D26 Application of Micro Digital Measurement in Fingerprint and Firearm Comparisons: A New Method for a Reliable and Valid Approach

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After attending this presentation, attendees will receive sufficient information of the micro digital measurement, the new device, the operating steps, and the unique features of the new technology, as well as, observe a live examination by the presenter.

This presentation will impact the forensic science community by introducing a new technique for fingerprint and firearm examinations: micro digital measurement using a palm-sized digital viewer. The device and the technique will impact the forensic science community by providing statistical and geometrical measurements of the evidence compared, and thus increasing greatly the levels of reliability and validity.

Current fingerprint (Integrated Automated Fingerprint Identification System – IAFIS) and firearm (National Integrated Ballistic Information Network – NIBIN) database systems are able to use digital technology for a comparison via a probability analysis. Yet to a large extent the two systems are solely based on the pattern and minutia characteristics between the known and the unknown samples without any statistical and geometrical measurements. Therefore, an examiner often has to rely heavily on his or her experience to make a decision and faces routine accusations of using "subjective factors" from the defense in court. This is exactly the focal point in the recent debate and accusation of fingerprint and firearm examination as non-science disciplines from the influential report which was issued in February of 2009.

To address the issue of lacking digital statistics and geometry that other advanced forensic examinations are using, the two fingerprint images will be used from the Madrid bombing case and illustrate the advantages of this new device. First, the equipment is a palm-sized device and can be connected to a laptop via a USB, thus being portable for a crime scene examination. Second, the device takes digital pictures of fingerprints and bullets/casings for comparisons, which makes it easier for online communications and evidence storage. Next, the device can be connected with a projector for a live comparison and analysis at any locations, such as the police department, the district attorney's office or in court during an expert testimony. Further, the device has multiple light sources with black/white, UV, infrared, and polarized lights, each with a magnification range from 1 to 250x. Most importantly, the new technique can provide micro digital measurements, which is a very practical comparison technique for fingerprint and firearms examinations. The measurement unit can be set at inch, mil (0.001 inch), um, or mm. the micro digital measurement is able to calibrate nine types of digital statistical and geometrical measurements simultaneously. The nine formats are: (1) line; (2) continuous line; (3) polygon; (4) radius circle; (5) diameter circle; (6) three points circle; (7) three points arch; (8) three points angle; and, (9) four points angel. With the nine formats, the author is trying to explore comparisons on partial fingerprints and heavily distorted bullets/casings.

With the three unique features of being portable, digital, and practical, this new device should be considered as a great tool in teaching forensic science in classrooms, conducting a preliminary examination at the scene, or even performing a supplemental or even verification examination in the lab. Finally, this pale-size device can provide an effective live demonstration in court with straightforward statistical and geometric digital images (measurements) of the evidence between the known and the unknown samples to the jury that no other device can display a similar function.

The forensic science community now has come to a crossroad that both qualitative and quantitative measurements are critical in courtroom battles. It is suggested that this new technique may provide a new direction for the fingerprint and the firearms examinations and promote them to be more reliable and valid disciplines.

Micro Digital Measurement, Fingerprints, Firearms

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