Project #2—Serious Games & Simulators

In this assignment, you will create a high-stake "serious" game or simulator, designed to train or educate a population (learning), treat/prevent some illness (health), or perform some work (productivity).

This is a **service-oriented** project, where you are not simply inventing your application, but providing the technical design and implementation skills to a domain expert who actually wants this project.

Here are some examples / ideas:

- **Health: Obesity prevention / physical rehab through VR Exercise –** Working with an athletic trainer, physical therapist, or kinesiologist, instrument a stationary bike to sense rider power and from that, build an immersive VR bicycle simulator for exotic terrains. Add haptic feedback in the form of vibrations. Provide measurements and graphs for all activities that can be used to track progress or compete with others.
- **Learning: Engineering Statics Education -** Working with an engineering instructor, create an immersive VR sandbox that has both an authoring and testing interface, where an instructor can author a physics simulation illustrates the concept of balanced forces & moments, and the student can identify/annotate those forces & moments for testing. Use a haptic joystick to allow forces to be felt by both instructor and student.
- **Training: Fire Safety –** Working with a local firefighter, create an immersive VR simulator that teaches children and parents what to do in the event of a fire. Control a heat lamp and smoke system to enhance the haptic and olfactory sensory inputs.
- **Productivity:** Working with a researcher/instructor/business, create an immersive VR document analysis system that allows a user to array hundreds or thousands of text documents or images around them in 3D space, navigating between them and manipulating their 3D locations for reading, viewing, or comparison. Allow the user to create physical links between documents that maintain their relative transformations.

Requirements:
- You must have a domain expert involved in your project. The more involved, the better. You must provide convincing evidence of their involvement. For example, if they attend final demonstration session, or you have audio recordings/meeting minutes of working with them.
- The system must qualify as immersive VR. This does not necessarily imply any particular type of technology. An ordinary monitor and haptic joystick could qualify in certain circumstances. Ask before you decide if it's not obvious. What's important is that the immersive aspects **add value** to the application.
- The application must be serious, though it may also be fun. The more useful the application, the better.
- The system must consist of – and the application must be improved by – at least 2 display types (video, audio, haptic, olfactory, gustatory). The more that are effectively fused, the better.
- The system must consist of – and the application must be improved by – at least 2 tracking systems (e.g. optitrack, hydra, fastrack, spacepoint). The more that are effectively fused, the better.
- The system must utilize network synchronization (either through VRPN or Unity Networking) to allow for two independent views of the shared virtual space. Only one of the views needs to be immersive.
- You must build a demonstration experience. This should cater to someone trying your project for just a few minutes. You can focus on this, but the vision should be for something broader that could see long term use.

Grading Considerations:

- **Usability**– Any aspect of your system performance or configuration that is poorly designed such that it hurts user performance or presence will adversely affect your grade. For example, if you have a slow update rate, or you did not match tasks well with your 3DUI.
- **Usefulness**—It's not expected that you will create the best possible immersive VR application in a month. However, the vision must be there, that with time and resources, your application could see actual use by real world stakeholders.
- **Creativity**– Great ideas emerged out of deliberate design processes (e.g. brainstorming with stakeholders) are particularly important. Also, designing your own input devices or 3DUI schemes that fit your application will greatly improve your grade.
- **Design** – Above all, I look at how much you learned about VR system design from the course. The more you can explain **why** you made the decisions you made for your project, the better.

Graduate Students: Graduate students must have a system that produces measurable and useful performance statistics or productivity artifacts. These should be produced automatically from system use. Graduate students should also use interaction techniques, displays, or other elements found in the Virtual Reality, 3DUI, or HCI research communities. Cite these and explain how they influenced your design in a 2-page write-up.

Submission: 1-week prior to the final exam period, all projects should submit a title, team members names, e a 200-word (maximum) abstract, and a 1-minute promotional video for their project. These will be posted as an advertisement for a <u>public</u> demonstration session. **During the final exam period**, you will be required to run me through your demonstration, which will be video recorded. During that demonstration, I will ask you and your team members questions. Graduate students should turn in their write-up at this time.

Groups: You may work with (at most) 2 other students on this assignment (mixed grad/undergrad teams are fine). All team members must contribute substantially to the project (be prepared to defend your contributions at the demonstration session).