

OSAC RESEARCH NEEDS ASSESSMENT FORM



Title of research need:

Hand Detail Comparisons Black Box and White Box Studies

Describe the need:

Forensic image analysts are often asked to determine if a hand depicted in a questioned image, such as those submitted in child pornography investigations, has characteristics visible to provide support for an opinion on the source (i.e. the degree of similarity/dissimilarity to a known hand). Black box testing would assist in the acceptance of this type of examination in court through measuring the accuracy of the source opinions, particularly when there are varying levels of image quality. The inclusion/addition of white box testing can help identify which specific features are used by analysts in reaching their opinions under both ideal and real-world conditions. The effect of image quality and the feature sets determined through these black and white box tests can then be incorporated into a standards of guide for photographic comparisons.

Keyword(s):

photographic comparison, skin detail, hand comparison, patterned evidence, image analysis

Submitting subcommittee(s):

VITAL

Date Approved:

28 June 2023

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

To date, research on the accuracy of source opinions in photographic comparison has focused on facial identification. However, image analysts are often requested to examine images to determine whether the hand depicted in the submitted images can be attributed to a source (i.e. the degree of similarity/dissimilarity to a known hand). Such requests often stem from imagery that is submitted in child pornography or sexual assault investigations where a suspect's face is not visible in the image. The VITAL subcommittee seeks to have multiple black box studies conducted to determine the accuracy of analysts' opinions when conducting comparisons on submitted imagery with varying levels of quality. The standards of practice and strength of opinions developed by VITAL will be directly impacted by the results of such black box testing (e.g., strength of opinion may be moderated by lower quality images). Likewise, multiple white box tests should also be performed with varying degrees of image quality to help define the specific features that analysts use to form an opinion under different conditions. Classification of the usefulness of various features can be incorporated into the standards of practice for conducting a photographic comparison.

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

We are unaware of any ongoing research; however, there have been several studies in recent years that have started to address the validity and reliability of photographic comparisons of hands. More research is needed to fully document the scientific basis and error rates for the opinions formed by analysts.

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

SWGDE Technical Overview for Forensic Image Comparison;
Malone, C., [2015]. Inter-/Intra- Observer Reliability of Hand Assessment Using Skin Detail: A Count-Based Method. Journal of Forensic Sciences. doi 10.1111/1556-4029.12824;
Malone, C., [2015]. Photographic Analysis Using Skin Detail of the Hand: A Methodology and Evaluation. Journal of Forensic Sciences. doi 10.1111/1556-4029.12670;
Slot, A. and Geradts Z., [2014]. The Possibilities and Limitations of Forensic Hand Comparison. Journal of Forensic Sciences. doi 10.1111/1556-4029.12542
Lancaster University, [2021]. H-unique: In search of uniqueness - harnessing anatomical hand variation. *H-unique*. 10/14/2021. <https://www.lancaster.ac.uk/security-lancaster/research/h-unique/>.

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at <https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest>? Is your research need identified by NIJ?

No

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

The research results would explore validity and reliability of photographic hand comparisons, including developing error rates related to the quality of images and determining the feature sets found to be most useful in photographic comparisons. For the purposes of these studies, quality could be defined by the percentage of the imagery that captures the hand or the number of pixels that capture the hand, and the number of perspectives of the hand (if multiple images are submitted). Other factors like overall illumination of the scene, contrast, and color fidelity could conceivably be incorporated. Quantification of these variables would bolster the basis for source onions by describing the variables and their impact on accuracy of analyses in controlled cases (white and black box studies).

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

The research would assist in determining which features of a hand are most useful when conducting photographic comparisons of the hand. Such research would also assist in determining what quality of imagery is needed for an examiner to reach an appropriate opinion. In addition, the study would assist in determining error rates for photographic comparisons of the hand.

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

The research would help determine the probative value of photographic comparisons of hand.

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

I

	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 informational resource to the community.