E1 Bloodstain Pattern Analysis Using 3D Laser Scanning Technology

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After attending this presentation, attendees will understand: (1) the use of 3D laser technology for the documentation of bloodstain patterns; and, (2) limitations of the 3D laser scanner for reconstruction purposes and bloodstain patterns.

This presentation will impact the forensic science community by providing research results for the use of 3D laser scanning technology in the area of crime scene documentation and reconstruction.

Currently 3D laser scanning technology is used to document crime scenes and physical evidence. Patterned evidence is one type of physical evidence commonly encountered at a crime scene and can be used to reconstruct the crime scene. Pattern evidence is made in a repeated and predictable manner, especially bloodstain patterns. By using the 3D laser scanner for documentation of physical evidence and the location of blood spatter in relation to the rest of the evidence, it may be used to reconstruct a bloodshed event. This project examined the ability of the 3D laser scanner to adequately document prepared bloodstain patterns; therefore, the use of the laser scanner would allow processing of the scene to take less time while maintaining the high accuracy needed for the reconstruction of the scene, specifically bloodstain pattern analysis.

White butcher paper was taped to a white board and pig blood was thrown against the paper, mimicking impact spatter stains and a transfer pattern. Traditional photographs were taken of the bloodstain patterns using a Nikon® D3300 digital camera with 18mm-55mm and 55mm-200mm lenses. A Leica® ScanStation C10 laser scanner was set up following the user manual. Throughout the designated space where the bloodstain patterns were placed, two six-inch targets were utilized in addition to the twin target. For the first scanning process, the scanner was five feet away from the bloodstained wall and a medium-resolution scan was performed. After the initial medium-resolution scans of the entire room, three highest-resolution scans were used for the bloodstain patterns. A second scanning was conducted with the laser scanner 17 feet away from the blood patterns. The scanning data was downloaded for compilation and image preparation by the Cyclone software into a ModelSpace view, which creates unified images of all data points with a point spacing of 0.01 for pixilation quality. Within the formulated image, manipulation of excess regions was eliminated and cleaned up before moving on to TruView™. The ModelSpace view created in Cyclone was utilized for the next step. Each scan that was registered was incorporated into one overall TruView™ site map. Within the TruView™ there were embedded images from the traditional photography. The 3D laser scans resolution and pixel quality were compared to the embedded photographic images.

After completion of the scans in Cyclone and TruView™, the resolution of the laser scans was not as high as the traditional photographs taken of each bloodstain pattern. With the distorted resolution in TruView™, the quality of the scanned image made it very difficult to determine the origin of the bloodstain patterns and, therefore, the photographs of the patterns must be embedded in the TruView™ for reconstruction purposes. Perhaps in the future, advanced algorithms or software may allow for the increase in the resolution of the bloodstain patterns when using the 3D laser scanner.

3D Laser Scanning, Bloodstain Patterns, Crime Scene Reconstruction