CMSC 498W Spring 2016
Assignment 2
Due March 3 12:30 PM

Part 1: Hello Rift

Background

To display a Virtual Reality scene in a Head Mounted Display (HMD), two virtual cameras, representing the viewer's eyes, are placed in the computer model of the world; the images seen by these cameras are then displayed on the corresponding lenses of the HMD. For this to work properly, the cameras must be placed at the same positions as the viewer's eyes would be; unfortunately, due to physical differences between individuals, different users' eyes would be at different positions in the scene. Displaying images from eye positions different from where the viewer is used to their eyes being can cause unpleasant effects, such as nausea.

To solve this problem, the Oculus Rift can be calibrated with physical measurements describing an individual user's eye positions. These measurements can tell the software, for example, how high above the ground the eyes are, how far apart they are, and how high above the user's neck they are (this can be used to move the cameras properly when the user tilts their head). In this portion of the assignment, you will experiment with this calibration.

Tasks

1. On the Oculus Developer page, go to the Docs section, and then
   PC SDK → Developer Introduction Guide → Getting Started
   (https://developer.oculus.com/documentation/pcsdk/latest/concepts/ug-tray-start/)
   Read this section, paying particular attention to the Advanced Settings subsection.

2. In the Oculus Configuration Utility, create a User for yourself and enter your values for "Gender" and "Player Height". Open the Advanced settings and note the default value chosen for interpupillary distance (IPD). Use the Measure option to measure your actual IPD, and compare the measured value to the default. Record your measured value. **(1 pt.)**

3. Select Show Demo Scene and observe the scene. Then, observe the scene again with each of the following changes: player height at max (7' 6"), player height at min (4' 4"), IPD at max (70.0 mm), and IPD at min (55.0 mm).

Part 2: Best Practices

Background

Oculus provides an extensive guide on VR Best Practices on their Developer site (https://developer.oculus.com/documentation/intro-vr/latest/concepts/book-bp/). These practices are designed to improve the comfort and immersiveness of the experience for the user. Some of these practices are targeted at engine developers; if you are using Unity, these should already have been taken care of. Other practices are targeted at content developers; these are the ones you will need to be concerned with if you are developing a VR experience in Unity.

According to Oculus, User-Interfaces should be placed about 2-3 meters from the viewer (1 unit in Unity = 1 meter), since this is the optimal distance for long-term viewing of objects in VR. Also, the interface should be contained in the middle 1/3 of the screen horizontally and vertically, since this will prevent the user from needing to move their eyes to see the entire interface. In this portion of the assignment, you will create such an interface and experiment with what can happen if it is done poorly.

Tasks

1. Create a menu that exists 2.5 meters from the viewer and takes up 1/3 of the screen, as described above. The menu should remain centered if the user turns their head. The menu should contain a "Play" option that, if selected with the Enter key, will cause the menu to disappear. **(4 pts.)**

2. Add an option to increase or decrease the size of the menu on the screen using the arrow keys. The possible sizes should range from the original 1/3 of the screen to the full screen. **(2 pts.)**

3. Add an option to increase or decrease the distance of the menu from the viewer using the arrow keys. As the distance changes, the size should be updated at the same time so that the menu always takes up the same amount of the screen. The possible distances should range from 0.25 meters to 25 meters. **(2 pts.)**

4. Experiment with changing the size and distance of the interface to see what types of discomfort can result.

Part 3: Procedural Content

Tasks

1. Download the Procedural Tree script from the Unity asset store
   https://www.assetstore.unity3d.com/en/#%21/content/32907
   and add a procedural tree to the world. **(2 pts.)**

2. Use a Unity script to create a small forest by populating the world with several Procedural Trees scattered at random locations. Ensure that the way you do this does not cause all trees to appear identical. **(4 pts.)**

What to Submit

Submit a zipped copy of the Unity project folder using the Submit Server. Do not include executables or temp folders; these may be removed by fully exiting Unity before creating the zip file. Submit your measured IPD from Part 1 in a file called IPD.txt included in the zip file.