CIS 19x Syllabus - Virtual Reality

Instructors: Sacha Best CIS ’17, Trung Le CGGT ’17

Faculty Sponsors: Norm Badler, Stephen Lane

TAs: Jian Ru CGGT ‘17, Emily Vo CIS ‘17

Prerequisites

This course is targeted at students who have at least one year of programming experience. A graphics background is not expected nor required. Ideally, this would be students who have taken CIS 110 and 120. Admission to the course will be by application only.

Course goals

Students should gain a solid, breadth based understanding of the tools that exist to bridge the gap between virtual reality hardware and computing software. This includes, but is not limited to, Unreal Engine 4, Unity3D, Three.js, and Google’s Daydream.

However, this course is not one in game design, nor pure graphics. The tools and concepts covered will be exclusively those relevant to virtual reality development, and it so happens that certain concepts in graphics and game engines are required to work in VR.

After an intensive, 12 week seminar, students should be able to quickly create projects on at minimum two of the aforementioned platforms, and gain experience in developing an interactive application through a capstone project in teams of 3-5.

Schedule

Week 1: Introduction to VR, its applications, and its challenges as an emerging technology and a vessel for novel interaction.

Assignment: Install requisite software, get dev environment working with Vive/Oculus and the controllers following the Unreal and Three.js VR tutorial.

Week 2: Introduction to 3D math for graphics and games. - **SACHA**

Assignment: Written homework on vectors, bases, etc.

Week 3: Intro to Three.js - **SACHA**

Assignment: Create a procedural, particle based “light show” using an HMD (2 weeks)

Week 4: Advanced Three.js. Navigation in VR, motion sickness, and other related design challenges. - **TRUNG**

Assignment: Work on previous

Week 5: Unreal Engine and survey of desktop game engines - **SACHA**

Assignment: Create a first-person, shoot to teleport game in UE4 (3)

Week 6: Game engine design theory (actors, run loops, rendering, physics, etc.) - **SACHA**

Assignment: Work on previous

Week 7: Unreal Engine 4, C++. Design optimization for your VR applications to achieve healthy framerates. - **TRUNG**

Assignment: Work on previous

Week 8: Introduce final project, form teams, seminar on designing for VR - **SACHA/RICHARD**

Assignment: Final project milestone 1

Week 9: Networking, multiplayer - **SACHA**

Assignment: Final project milestone 2

Week 10: Guest lecture on procedural environments for games - **RACHEL**

Assignment: Final project last milestone

Week 11: Bringing external information into games (APIs, scraping, etc.) - **SACHA**

Assignment: Final project last milestone

Week 12: TBD - possibly flex, answer common questions, clarifications

Assignment: Final project last milestone

Week 13: Final project demos, class survey

Assignment: Package final project for distribution; release open-source

Projects:

Passive VR: Three.js non-interactive visualization of data-drive or procedural graphics
Active VR: Unreal Engine 4 driven interactive game or data-driven experience
Capstone: Push the applications of VR to new limits; don't just make a game, attempt something that has not been done before

Grading policy:

Class participation: 20% (we want an engaged class)
Final project: 50%
Other assignments: 30%