3-D Laser Scanning and Forensic Engineering

The investigator’s toolbox

In its simplest form, 3-D scanners utilize lasers to generate three-dimensional copies to millimeter-accuracy of complex real-life objects and environments. The end result of a single scan is a collection of millions of data points containing relative x, y, z locations. A series of scans are then stitched together to create an exact color copy of the as-built condition or scene.

In the same way that a digital camera, a tape measure and graph paper are tools of the forensic investigator, 3-D laser scanners belong in the same toolbox.

Why you should care

Accurate documentation and preservation of evidence is a critical component of any forensic investigation. 3-D Laser scanning enables an S-E-A investigator to document a complex object or entire accident scene in the form of millions of measurable points, in a fraction of the time it would otherwise take. Not only is the level of detailed documentation staggering, but the scanner can measure objects considered immeasurable just a few years ago.

The 3-D scanners capture everything from the irregularity of a hairline crack in a plaster wall to the vastness of the interior of an industrial warehouse still smoldering from a fire the night before; from the length, depth and curvature of a tire mark left on an asphalt street to the compaction depth of the hood of a vehicle involved in a collision; from the tread and risers of a staircase to the slope and paint stripe location of a crosswalk that extends to a big-box retailer’s front door. The application of the scanner is truly limited only by the creative application of the equipment’s certified operator.
An example of a typical vehicle scan. A total of four to eight scans will be performed (each taking about eight minutes) to ensure the entire vehicle is captured.

How it works

S-E-A’s 3-D scanners emit a laser beam directly into a rotating mirror while the scanners themselves rotate 360 degrees. Many of S-E-A’s scanners project constant waves of varying length toward the objects being measured. The distance from the scanner to an object is accurately determined by measuring the phase shifts in the waves of infrared light.

After one scan is successfully completed, the scanner can be moved to capture another portion of the scene and is later stitched together with other scene captures to form a complete 3-D representation of the subject.

What are the benefits?

- **Quick**: objects can be documented in a matter of minutes, exponentially less time than it would take using prior techniques

- **Thorough**: one million data points may be collected per second, allowing an investigator to capture the critical measurements as well as those measurements which may seem insignificant at the time, but prove to be the crux of a case

- **Precise**: accurate to within 2mm at 25m
Applications

Measurements, modeling and other analyses can be performed long after the object/scene is unavailable.

Imagine an accident on a bus containing 50 passengers. A few of the passengers bring lawsuits immediately, but others do not file until much later. Prior to the point of the last filing, the bus may be altered or even scrapped. The accident scene itself (including roadway, landscaping, trees, etc.) has been changed substantially. Measurements were taken during the initial inspection, but a measurement deemed insignificant during the first trial is now the focal point of subsequent cases. If the inspection had been performed without a 3-D scanner, this previously insignificant measurement may not have been recorded. However, the scene had been captured using a 3-D Laser Scanner, and thus the evidence has already been documented and is available to S-E-A's investigators.

Documenting a dynamic scene at the time of the accident.

Construction scenes, like accident sites, are in a dynamic state. A skyscraper is now erected in the location where an injury previously occurred. S-E-A investigators were at the scene in a matter of hours to completely document the exact state of the construction site with the 3-D scanner.
Documenting hard to reach places.

A tractor-trailer damages the underside of a multi-lane freeway overpass. A setting with vehicles racing past investigators at 65+mph is not an ideal situation in which to document damage. Shutting the freeway down is expensive and many times impossible. With the 3-D scanner, S-E-A fully documents the damaged overpass from a safe distance.

Efficiently documenting large scenes.

Two vehicles collide in the middle of a large intersection. Documenting all paint stripes would have taken hours, but the S-E-A investigator simply scanned the scene with the 3-D scanner. Later, the impact configuration and crush profile were determined by stitching together scans of the damaged vehicles.

Creating a video based upon real life data.

At trial, only one opportunity exists to communicate your case. This underlines the importance of presenting the necessary facts in a clear and impactful manner. A video based upon real life data, gathered by the 3-D scanner, can make all the difference in the pursuit to convey “what happened” to a jury.

For more information, questions, or comments please visit: www.SEAlimited.com or contact Jared Henthorn at 800-782-6851.