D37 The Application of Laser Scanning for Visualization Within a Courtroom Environment

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After attending this presentation, attendees will gain a better understanding of how laser scanning and three-dimensional (3D) modeling can be used for visualizing forensic evidence within a court of law.

This presentation will impact the forensic science community by determining the advantage laser-scanned evidence has compared to traditional photographic methods for reconstructing a sequence of events within a court of law.

In homicide cases, skeletal trauma can provide evidence for the specific conditions of individuals' death. Forensic anthropologists can use skeletal trauma to reconstruct the final sequence of events for an individual. Photography is then utilized as a way of interpreting this evidence within a court of law.

Photography and digital imaging are the standards for documenting forensic evidence. The use of images is important in the investigation process and allows reconstruction after the scene has altered. More recently, technology from interdisciplinary research is being adapted to record evidence at a crime scene. A laser-scanned scene can be transformed to create a three-dimensional (3D) walkthrough. Thus, a 3D model can be taken into a courtroom as an alternative to photographs. This concept of visualization can also be used to replicate forensic evidence, especially that which is too sensitive to take into a court of law. Laser scanning also allows an enhanced visual walkthrough of events that can be viewed live in front of a jury.

This research compared photographic methods against laser-scanned data. First, several human archaeological skulls were recorded that displayed signs of traumatic damage. These skulls replicate similar blunt and sharp force traumatic damage seen in present populations. In an actual forensic investigation, this type of evidence is highly sensitive for the parties involved. Photography and laser scanning allows sensitive images to be displayed without bringing the actual evidence into the courtroom.

The present study recorded the human archaeological skulls using photographic and laser scanning techniques. The non-contact 3D scanners record surfaces by using basic triangulation. The scanner records an object by building a series of point clouds as a laser line passes over it. This research utilized the a laser scan arm and a compact 3D scanner for comparison against photography. The laser scan arm has an accuracy of up to 50 micrometers (50µm) (0.002") with a repeatability standard deviation of ± 0.002". The laser line has a scan width between 34mm and 60mm and a depth of field of 85mm. The compact 3D scanner has an accuracy of 0.1mm with a resolution of 968 x 644 8 bits and an 18-55mm lens. For photography, a digital SLR camera with an 18-70mm lens was utilized.

The research showed that laser scanning is an extremely useful tool for future applications when replicating sensitive evidence. Laser-scanned data allows information to be captured more accurately than photography. Furthermore, within the editing processes, results show that actual evidence is not being removed. This research also shows the 3D model allows for more accurate visualization than photography. This novel technique has the ability to be manipulated live by rotating and zooming into specific areas of interest. Laser scanning also relays technical information within a court to non-technically-minded people.

Laser Scanning, Visualization, Courtroom

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