Development of an Intelligent Mobile Application to Enhance the Quality of Latent Fingerprint Acquisition

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During this presentation, attendees will be introduced with an intelligent mobile application that is developed to assist the process of latent fingerprint acquisition. The application uses integrated camera of smartphones to capture latent fingerprints, and is able to indicate the quality of such fingerprints with both a graphical color-map and a numerical reliability score in real time. As such, it assists crime scene investigators to capture the optimal black-on-white fingerprint image.

This presentation bears the impact to the forensic science community by demonstrating the utility of mobile computing and the potential to integrate artificial intelligence (AI) into crime scene investigation and latent fingerprint acquisition. The mobile application runs real-time algorithm to identify usable and unusable areas of a latent fingerprint image, and furthermore, leverages techniques such as augmented reality (AR), to provide graphical indicators (i.e., green and red color-map) to inform the investigator the quality of such image. This application makes it possible for investigators to determine the optimal camera angles, distance, illumination, etc., during the latent fingerprint acquisition, and therefore enhance the quality of the acquired latent fingerprint image.

Latent fingerprint image capturing used in the forensic investigation field requires that quality images be taken in order to accurately match fingerprints to those stored in a database. The goal of this project was to implement a mobile application to aid forensic investigators in the latent fingerprint acquisition process. In a typical use scenario, the investigator points the camera of the smartphone to a latent fingerprint, and the application is able to recognize and analyze the latent print in real-time, and display a graphical indicator (i.e., green/red color-map) for useable/unusable fingerprint areas, as well as a numerical score evaluated based on the overall fingerprint quality. The acquired latent fingerprint image can be directly send to remote automated fingerprint identification system (AFIS) for latent fingerprint searching or matching.

The application development process was sectioned into three major components: *mobile application* development, *reliability score algorithm* development, and *client-server system* development. The *mobile application* development creates a camera application and photo gallery, which allows latent fingerprints to be captured and stored on the smartphone. The *reliability score algorithm* development is currently based on and modified from the SourceAFIS, an open-source fingerprint analysis and matching project. The algorithm provides the basis for a green/red color-map overlay to the application that indicates the usable and unusable areas of a captured latent fingerprint image. The *client-server system* is also developed based on the SourceAFIS, which accepts images acquired from the mobile application, and is able to conduct 1:1 fingerprint matching, or 1:N fingerprint searching. It is also noteworthy that the modular design of this project is flexible enough to allow various algorithms be easily exchanged, and one of the research goals is to develop and integrate AI-aided algorithms to enhance the quality of latent fingerprint development and acquisition during crime scene investigation.

All in all, this to-be presented mobile application serves the purpose as being informative to forensic investigators during the process of latent fingerprint development, analysis, and acquisition.