C9 Use of High-Definition Survey (HDS) Laser Scanning in Forensic Engineering

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After attending this presentation, attendees will gain knowledge regarding the utilization of High-Definition Survey (HDS) laser scanning. Engineers are now able to, cost-effectively and with unprecedented accuracy at the speed of (laser) light, collect millions of measurements and create a 3D world.

This presentation will impact the forensic science community by illustrating how HDS laser scan data is collected; how the data is utilized in the industry; how the data and its by-products have been presented in court; the basic costs; and the strengths and weaknesses of the technology. This presentation will also focus on the unique issues that may arise when HDS laser scanning is utilized in the forensic field, including how to prepare for the expected challenges to the data collection process and accuracy.

We view our everyday world in 3D so why should we not be able to view and analyze our collisions, incidents, accidents, and other types of occurrences in the same manner? With the advent of state-of-the-art technology in data collection, the use of HDS laser scanners now makes this possible. Through the utilization of this cutting-edge laser scanning technology, engineers are now able to, cost-effectively and with unprecedented accuracy at the speed of (laser) light, collect millions of measurements and create a three-dimensional world. The quality of an engineer's analysis is directly related to the quality of the collected data, so this new technology is rapidly advancing the field of forensic engineering.

Traditionally, forensic engineers have utilized the same equipment used by professional surveyors. Though this equipment is still a valuable tool in the engineer's toolbox, its speed limitations and measurement recording technique has been far surpassed by laser scanning technology. Before laser scanning, the data collection process prevented engineers from taking more than a couple of measurements per minute. Now, engineers can record hundreds of thousands of measured points every minute. The measurements are recorded from laser light, which reflects from objects after being projected from a series of rotating mirrors. The scanner is indiscriminate in what objects it measures, meaning that precise measurements can be taken of just about anything. This relatively new technology is rapidly becoming more and more affordable to forensic professionals. The HDS laser scanners have the ability to quickly, accurately, and thoroughly collect 3D data for almost any type of incident and environment. The HDS laser scanners are routinely utilized to collect fresh, physical evidence at building collapses, bridge failures, vehicular collisions, and anywhere there is a need for precise 3D measurements. This is especially beneficial in capturing the scene as it was at the time of the occurrence, if the incident area will be changing. HDS laser scanning data is so beneficial that, even in its raw form, it can be utilized for critical data, measurements, and even exhibits. The mass quantity of recorded raw data collected from long-range scanners (frequently referred to as a point cloud) is accurate to within a few millimeters (approximately the size of a pencil eraser). In addition, because the raw data cannot be altered or modified in its initially recorded state, the data validation process with other engineers and investigators has been greatly streamlined. The 3D data is also a foundation for other engineering analyses, providing an accurate baseline data to effectively utilize scientific tools such as photogrammetry and camera-matching. The "point cloud" data can also be used to quickly and accurately create real-world, 3D models for use in demonstrative exhibits, like simulations and animations.

HDS Laser Scanning, 3D Measurements, Camera Matching

 ** Presenting Author*