B96 Assessing the Expected Weight of Evidence for a Latent Print (Fingermark) That Is Insufficient for Identification and Without Reference to a Putative Source

Marco De Donno, Batochime, University of Lausanne, Lausanne, Switzerland , SWITZERLAND; Christophe Champod, PhD, University of Lausanne, Lausanne-Dorigny, Vaud 1015, SWITZERLAND; David A. Stoney, PhD, Stoney Forensic, Inc, Chantilly, VA 20151; Paul Stoney, MBA, Stoney Forensic, Inc., Clifton, VA 20124*

Learning Overview: After attending this presentation, attendees will understand a method to assess the expected weight of evidence for latent prints (fingermarks) that are insufficient for identification, without reference to a putative source.

Impact on the Forensic Science Community: This presentation will impact the scientific community by providing a means to assess the expected weight of evidence for latent prints (fingermarks) that are currently set aside as insufficient for identification.

Latent prints that have insufficient characteristics for identification often have discernable characteristics that could form the basis for lesser degrees of correspondence or probability of occurrence within a population. Currently, those latent prints that experts judge to be insufficient for identification are not used as associative evidence.

The aim of this presentation is to expose the methodology developed to assess the value of a fingermark without its putative source. By "value" means an assessment of the expected weight of evidence (WoE quantified by a Likelihood Ratio or Bayes factor) that a mark may bring if it was compared with it corresponding print. Because the proposed assessment of the Weight of Evidence is made without the corresponding print, it is called a *pre-assessment*, based on the sole merit of the features of the mark.

The proposed methodology is based upon the model of Egli (2009) enhanced by a distortion model that produces a score-based Likelihood Ratio.

When used in regular casework (hence following a comparison between a mark and a print), the score-based Likelihood Ratio system requires minutiae information from both the mark and the print. In the pre-assessment mode adopted here, the print is not available and will then be postulated. To do so, one will assume that the potential print that should be associated with the mark presents the same minutiae configuration (in terms of x-y positions and angles theta) as the minutiae on the mark. The expected score-based Likelihood Ratio is then calculated between the mark and the mark itself. Based on the score obtained from that transaction, a model is developed to estimate the expected score-based Likelihood Ratio (ESLR) if the putative reference would be available. The model is calibrated against the score-based Likelihood Ratio obtained in known cases where marks and corresponding prints are available.

This project has shown that it is possible to predict the expected value (ESLR) to be assigned to a mark solely based on the features of available on the mark. The closer prediction to the target score-based Likelihood Ratio are achieved when an expert manually annotates the minutiae on the mark. However, reasonable prediction is achieved when the mark is auto-encoded using a latest generation Automatic Fingerprint Identification System (AFIS) minutiae encoder and the minutiae are further selected as a function of quality metric exported by the AFIS system. A fully automatic system for pre-assessing marks is proposed and has been calibrated using a linear regression model.

Fingerprint, Weight of Evidence Pre-Assessment, AFIS