Challenges in creating realistic and immersive virtual reality environments and laboratories for engineering education

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Abstract: This presentation focuses on the challenges associated with creating immersive virtual reality laboratories to enhance surveying engineering education. The challenges can be separated into two main categories: (i) challenges related to the virtual environment and (ii) challenges related to the replication of surveying instruments and physical laboratories in virtual reality.

For the first category we will discuss issues associated with data collection, processing, and modeling. For the purposes of this study, data collection was conducted using terrestrial laser scanner and unmanned aerial systems. Point-clouds derived from these techniques were used to create the environment in Autodesk 3DS Max and Unity. The virtual reality environment needs to replicate accurately the real-world environment, while maintaining efficient rendering and navigation in the virtual world.

Next, we will discuss issues pertaining to the virtual reality laboratories and surveying instruments. A challenging part of this project was creating the virtual surveying instruments. The levels, tripods, and leveling rods each had unique requirements. The virtual equipment had to replicate their real-world counterpart's functions while maintaining the same device arrangement and interact with the user given limited user interface options. Further problems were encountered while running consumer software in an enterprise environment with limited manufacture support.

The objective of this presentation is to discuss and present the challenges related to creating realistic and immersive virtual reality environments, as well as replicating surveying instrumentation and exercises for laboratories.