the game, we also did some user study about the uncomfortable feeling when watching the roller coaster video, or experience first person perspective roller coaster in VR. We made some modifications on the "head and neck" model discussed in EE267 lecture, and name it "head and waist" model by creating a separate slider for changing the ratio of head and neck while user is playing the game.

2. Game Design

2.1. Roller Coaster

We were using the Google VR Roller Coaster asset as a starter code for building the roller coaster. The main idea of this roller coaster is putting multiple 3D coordinates in the scene, representing the direction of the rails, and build rail segments linearly between each coordinate points. While the game is running, the position of the seat is interpolated between the coordinates, so that make the game kind of coarse on physics(i.e. no gravity applied) but achieved faster rendering on the scenes.

2.2. Environment

We designed our game environment to present a relaxing and enjoyable visual effect for the users. The background color is navy blue, with cute yellow stars, various shiny stars and planets dotted in the space. There are also astronauts, space stations, space crafts which simulate a real-life space environment. By simply moving the head around, the user would see various objects in the scene. Melodious background music will be played while the user is enjoying the pleasant space coaster journey.

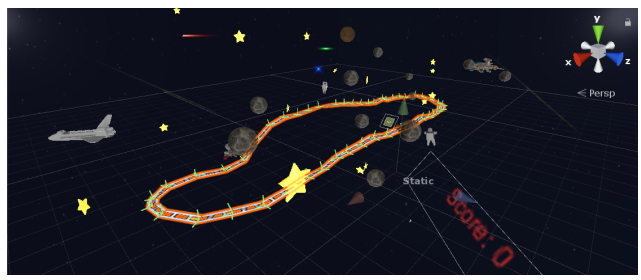


Figure 1: Roller coaster rails.

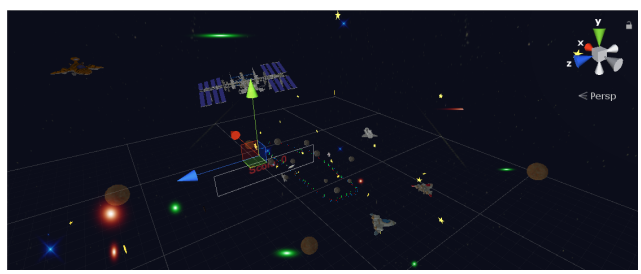


Figure 2: Game environment.

2.3. Interactive shooter game

While feeling a little bit bored on just enjoying the scene on the roller coaster, the player could also shoot on the stars in the surroundings and get points. The score will be shown on the screen. For guiding the user where is the center point of the screen, where the shooter is actually pointing, we placed a pink dot in the middle, and if any stars touches the pink dot while the user is pressing space, such star will disappear and 1 point will be added. Note that not all kinds

of stars are designed for shooting game, so the user should also distinguish the correct type of star during the game.

3. How to play

The starting scene is a roller coaster sitting on the rail, facing a button says ”GO!”. By clicking that button with mouse, the roller coaster will start to move. While moving, user can press space and shoot surrounding stars. If the star disappears, the player will get one point, and the total score is shown on the screen.

Figure 3: Stereo rendering during game playing.

4. Head and Waist model

While watching a roller coaster video or experience roller coaster in first person perspective in VR, people will commonly feel uncomfortable due to the fast moving of the seat resulted in fast changing on the screen. We assume that this may because the imu is so sensitive to the motion on the head, even if we turn on the ”had and neck model”. Therefore, we proposed an augmented ”head and neck” model, and call it ”head and waist” model by increasing the ratio between the neck length and head length, so that the player is actually rotating around the waist.

After doing user study on 15 different students, 9 students found the head and waist model release some of the pain in a high-speed roller coaster, 6 students did not feel so much difference.

5. Acknowledgement

We want to specially thank our TA, Robert Konrad, for his help on building our project and patience on teaching us how to use Unity. We cannot make thing happen without his help, and we truly learned a lot from this project.

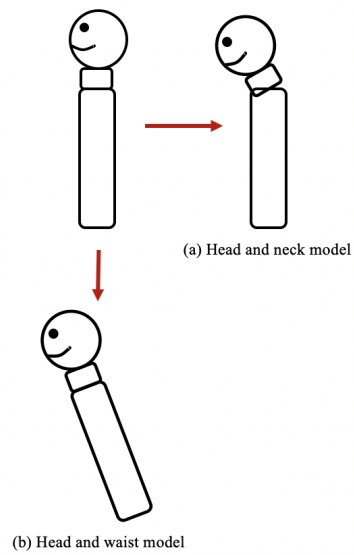
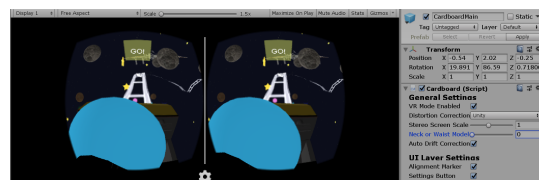
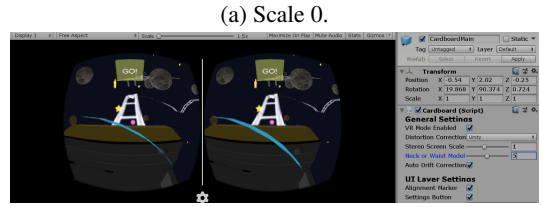


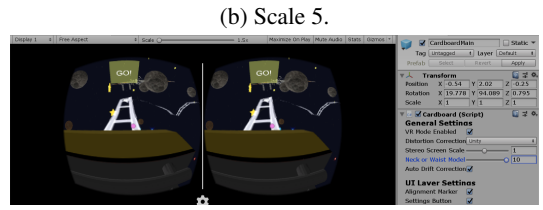
Figure 4: Head and neck model vs. Head and waist model



(a) Scale 0.



(b) Scale 5.



(c) Scale 10.

Figure 5: Neck or waist model with different scale factors

References

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https://assetstore.unity.com/packages/templates/packs/cardboard-vr-roller-coaster-59853
[2]Shooting with Raycasts - Unity Tutorial:
https://www.youtube.com/watch?v=THnivyG0Mvo
[3]EE267 Lecture Note 10