C21 Using an Orthogonal Fingerprint Matcher to Boost Recognition of Contactless Fingerprints

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Learning Overview: After attending this presentation, attendees will better understand the capabilities and possibilities as well as the current status of off-the-shelf smart phone technology as a fingerprint-capture device in support of identity matching. Technical details will be provided regarding the process of capturing accurate photographs with a smart phone camera, rendering these images into high contrast fingerprints and automatically matching these fingerprints to identities. A new concept will be presented that contactless fingerprints should be handled as latent fingerprints for matching purposes with final adjudication of results performed by an orthogonal matcher.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by proposing a new idea that contactless fingerprints be treated as latent prints and discussing the steps for implementing this concept. Specific reporting will be provided on the development and testing of techniques for capturing contactless prints using a mobile device and submitting these prints to an Automated Fingerprint Identification System (AFIS) as latents against legacy "rolled" or "flat" prints. Once the AFIS results are returned, this presentation will discuss the adjudication of the matching results using orthogonal recognition technology originally developed by the Federal Bureau of Investigation (FBI) Laboratory (Project GRAFF) as an "Afterburner" and generating an objective score that makes a statistical statement regarding the results.

Fingerprints are truly the "human barcode" and among the best measures of human identity available. Conventional fingerprint sensors require a person to touch the device platen or sensor. Disadvantages to this mode of acquisition include the time required to collect (particularly rolled) prints, as well as hygiene concerns. Recently, technologies have been developed to use smart phones as fingerprinting devices. Since capturing fingerprints with the camera on a phone does not require physical contact, this method of collection has been labeled "contactless fingerprinting." Contactless fingerprinting can be performed by the "rear" phone camera with no additional hardware. A 12-megapixel camera can produce high-resolution images (from 500 to 1,000ppi) that capture sufficient ridge detail to support fingerprint matching. A typical strategy for contactless fingerprinting is to capture ten fingers in three pictures: two "slaps" (four fingers each) plus two thumbs held together. Once captured, the images are processed into high-contrast prints; features are extracted from these prints and placed into an AFIS query format. Matching can either be performed on the mobile device or the fingerprint images can be set to a remote server for matching.

Images produced by contactless devices are fundamentally different from conventional scanned ink and livescan fingerprints, supporting the concept that they be treated as latents. Contactless and contact prints differ in both distortion characteristics and image sensor characteristics. New pathways for device certification are being developed for contactless fingerprinting to ensure these new contactless fingerprint images are matchable to conventional fingerprints captured through inking or contact scanning. For example, through funding from the FBI's Biometric Center for Excellence, the National Institute of Standards and Technology (NIST) has been developing standards for certifying contactless scanning so images obtained in this manner can be submitted for matching against the FBI's databases. However, the body of current research focuses on what can be done on the mobile device to create contactless images that are most compatible with legacy collections. This presentation discusses a different approach in terms of technology that can be employed to handle the contactless fingerprint transaction. The content of the presentation focuses on a specific approach for submitting limited sets of prints (such as would be the case for latents) and introducing orthogonal matching technology that will modify the matching process without fundamentally changing the nature of how existing AFIS systems work. The outcome of the modified process is improved performance for matching contactless prints submitted against collections of prints obtained through contact methods.

This presentation of treating contactless prints as latents will be supported by actual data obtained through contact fingerprinting and matched against an AFIS with contact reference prints taken from the same and different individuals. These results will show original accuracy scores for contactless images against legacy contact prints using a commercial AFIS. In contrast to these original scores, results incorporating the orthogonal technology as an Afterburner are also shown to demonstrate its impact on scoring and ensuring data from all ten fingers can be reliably collected using contactless methods.

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