Virtual Reality Project - CS291A Future User Interfaces
Winter 2020
BEGIN: Jan 23, 2020
DUE: Mar 5, 2020 (Paper), Mar 10, 2020 (Presentation), Mar 12, 2020 (Demo)

Abstract

Virtual reality has the potential to change the way we live, communicate, learn and interact with technology. What makes this possible is the convergence of many digital technologies that we have seen develop since the 1960s. These include processing power, memory, display technologies, optics, sensing and reconstruction, input and interaction, rendering, tracking and connectivity, to name a few. As prices continue to drop and devices become more user friendly along with the availability of new types of applications as we saw in class on Jan 21, VR could become as commonplace as many other digital devices we already use on a daily basis.

So far in this course, you have been introduced to aspects of HCI and VR design along with an introduction to Unity, necessary to make a viable VR project. Now, you’ll be using what you have learned so far and continue to learn, in and outside class, to make a VR experience. This final project is comprehensive in that it combines several elements of what has been and will be presented in class. The overall goal is to help you go through an entire research cycle -- problem finding, brainstorming ideas, reviewing a research paper, implementing your design, presenting your implementation, and writing about your work, as well as learning to provide respectfully critical, encouraging and unbiased feedback to your classmates.

I will provide Oculus Quest headsets and controllers to each team and you do not need to purchase anything, except perhaps AA batteries for the controllers after the first two (one in each controller, the headset has a rechargeable battery so you need to plug it in) run out.

You should not need to purchase any digital assets either as the Unity asset store has many things (3D models, animations, sound clips, materials etc.) available for free. Freesound (https://freesound.org/) can be a good source of sound clips, several of which are under a Creative Commons license. From Mixamo (https://www.mixamo.com/#/) you can download 3D character models and animations for free. There are two natively supported audio spatializer plugins in Unity for your use: https://docs.unity3d.com/Manual/VRAudioSpatializer.html

IMPORTANT: Do not use any copyrighted material in your project.

I hope you have fun creating, exploring and learning!

Project Description

The goal of this project is to design a VR experience that goes beyond visually centric games and apps currently available on the Oculus store or Steam. Your group will create an
experience where sound will play a dominant role. Interaction design is an important part of this project. You should spend the first couple of days on the project brainstorming how to best utilize the 3D immersive quality of VR and how to make the most of it. Of course your project should be as interesting, creative and dramatic as possible.

Here are some project ideas -- a musical game, a new type of interactive musical instrument, an experience that uses sound for navigation, an audio storytelling experience, a visualization of sound data, a tool to help others play with sound in VR, audio as a communication mechanism in VR.

Here are some example apps. Most all these apps focus on music but many more things can be done with sound, as listed in the project ideas above.

Intone: https://www.youtube.com/watch?time_continue=4&v=xeatsFrfipA
Playthings: Musical VR Playground: https://vimeo.com/155628376
Canetroller: https://www.youtube.com/watch?time_continue=43&v=Q1jHXxUBJ8o
http://redpillvr.com/
The Wave VR: https://www.youtube.com/watch?time_continue=136&v=xrIRPH2yGtl
Vinyl Reality VR Mixing: https://www.youtube.com/watch?time_continue=107&v=9-e0_GZCxrU

Projects must be presented using the free personal version of Unity 2019 available for individual use. Creativity is important!. You can and you should go above and beyond the basic project requirements in both the technical aspects and in the design of your virtual experience.

Requirements

There are three main parts that make the entirety of the project: the idea, the interaction, and the technical implementation. This is a group project so that the work can be distributed and the project accomplished in time. There are some major requirements for each group outlined below.

Project milestones

- Each group will meet with Misha to discuss their 5 project ideas (Jan 28)
- Each group will present their final selected project idea in class (Feb 6) - 5%
- Each group will meet with Misha for a progress review of the project (Feb 18) - 10%
- Each group will meet with Misha for a progress review of the project paper (Mar 3)
- Each group will submit their project paper (Mar 5) - 10%
- Each group will do a presentation in class about their project (Mar 10) - 10% + 5%
- Each group will do a demo of their project at the open house (Mar 12) - 15%
Technical Requirements

The project needs to have well thought out interaction as well as well defined tasks for a user to perform. The Unity Engine, the VR headset and controllers and the Oculus Integration plugin from the Unity Asset Store provide you with all that is needed to build an interactive VR interface.

Mandatory Project Components

Your group must implement the following components:

- Navigation / Locomotion System
  - This could simply be walking around in the real world to walk around in the virtual world
  - This could be an implementation of an existing VR locomotion system like teleportation ([https://developer.oculus.com/documentation/unity/unity-sf-locomotion/?device=QUEST](https://developer.oculus.com/documentation/unity/unity-sf-locomotion/?device=QUEST))
  - This could be something entirely new that you come up with

Do not make a ‘standing only’ experience. Some movement is mandatory. If a user is on a flying ship, the user should be able to move around the ship.

- Interaction System
  - You must be able to interact with objects in your virtual environment. For example, this could be mean picking up an object and inspecting it, shaking hands with a virtual avatar, hand gestures to create musical drawings in air, or clever interaction mechanics of your own choice, appropriate for your specific experience.

- The Audio Experience
  - This is the essence of the project. It doesn’t need to be complicated but it needs to be a full experience that lasts at least 3-5minutes with the user performing tasks or activities that make sense. For e.g., playing a full song in Beat Saber OR using spatialized sound in an Escape the Room style experience to help a user navigate their way out of a dark space OR an interactive music composition experience.

- The Virtual World
  - You must create a virtual space that acts as a setting for the experience you are designing. For e.g., if building a DJ experience, then a stage, crowd and other related scene elements that would not be out of place in a DJ experience.

- Animation of objects within the scene

- Something else! (optional)
  - Surprise everyone with something fun and cool.
Submission

You will present your work at the final open house. It needs to be a working prototype, not a description of unimplemented ideas.

Resources

I do not expect you to have access to personal high performance computers and VR headsets to complete this assignment. Thus I am making available 8 Oculus Quest devices for programming and development. You should be able to use a normal laptop to run Unity for development of your VR project. If any team does not have access to a computer/laptop for development, let me know asap.

Questions?

Ask me any questions/clarifications in class so that everyone can learn from it.