



OSAC Research Needs Assessment Form

Title of research need:

Latent Fingerprint Image Quality Usage

Keywords:

Image Quality, LFIO, AFIS, Sufficiency, Suitability

Submitting subcommittee(s):

Friction Ridge

Date Approved:

(If SAC review identifies additional subcommittees, add them to the box above.)

Background information:

1. Description of research need:

(1) Research on the effectiveness and reliability of using automated LFIQ (latent finger image quality) scores to systematically determine suitability and assign verification levels, e.g. one-person, two-person, blind, non-blind, etc. (2) Develop tools regarding the calculation of manually derived latent image quality scores based on the image quality map described in "Markup Instructions for Extended Friction Ridge Features" (NIST Special Publication 1151). (3) Research whether examiner derived scores could then be compared to automated LFIQ to determine if these mark-ups have greater predictive power than automated LFIQ scores alone, or if those two techniques can be combined to add to that predictive power. (4) Research on the effectiveness and reliability of using LFIQ scoring to guide Latent Finger Image Search (LFIS) vs. Latent Finger Feature Search (LFFS) AFIS (Automated Fingerprint Identification System) searches. (5) Research on the effectiveness and reliability of using AFIS match score thresholding to reduce latent print AFIS verification/comparison workloads, and when to use that technology.

2. Key bibliographic references relating to this research need:

Please see Appendix "A" for a normative bibliography related to this research topic.

For a comprehensive and informative bibliography related to friction ridge examination please see Appendix "B": The 2011 SWGFAST response to the Research, Development, Testing & Evaluation Inter-Agency Working Group of the National Science and Technology Council, Committee on Science, Subcommittee on Forensic Science.

3a. In what ways would the research results improve current laboratory capabilities?

Latent fingerprint image quality measurements have proven to be inconsistent. Improvement in this technology is necessary to reduce error and improve efficiency. Improved image quality measurement will assist examiners in the ACE-V (Analysis, Comparison, Evaluation, Verification) process by assessing risk of error. Improved LFIQ measurement will also help streamline examination and AFIS search workflows through systematically determining sufficiency, as well as suitability for AFIS, and level of verification required. This type of tool will also assist researchers in developing and validating chemical friction ridge detection techniques.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

It is difficult to standardize AFIS and ACE-V methodologies without reliable image quality measurement techniques.

3c. In what ways would the research results improve services to the criminal justice system?

Improved image quality measurements (providing new tools) and understanding how to use those metrics will likely reduce examiner error rates, as well as boost workload efficiency by assigning examiner resources through rational business processes.

4. Status assessment (I, II, III, or IV):

II

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an

Subcommittee

Approval date: 01/29/2016

(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)

SA

1. Does the SAC agree with the research need? Yes

2. Does the SAC agree with the status assessment? Yes

If no, what is the status assessment of the SAC:

Approval date: 17-Mar-2016

(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)

informational resource to the community.

APPENDIX "A"

Alonso-Fernandez, F., Fierrez, J., Ortega-Garcia, J., GonzalezRodriguez, J., Fronthaler, H., Kollreider, K., and Bigun, J., "A Comparative Study of Fingerprint Image-Quality Estimation Methods", *Information Forensics and Security, IEEE Transactions on*, vol. 2 (4), pp. 734-743, 2007.

Blomeke, C. R., Modi, S. K., and Elliott, S. J., "Investigating the Relationship between Fingerprint Image Quality and Skin Characteristics", in *42nd Annual IEEE International Carnahan Conference on Security Technology*, Prague, Czech Republic, 2008, pp. 158-161.

Changlong, J., Hakil, K., Xuenan, C., Eunsoo, P., Junchul, K., Jinsoo, H., and Elliott, S., "Comparative Assessment of Fingerprint Sample Quality Measures Based on Minutiae Based Matching Performance", in *Electronic Commerce and Security, 2009. ISECS '09. Second International Symposium on*, 2009, pp. 309-313

Hicklin, R. Austin, JoAnn Buscaglia, and Maria Antonia Roberts. "Assessing the Clarity of Friction Ridge Impressions." *Forensic Science International* 226 (2013): 106-17.

Indovina, M., V. Dvornychenko, E. Tabassi, G. Quinn, P. Grother, S. Meagher, and M. Garris. "Elft Phase II - an Evaluation of Automated Latent Fingerprint Identification Technologies." Washington DC: National Institute of Standard and Technology, 2009.

Indovina, M., R. A. Hicklin, and G. I. Kiebusinski. "ELFT-EFS Evaluation of Latent Fingerprint Technologies: Extended Feature [Sets Evaluation #1]." Washington DC: U.S. Department of Commerce, National Institute of Standards and Technology, 2011.

Indovina, M., V. Dvornychenko, R. A. Hicklin, and George I. Kiebusinski. "ELFT-EFS Evaluation of Latent Fingerprint Technologies: Extended Feature Sets [Evaluation #2]." National Institute of Standards and Technology, U.S. Department of Commerce, 2012.

Li, Z., Han, Z., and Fu, B., "A Novel Method for the Fingerprint Image Quality Evaluation", in *Computational Intelligence and Software Engineering*, 2009. CiSE 2009. International Conference on, 2009, pp. 1-4.

Yoon, Soweon, Eryun Liu, and Anil K. Jain. "On Latent Fingerprint Image Quality." In *Proceedings of the 5th International Workshop on Computational Forensics*. Tsukuba, Japan, 2012.