HOLOLENS MATERIALS STRESS VISUALISATION

Speeding up the testing workflow

STRUCTURAL TESTING LAB NEEDS ANSWERS **NOW**

Fig 1: The hydraulic test rig that is used to test the structural materials

The Structural Testing lab tests various construction materials by applying forces via a hydraulic press and sees when and where it fails.

Previously, researchers would have to wait for the test to finish in order to analyze the data, and as the test was occurring they had no real way of seeing what was happening. As tests can take days, not being able to analyze until its completed can seriously delay analysis and makes it difficult to make small changes to the tests.

This project aims to expedite the material research process by implementing a live feedback system that allows for real-time augmented reality visualization of structural forces during testing.

This will minimize the delay between visualization and testing, freeing up valuable time for researchers and engineers to focus on other essential tasks.

Fig.2: a Microsoft HoloLens 2, the same device used in this project

APPROACH TO THE PROBLEM

Each specimen being tested is embedded with various sensors that record structural stress across the object.

These sensors transmit analog voltage data to the lab computer, which gets processed and transmitted over a serial connection to a computer that updates a webserver with the data.

The hololens polls the web server periodically to get the data and update the AR sensor markers.

Using the Unity engine allows us to easily and successfully use the integrated features of the Hololens via the MRTK Toolkit.

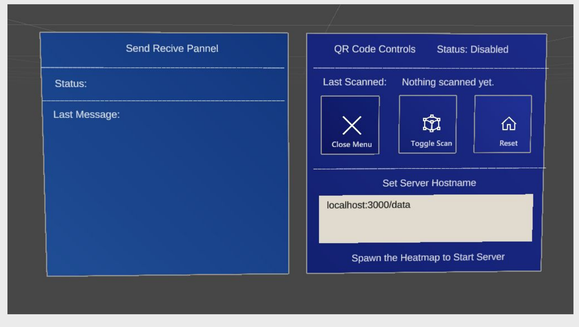

Fig.4: A menu we created to be displayed as a hologram

IMPROVING TESTING EFFICIENCY

Using augmented reality goggles, we can overlay computer graphics directly on top of a physical object and see both in real time. This allows us to visualize live data directly without disrupting the testing workflow

We can use a heatmap to get the general sense of the stress on the test specimen and add specific number labels to each sensor for a detailed look

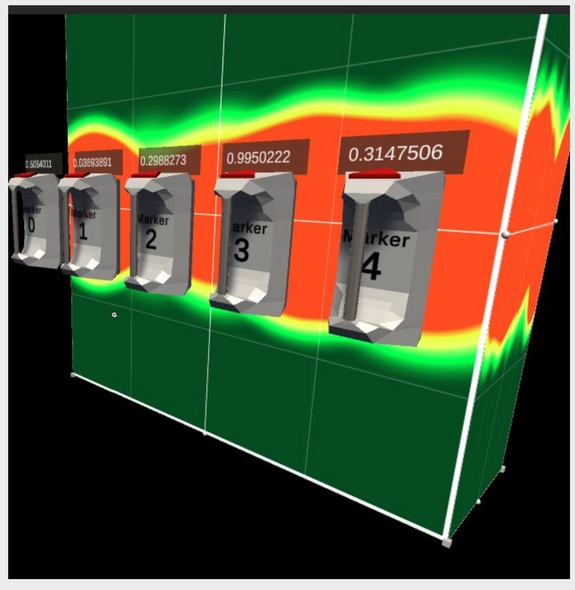

Fig.3: An example of visualization of sensor data on a heat mapped object

WORKING WITH A HOLOLENS

There was difficulty debugging, building, and testing on the device; workarounds had to be devised. We had to figure out how to world-lock the 3D space, move the markers and do other configuration in AR

Microsoft's strong integration with Unity and pre-built tools guided us along the way. The end result is a visualizer that allows researchers to get insights into their data and make improvements far faster than was previously possible.

The Team

Peter LaMontagne -
lamontap@oregonstate.edu

Austin Friedrich -
Austin.t.friedrich@gmail.com

Dietrich Lachmann -
lachmand@oregonstate.edu

Henri Pierre -
pierreh@oregonstate.edu

Fig.5: (Left to Right) Austin Friedrich, Dietrich Lachmann, Peter LaMontagne, Henri Pierre

Project Partner: Mike Bailey - OSU CS Professor specializing in Computer Graphics

Project Stakeholder: Chris Higgins - OSU Professor of Civil Engineering

Oregon State University