



Big Rig Ergonomics

Problem

Our customer needed to baseline the ergonomic characteristics of a full scale commercial truck tractor. That meant defining what the driver could see, where the driver would sit, and how much of the road the driver could see. This is no trivial task, and 3D scanning provides the best tool for digitizing complex shapes and creating the plots and figures that can be used to compare different vehicles from different manufacturers.

Process

Big scans require a different process, and in order to maintain a high degree of accuracy over this very large area, we first construct a photogrammetry skeleton of the entire vehicle that will provide reference markers for our handheld 3D scanner to track accurately.

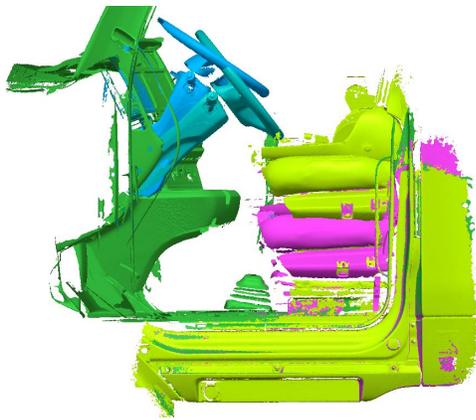
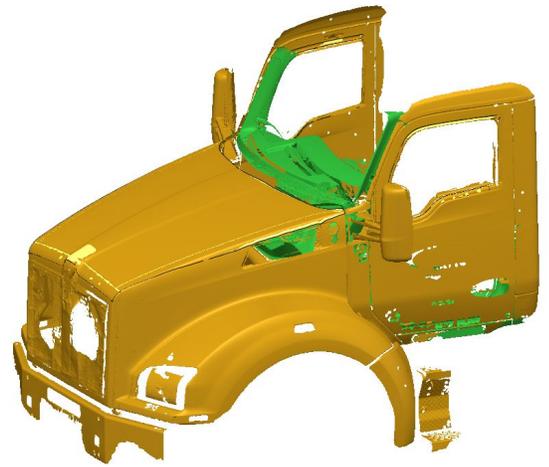
A series of retroreflective markers are positioned on the vehicle in a spaced random pattern. We then took a series of high resolution photographs of the entire vehicle. A high accuracy scale bar is included in the images, which provides a scale reference and allows us to accurately calculate the position of the markers within .005" over the entire captured area.



Once the photo images were digitally processed and aligned, we could then generate a reliable skeleton of all of the markers positioned in 3D space. The software first calculates the position of the camera for each image, and then uses the

photos to triangulate and estimate the position of each marker based on two or more images.

The photogrammetry skeleton provides much higher accuracy placements over a large volume, and are automatically detected and tracked by our handheld scanner. We proceeded with the 3D scanning process using our handheld white-light 3D scanner. The scanner reads the markers from the vehicle to control the overall placement to .005", and captures all of the 3D detail in between. For this project, we were only concerned about the parts of the truck that could be seen from the driver's seat, so we focused mainly on the hood and window surrounds facing forward.



We captured not only the exterior of the vehicle, but the interior as well. Since the customer was interested in the ergonomics at all possible positions, we also added additional scans for the interior seat and steering wheel in all of the possible positions.

The completed scans were then superimposed on one another to provide a stacked composite of all possible ergonomic positions.

Results

We delivered the 3D scan data, as well as a set of reference curves that define the exterior surround of the windshield. Our client was able to process the data into a set of reference plots directly compare different truck models using a standardized form using his own CAD tools and the reference scan data we were able to provide.

