Crime Scene

3D Laser Scanner Error Sources

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Abstract: 3D laser scanners have great potential to quickly capture and preserve crime scene information. These systems collect a set of distance (range) measurements to objects within their field of view in equal increments of arc in both the horizontal (elevation) and vertical (azimuth) planes. The resulting data set, called a point cloud, can contain millions of individual data points that represent the surfaces in the scene. Typically, a laser scanner is placed in several locations within a crime scene the individual data sets are stitched together to give a more comprehensive view.

NIJ's Forensic Science Technology Working Group, at the FY2014 meeting, recognized the potential of this technology: "many rapidly developing 3-D imaging technologies could enhance forensic science purposes (investigations, analyses and reconstruction)". Because they are capable of quickly capturing and preserving an entire scene, these systems hold real benefits for forensic science.

The current method of using measuring tapes or other manual methods to record critical crime scene dimensions relies on the crime scene technician's ability to predict which measurements will be important in the investigation. As the investigation continues, different parts of the crime scene may gain significance. If the scene has been adequately captured using a 3D laser scanner, additional measurements can be made using the archived digital computer 3D representation of the scene.

In fact, this technology has begun to be adopted by law enforcement agencies to capture crime scene information. This information is not only used for measurement but also for scene recreation and examination, and creating visuals to be presented in court.

This presentation will give symposium participants an understanding of the sources of errors that may be present in data collected by a 3D laser scanner. We will begin by discussing the basic operating principles of 3D laser scanners. This will lead into a deeper discussion of both geometric error sources and errors that may result from the interaction of the laser with different surfaces within the scene. We will present simple test methods that can be used to detect some of the systematic errors in the 3D laser scanner. We will also briefly discuss the more comprehensive set of performance evaluation tests that is being developed with the ASTM E57.02 working group.