A183 A Fingerprint Search Program Validation Study

Robert E. Ryberg, Utah Valley University, Crimnal Justice Department Mail Stop 286, 800 West University Parkway, Orem, UT ; and Gary H. Naisbitt, PhD*, Utah Valley University, 4374 West Redwood Cove, Cedar Hills, UT 84062*

The goal of this presentation is to explore the capabilities of a fingerprint search program and identify its optimal settings and deficiencies.

This presentation will impact the forensic science community by discussing validation strategy and ramifications of the *Daubert* Ruling.

Validation strategy and ramifications of the *Daubert* Ruling will be discussed. This is the companion paper to *A Comparison of Fingerprint Screening Ability between a Computerized Search Program and Human Examiners.*

Two types of experiments were performed in this study. One group of experiments sought to optimize the software's selectivity setting to the number of minutiae in the search. The other group of experiments measured search accuracy by comparing search results to known theoretical outcomes.

The search program uses two categories of prints in its operations, the print being searched called the "Latent Print" and the library of prints called the "Database." In the following experiments the latent print was always the test print being searched against the database. Using rolled and plain (slapped) fingerprints of high quality, several tests were performed and the results were compared to known theoretical outcomes. Graphs and tables of the data will be presented and the experimental design is described below.

Optimized Settings Experiments: Starting with a known number of minutiae, what is the optimal selectivity setting that gives the highest number of true candidate latent prints with the fewest false candidate prints? A test print was searched with minutiae ranging from 18 to one and the highest selectivity settings that identified a true candidate were determined for each number of minutiae. As the number of minutiae for searching declined, the search selectivity needed to be reduced to identify the matching print in the database. It was also noted that as the search selectivity was lowered, a greater number of non-matching candidates increased. The optimized balance between these search parameters, i.e., the highest selectivity for a given number of minutiae was determined.

Search Accuracy Experiments:

1. Can the software find an exact copy of the full latent in the database? This is a self-matches-self experiment with the expected outcome of a match on every attempt.

2. Can the software match the full print by searching portions of an exact copy of the full print? This is a self-matches-self experiment that simulates searching the database with an ideal partial print. To mimic a partial print the full latent print was divided into quarters or quadrants and each quadrant was searched as a separate latent print. Fifteen minutiae were arbitrarily chosen for all experiments as it is generally accepted that a full latent can be identified from twelve to sixteen minutiae even if only a partial print is present.

3. Can the software match the full print by searching a series of plain prints of the same finger that have varying quality and spatial orientation? In this case the database contained only prints made with the same finger as the full latent. It is also another version of a self-matches-self test. Each plain print was searched with fifteen minutiae with the theoretical matching expectation of 100 percent.

4. This experiment was the same as experiment three except non- matching prints were included in the database to better simulate a real life search. The same settings and number of minutiae were used as before except the theoretical outcome changes to include non-matching candidates for examination.

Summary: In some cases fifteen minutiae were not sufficient to identify the full print in the database. And at times, true candidates present in the database were omitted from the list of candidates for consideration. The results will be discussed as they apply to the use of this software and also to the broader debut about the ACE-V approach of fingerprint examination's compliance to scientific methodology and Daubert considerations such as an error rate.

Fingerprint, Validation, Daubert

 ** Presenting Author*