

Virtual Reality Simulation of Fluid Mechanics Laboratory Instruction

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Physical laboratory experiments are designed to provide students with the opportunity to learn in a hands-on environment where they develop technical acumen while becoming familiar with industry specific technologies. The engagement and familiarization of these technologies like industry standard measuring tools, industrial machinery, and computer software are crucial to the training and development of mechanical engineering students who aim to be competitive professionals in their field. Technical acumen is earned in the lab environment as the student observes mechanical engineering principles in action. However, due to the rapid growth in enrollment for many already impacted engineering programs, undergraduate students experience an increasing difficulty gaining valuable hands on experience in the lab.

Our group is focused on developing a virtual lab of the Fluid Mechanics laboratory. There are two types of virtual labs—Virtual Reality (VR) simulation and 360° Virtual Lab Tour—being created for this project to supplement students' engagement in the lab. This poster reports our development of an interactive VR laboratory which is achieved by simulation with realistic audio, visual, and haptic feedback. The goal of this project is to provide an immersive and rewarding experience like a challenging video game where students interact with lifelike representations of lab experiments in a virtual space. Through a virtual headset and manual controls, students will gain access to a virtual lab for extensive exercise that is not limited by enrollment capacity or lab availability.

The VR Simulation lab is created by utilizing the Unity game engine paired with the Oculus Rift VR headset. Programming and design of virtual lab experiments is based on existing physical lab exercises. After the physical lab meeting, students will collect multiple sets of data with different parameters in the VR Simulation lab outside the lab time. Preliminary student tests will be conducted in Spring 2019, and feedback will be collected to guide further development.