E22 Determining the Accuracy and Suitability of Measurement Apps for Crime Scene Documentation

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Learning Overview: After attending this presentation, attendees will better understand the current capabilities of several mobile device measuring software applications (apps) that have the potential for obtaining measurements when documenting a crime scene.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating the benefits and limitations of the forensic use of mobile device measuring apps and the potential for such apps to be a low-cost, user-friendly, and efficient method of collecting measurements at a crime scene.

The spatial location of evidence drives crime scene documentation, requiring the measurement of numerous distances during the course of a criminal investigation. One major advantage of crime scene documentation involves placing the judge and jury into the scene through reconstruction techniques. Traditional reconstruction techniques are laborious and time consuming, while automated methods for capturing distance measurements (e.g., total stations and 3D laser scanners) may be cost restrictive. An efficient, portable, cost-effective device that can match the accuracy of a tape measure is ideal for crime scene documentation.

With the prevalence of mobile devices, the development of apps has flourished. The advancements in technology have resulted in the inclusion of augmented reality into these applications, allowing real and virtual worlds to interact in real time. Measurement apps can generate distance measurements either through augmented reality or point-and-shoot methods. However, both methods involve a set of algorithms that utilize data from sensors to output measurements. Image sensors and display sensors are major contributors of input data and offer technical limitations to the application and variability among devices. The sensitivity of the technology in the mobile devices and the precision of the data type used in the application are critical for accurate outputs.

Three mobile phones (Apple® iPhone® 7 Plus, Samsung™ Galaxy Note® 3, and Amazon® Fire®) were selected for use in this study due to their availability. Pertinent information on each phone was documented due to the potential impact of the operating system and sensor size/type when collecting distance measurements through each phone's camera. A series of known distances was established through hand measurement with a tape measure. Repeated distance measurements were then collected using each of three apps (AirMeasure, Smart Measure, and 3D Measure) specific to the phones operating systems (iOS®, Android®, and Fire® OS, respectively). Factors that were presumed to affect the accuracy of the measurements, such as distance from which the measurement was taken, lighting, angle, and shape/size of objects, were assessed. Statistical analyses were conducted to determine which apps produced the most consistent and accurate results compared to the hand-measured distances. The data collected, combined with an assessment of the ease of use for each app, demonstrates the benefits, limitations, and overall suitability for using mobile measuring apps for crime scene documentation.

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Measurements, Documentation, Crime Scene