

CSE 190: Virtual Reality Technology

LECTURE #1: COURSE OVERVIEW

Instructor

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Office: Atkinson Hall, Room 2125

Office hours: Thursdays 3:30-4:30pm

TA and Tutors

TA:

- Karen Lucknavalai

Tutors:

- Weichen Liu
- Ziyang Li

Office hours will be held in VR lab, room B210. For times see Piazza.

Course Goals

Provide in-depth knowledge of virtual reality technologies.

Gain experience with the software pipeline for rendering in VR systems, with a focus on HMDs.

Give up-to-date overview of current VR and AR technology developments.

Course Topics

Introduction to course and VR/AR

Human perception

VR and AR display systems

Head mounted display components

Sensor processing

Spatial audio

Content creation:

- VR authoring tools
- Panoramic video

VR programming in C++ and OpenGL

Prerequisites

CSE167 (Introduction to Computer Graphics) or equivalent

- Programming in C++ with modern OpenGL
- Microsoft Visual Studio for C++
- Linear algebra, coordinate system transformations
- GLSL shader programming

You need to know how to debug C++ code

You need to feel comfortable writing C++ programs from scratch

Online Course Resources

Course web site:

- <http://ivl.calit2.net/wiki/index.php/CSE190S2019>

TritonEd :

- Grade management
- Submission of code for homework projects
- Scheduling of content presentations

Piazza:

- Course related notifications and discussions
- Tutors' office hours
- Miscellaneous things: VR/AR events, internships, jobs
- URL: <https://piazza.com/ucsd/spring2019/cse190/home>

Lectures/Discussion

Lectures:

- Tue/Thu 2-3:20pm at EBU3B, room B210 (VR Lab)

Homework Discussion:

- Mondays 3-3:50pm, starting April 8th
- Location: VR lab

Homework presentations:

- Fridays on due dates at 2pm in VR lab

Assignment Submission on Ted

Submissions are required for each homework project:

- All source code (.h and .cpp files)
- Shader code
- 3D models, textures, etc.
- Don't upload code binaries or project files

Books

No required books.

Recommended books: see course web site

Class Structure

- Two lectures per week
- Three structured homework assignments
- Final Project
- Written exam
- VR content presentation

Grading

Project 1	15%
Project 2	15%
Project 3	15%
Final Project	25%
Midterm Exam	25%
Presentation	5%

Cloud Storage

Unless otherwise explicitly authorized, each student is completely responsible to keep their code, homeworks, design files and other course work off of publicly accessible internet sites.

Example: it is **not allowed** to put code in a **public** Github repository.

However, you are **encouraged** to put your code in a **private** Github repository.

These rules expire after finals week.

Programming Assignments

- You write applications to run on the Oculus Rift
- Use lab computers or your own VR ready laptop
- Teamwork (teams of two) allowed for projects 1 and 4
- ~2 weeks for projects 1-3, ~3 weeks for final
- Operating system: Windows 7 or 10
- Programming language: C++
- APIs: OpenGL, Oculus SDK, and others
- Grading in CSE lab B210
 - Demonstrate to course staff on due dates after 2pm
- If you can't finish your project by the due date, you can submit on the following Friday, but your score will be subject to a penalty of 25%.
- If you want to get graded before the due date, you can do this during any of the tutoring hours in the lab, but you only have one attempt at early grading. Note that you will then get graded on your entire project again, not just the part that was missing or incomplete.

VR App Presentation

- Each student needs to present a **VR or AR app** in class
- App must run on your smart phone with a VR viewer (eg, Merge VR, Gear VR, Daydream) or an Oculus Go in 3D stereo with head (orientation) tracking
- The app must be from an app store (eg, Google Play, Apple Itunes, Oculus store, Samsung Gear VR store)
- Enter app URL on scheduling wiki on TritonEd
 - Deadline: Monday, April 8th
 - You must at least pick a date by then
- In-class presentation should take ~5 minutes
- After presentation: short Q&A

Example for VR App

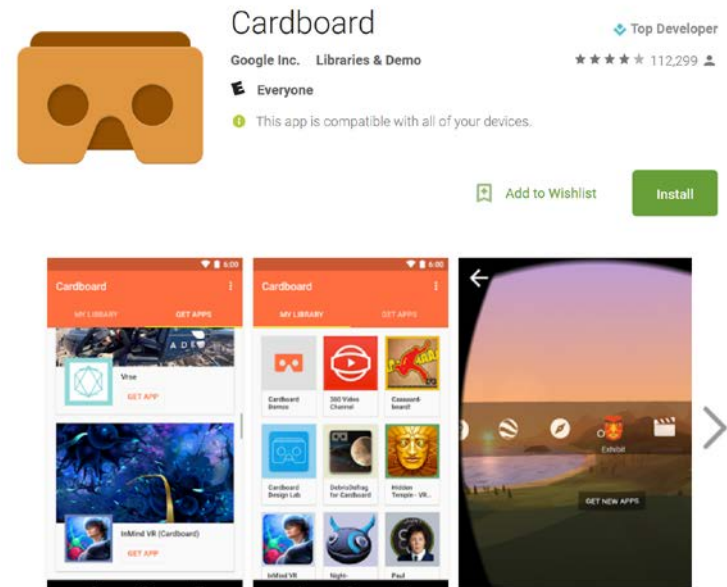
App: Google Cardboard

URL:

<https://play.google.com/store/apps/details?id=com.google.samples.apps.cardboarddemo&hl=en>

Comments:

- This app is a portal to a large number of Google vetted VR apps
- Pros: Very polished, great tutorial mode, large variety of apps to choose from within VR mode
- Cons: requires Cardboard compatible viewer



Cardboard puts virtual reality on your smartphone. The Cardboard app helps you launch your favorite VR experiences, discover new apps, and set up a viewer.

Try out a set of included demos as well

Midterm Exam

In-Class written examination.

Closed book.

Date: May 23rd

Counts as 25% of your grade

Exam content covered in class

Previous years' exams available on course schedule

Final Project

For teams of two

Less formalized project, similar to final projects in CSE 167 and CSE 165

Based on C++ and OpenGL

25% of grade

Project videos from Spring 2018:

<https://www.youtube.com/watch?v=0saIJ3tKCK0&list=PLINx2DKpKpTuRzXIEkhCVwcoVUI4-Pgtj&index=4&t=0s>

<https://www.youtube.com/watch?v=UgECLCYevcw&list=PLINx2DKpKpTuRzXIEkhCVwcoVUI4-Pgtj&index=16&t=0s>

Note on Slides

Most of the slides were created from scratch for this course.

Some of the material was inspired by the three recommended books.

Some of the slides were inspired by Professor Gordon Wetzstein (Stanford), from his course EE 267 – Virtual Reality.

- <https://stanford.edu/class/ee267/>

Announcements

Oculus lock codes given out Thursday after class in B210

First discussion will be Monday at 3pm in B210

Deadline for time slot selection on wiki: April 8th 11:59pm

Door code for VR lab should be accessible from UCSD student accounts.