

CSE 190: Virtual Reality Technology

LECTURE #1: COURSE OVERVIEW

Video Recording

Disclosure:

This and all other Zoom lectures and discussion sections will be recorded (audio and video) and made available on Canvas. This includes all student interactions.

Instructor

Jürgen Schulze, Ph.D.

Research Scientist at Qualcomm Institute

Adjunct Professor in CSE Department

Email: jschulze at ucsd.edu

Office hours:

Tuesdays 2-3pm, starting today

Zoom link: <https://ucsd.zoom.us/j/99338899926>

Teaching Assistant

Guowei Yang

Best to reach through Campuswire

Will offer:

- Discussions on Mondays at 2pm on Zoom (starting next week)
- Lab hours, see Campuswire for schedule (starting next week)

Course Goals

Gain in-depth knowledge of virtual reality technologies.

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

Get up-to-date overview of current VR and AR technology and research.

Course Topics

- Overview of the state-of-the-art VR technologies and research trends
- VR programming in Unity
- Human visual system: 3D depth cues, color perception
- Fundamental physics of 3D displays
- Display types: LCD, OLED, volumetric, light field
- How to generate stereographic 3D images
- Immersive VR systems: Head Mounted Displays, CAVE, smart phone VR, etc.
- Augmented reality devices
- Rendering to Head Mounted Displays

Prerequisites

CSE167 (Introduction to Computer Graphics) or equivalent

- Linear algebra
- Coordinate system transformations
- Shader programming

General knowledge about debugging of code.

Useful Experience

Software development with Unity

Programming in C#

Experience with 3D modeling tools

VR Headsets

CSE department will provide loaner Oculus Quest 2 headsets to those who need them.

If you don't have a 6 DOF tracked VR headset (e.g., Oculus Rift/S, HTC Vive/Pro, Microsoft Mixed Reality, etc.) please fill out Google survey sent to you by email.

If you got a headset for CSE 165 you can keep it for this course.



Online Course Resources

Course web site:

- <http://ivl.calit2.net/wiki/index.php/CSE190S2021>

Canvas:

- Grade management
- Submission of homework projects
- Scheduling of student presentations

Campuswire:

- Everyone should have received an invite by email
- Course related notifications and discussions
- TA office hours
- Miscellaneous: events and opportunities in VR/AR

Important Dates

Lectures:

- Tue/Thu 12:30-1:50pm live on Zoom
- Recordings will be available on Canvas within 24 hours

Homework Discussion:

- Mondays at 2pm live on Zoom, starting April 5th
- Recordings will be available on Canvas within 24 hours

Homework submission deadlines:

- Sundays at 11:59pm, see course schedule for due dates

VR app presentation scheduling due Sunday, April 11th at 11:59pm

Final exam:

- 3 hour time slot
- Monday June 7th 11:30am to Tuesday June 8th 11:30am

Homework Assignment Submission

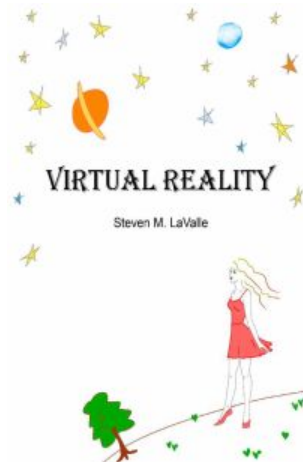
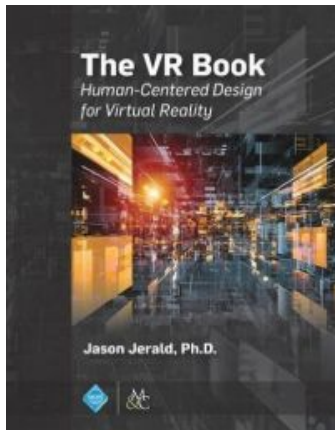
Submissions are required for each homework project

- Submit video of VR recording on Canvas
- Optionally submit Unity project or Git repository link

Books

No required books.

Recommended books:



[The VR Book](#) by Jason Jerald, 550 pages, Morgan & Claypool Publishers, October 16, 2015, ISBN-10: 1970001127, ISBN-13: 978-1970001129

[Virtual Reality](#) by Steven M. LaValle. To be published by Cambridge University Press. Available as PDF free of charge.

Class Structure

- Two lectures per week
- Four structured homework assignments
- VR content presentation
- Written final exam

Grading

Programming Project 1	15%
Programming Project 2	20%
Programming Project 3	20%
Programming Project 4	20%
Written Final Exam	20%
VR App 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 Environment

All homework projects will be using Unity.

Download free student license from:

<https://store.unity.com/academic/unity-student>

You can choose to use any other VR content development environment instead, but will not be able to get support from instructor/TA.

- Unreal Engine
- Lumberyard
- Cryengine
- C++/OpenGL
- Etc.

VR App Presentation

- Each student needs to present a **VR or AR app** in class
- It can be a game, entertainment or productivity app
- The app must be able to run on your VR device
- The app must be publicly accessible on the internet (e.g., Oculus Store, Steam, Viveport, Google Play, Apple Itunes, etc.)
- Enter your name, app title and app URL on scheduling page on Canvas for scheduling
- Presentation should take 5-8 minutes
- After presentation: short Q&A

Example for VR App

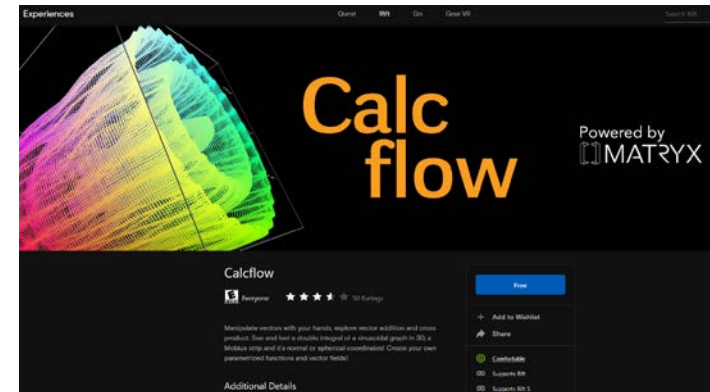
App: Calcflow

URL:

https://www.oculus.com/experiences/rift/1143046855744783/?locale=en_US

Comments:

- Visually teaches linear algebra concepts such as vector addition and cross product.
- Pros: Very polished, large variety of mathematical concepts are taught
- Cons: does not support Oculus Quest



Acknowledgements

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

Some of the material was inspired by the recommended books.

Some of the slides were inspired by Professor Gordon Wetzstein's Stanford course EE 267 (Virtual Reality)

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

Questions?
