E79 Evaluation of the Booz Allen Hamilton Tactical Forensic Device: The VAMPIRE™

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After attending this presentation, attendees will understand the value of mobile fingerprint capture and identification.

This presentation will impact the forensic science community by providing insight into the capabilities and limitations of the Booz Allen Hamilton VAMPIRE™ as a mobile Automated Fingerprint Identification System (AFIS). These capabilities include photographing developed latent and latent fingerprints, capturing known and live-scan fingerprints, comparing known to known, known to latent/developed latent, and latent/developed latent to latent/developed latent.

Fingerprints have proven to be valuable in the investigation of crimes by placing an individual at a specific location and/or providing insight into whether that individual handled specific items. The VAMPIRE™ is capable of capturing both developed and undeveloped latent prints through a simple "point and shoot" method. Once the image has been captured, the image is compared to both the onboard collection history of other data previously collected and/or a watch list of individuals the operator generates from known persons of interest. The VAMPIRE's™ algorithm provides a list of possible individual identifications leading to possible future verification. No previous research or validation of the VAMPIRE™ has been conducted to date as the device is relatively new and not widely available. By comparing the image quality, image clarity, identified number of minutiae, and image quality map percentages of the VAMPIRE™ captured images with the images more commonly acquired by a Digital Single-Lens Reflex (DSLR) camera, it will be possible to ascertain if the VAMPIRE™ is a valid tool for field and lab-based forensic work.

To evaluate the VAMPIRE™on its captured image quality, image clarity, number of minutiae, and image quality map percentages in similar fashion to Pulsifer et. al., a trio of programs were utilized: the Federal Bureau of Investigation (FBI) Criminal Justice Information Services Division's Universal Latent Workstation (ULW), version 6.6; the GNU Image Manipulation Program, version 2.8 (GIMP); and Wolfram Mathematica, version 11.1.1.[1] Thirty-two friction ridge impressions from the same individual were placed on 15 surfaces of varying textures and porosities. Three magnetic powders (blue, black, and white) and one dye-stain (cyanoacrylate fuming and Ardrox™) were used to develop the latent impressions. Each of the developed impressions was captured by both the VAMPIRE™ and a Canon® EOS Rebel XSi camera and introduced to the ULW where the image quality, image clarity, and number of minutiae identified were recorded. The ULW allowed for application of an image-quality mask. An image-quality mask, also referred to as a clarity map, provided a more standardized analysis of the size and clarity of areas within a given image.[2] Once the image-clarity map was applied, it was "darkened" within the ULW and exported.[1] GIMP was used to brighten the specific darkened colored regions. The image was imported into Mathematica, where a series of commands were written to generate the percentage of the total image that corresponded to the specific colors present. The colors of the quality map range from red (questionable ridge flow present) to the observed royal blue (ridge flow, minutiae and ridge edges are certain). The comparison of the assigned color percentages, as well as the earlier recorded values between the VAMPIRE™-captured images and the DSLR-captured images allowed for any differences between the capture methods to be established.

Preliminary statistical analysis utilizing 3 of the 15 total surfaces (aluminum foil, Styrofoam™, and white painted wood) indicated there was a significant difference between the two capture methods for the number of total minutiae identified in each image. VAMPIRE™-captured images had a significantly larger number of minutiae identified than the DSLR-captured images. No significant differences were found between the two capture methods when comparing the latent quality score of the images and the overall clarity of the images.

Further research is underway to analyze the remaining 12 surfaces. The conclusion will provide further insight into the capabilities and limitations of the VAMPIRE™ as compared to the more commonly used DSLR.

Reference(s):

1. Pulsifer, Drew P., Sarah A. Muhlberger, Stephanie F. Williams, Robert C. Shaler, and Akhlesh Lakhtakia. 2013. An objective fingerprint quality-grading system. *Forensic Science International.* 231 (1-3): 204-7.

2. Hicklin, R. Austin, JoAnn Buscaglia, and Maria Antonia Roberts. 2013. Assessing the clarity of friction ridge impressions. *Forensic Science International.* 226 (1-3): 106-17.

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