**MATC Internship**

Midwest Roadside Safety Facility

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Nathan Asselin

MWRSF is changing the way crash tests are being documented with the use of high-precision 3D scanning equipment from a global technology company called FARO. The FARO Freestyle and the FARO Focus are able to laser scan any three dimensional object and create a point cloud that can be viewed, edited, and shared through the corresponding software. The FARO Focus is mounted on a tri-pod and used for scanning larger objects, such as a guardrail system. The FARO Freestyle is a small, handheld scanner connected via USB to a Microsoft Surface tablet and used for scanning smaller objects, such as a test vehicle, or a small section of a larger guardrail system, usually the point of impact.
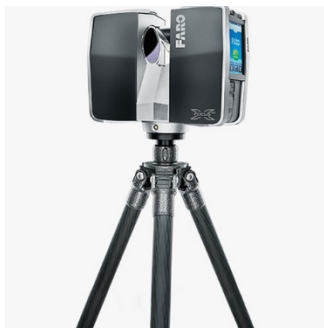
FARO Focus　　　　　　　　　　　　　**FARO Freestyle**

During my time at MWRSF, I have worked extensively with the FARO Freestyle to measure pre-test and post-test deformations on our test vehicles. When a scan of a vehicle is taken and loaded into the FARO software, the raw data is processed to eliminate any scanning errors. Multiple scans can be placed (or "registered") together to assemble a final product. Finally, measurements can be taken and results can be analyzed.

Using relatively new equipment like the FARO Focus and FARO Freestyle has opened the door to a world of possibilities, but it has also taken a considerable amount of time to become familiar with the products. Using the FARO Freestyle to scan sections

of a guardrail is often difficult because the scanner is very sensitive to direct sunlight. The FARO Focus is less sensitive, thus, it is able to take more detailed scans of the entire system. The FARO Freestyle also has trouble capturing data from a sheet of glass, such as a car window. When measuring pre-test and post-test deformations, we move the vehicle into our shop (out of direct sunlight) and apply chalk paint to the windows of the vehicle to eliminate the glass effect and capture all necessary data.

Over the last few months, my internship has focused on pre-test and post-test deformation scans of various test vehicles. Before a test, the vehicle is scanned in the shop using the FARO Freestyle. Chalk paint is applied to windows and the vehicle is moved out of any direct sunlight. After the vehicle has been scanned, the test is performed. When the vehicle is moved back into the shop after the test for measurements, the vehicle is scanned again.

The next step is to import the scans into a 3D point cloud software to compare. The FARO products came with a software called Scene. I have used Scene quite a bit in the past year, but have constantly had trouble with performance issues and crashes. During this internship, I studied two additional programs, called Build-IT and CloudCompare.

Build-IT is another FARO product and it was necessary to obtain a license for a 30 day free trial before importing. I found Build-IT to have much better performance capabilities than Scene, but the design and layout was kind of confusing. There were many buttons with awkward logos and misleading names, and the software was difficult to navigate overall.

CloudCompare is a software for cloud comparison developed by a third party and free for anyone to use. I wasn't exactly sure what to expect from a third party software, but I was pleasantly surprised. The program was well-designed and ran efficiently. More importantly, CloudCompare was perfect for comparing pre-test and post-test deformation scans. I was able to import the scans in the Ascii XYZ format, place them together, and easily colorize the different scans. When the scans are placed and colorized, measurements could be easily taken between chosen points to find an accurate deformation measurement.

Although I had previously been working with FARO equipment, this internship gave me more of an opportunity to take the initiative on a project. I had a long-term goal of finding the best software for measuring deformations, while still working on reports and other projects that I normally do around the company. I had to make sure I found time to go out to the test site to take scans, and I had to be proactive and stay on task in the office to get all my work done. I would like to thank MATC and MwRSF for the opportunity; this summer internship was a great experience for me.