Course Proposal: Virtual Reality

Tentative Syllabus
Spring 2018

General

- Instructor: Jiasi Chen

Description

While the idea of virtual reality (VR) has been around for many years, recent commercial availability of hardware and software is spurring renewed interest. This course covers the development of virtual reality worlds, including mathematical basis of motion and physics in VR worlds, human visual perception, design practices to enable immersive experiences for users, and development on heterogeneous device hardware. A major component of the course will be a final project where students develop their own VR worlds based on the design practices discussed during the course.

Syllabus

Week 1
Overview of course. Overview of VR hardware and software. Current trends.
Reading: LaValle, Ch. 1-2

Week 2
Geometry of virtual worlds. Translations, rotations, orientation through matrix transformations.
Reading: LaValle, Ch. 3

Week 3
Properties of light and lenses. Human visual perception of VR worlds. Implications for design of VR hardware and software.
Reading: LaValle, Ch. 4-6

Week 4
Visual rendering. Storing and transmitting VR data over the network.
Reading: LaValle, Ch. 7

Week 5
Motion and physics of VR worlds. Preventing motion sickness.
Reading: LaValle, Ch. 8

Week 6
Positional tracking through external sensors (e.g., IR) and internal sensors (e.g., gyroscopes, accelerometers).
Reading: LaValle, Ch. 9

Week 7
Social interactions within the virtual world. Environmental interactions using controllers. Adapting to heterogeneous capabilities of different VR hardware.
Reading: LaValle, Ch. 10

Week 8
Creating immersive audio experiences.
Reading: LaValle, Ch. 11

Week 9
Augmented and mixed reality, and their relation to virtual reality. Capturing and integrating ``reality'' into virtual reality.
Reading: TBD

Week 10
Project presentations

Textbook
Steven M. LaValle, Virtual Reality, 2016.
Online version: http://msl.cs.uiuc.edu/vr/

Grading
Lab programming assignment 1: 10%
Lab programming assignment 2: 10%
Lab programming assignment 3: 10%
Midterm 1: 20%
Midterm 2: 20%
Final project: 30%

- Proposal: 5%
- Presentation + demo: 10%
- Report: 15%