SWGDE Best Practices for Photographic Comparison for All Disciplines

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Table of Contents

1. Purpose 4
2. Scope 4
3. Definitions 4
4. Limitations 4
5. Evidence Preparation 5
6. Comparison Method 5
7. Conclusions 6
8. Limitations of Methodology 7
Appendix A. Work Flow Scenario: Photographic Comparison Example 8

1. Purpose

The purpose of this document is to provide personnel with guidance regarding practices appropriate when performing photographic comparison as a part of forensic analysis (this includes, but is not limited to, fingerprints, tool marks, odontology, etc.) For the purposes of this document, photographic comparison refers to comparing objects recorded on film, digital images, images from video sources, and printed images.

2. Scope

This document provides basic information and best practices on the evidentiary value, methodology, conclusion scale, and limitations when conducting photographic comparison as a part of any forensic analysis. The intended audience is examiners in a lab setting and personnel who capture images for use in photographic comparison.

This document is not intended to be used as a step-by-step guide for conducting a proper forensic examination or reaching a conclusion. This document should not be construed as legal advice.

3. Definitions

Image Comparison (Photographic Comparison) – The process of comparing object(s) or person(s) when at least one of the items in question is captured in imagery, and making an assessment of the correspondence between features in the captured imagery for rendering an opinion regarding identification or elimination.

Physical Object – A thing or person to which action is directed.

Class Characteristic – A feature of an object that is common to a group of objects.

Individualizing Characteristic – A feature of an object that contributes to differentiating that object from others of its class.

4. Limitations

Many forensic disciplines (e.g., facial identification, friction ridge, firearms and tool marks, document examination, footwear and tire tread) utilize photographic comparisons. The practitioners of these disciplines should have knowledge of image science, such as: compression, aspect ratio, resolution, codecs, interlacing, foreshortening, etc.

A photographic comparison relies upon the process of comparison when at least one of the items is captured in imagery. This document will not apply to the methodologies used when comparing physical objects to one another (e.g., when comparing two bullet fragments under a microscope). This document will not describe discipline-specific analytical techniques or the limitations associated with them, only the comparison process and the general manner used to formulate a conclusion.

5. Evidence Preparation

General guidelines concerning the preparation of evidence for photographic comparison are provided as follows:

5.1 Identify the items that are the subject of the examination. These could be either objects or photographs of objects. Acquire photographs for use, as necessary.

5.1.1 If an object is to be compared, photograph the item as appropriate for the examination. Specific disciplines may have different standards for the photographic process for use in comparison. This may involve photographing the object under comparable conditions as those captured in another image.

5.1.2 If the item that is to be compared is already depicted in an image, ensure that the image has been captured according to defined discipline specific procedures. In some cases, this may not be possible, and the examiner will need to work from existing images.

5.2 Examine the photographs to determine if they are sufficient quality to complete an examination, and if the quality will have an effect on the degree to which an examination can be completed. Specific disciplines should define quality criteria, when possible, and how a failure to meet the specified quality criterion will impact results. (This may apply to a portion of the image, or the image as a whole.)

5.2.1 If the specified quality criteria are not met, determine if it is possible to obtain additional images. If the specified quality criteria are not met, and additional images cannot be obtained, this may preclude the examiner from conducting an examination, or the results of the examination may be limited.

5.3 Enhance images as necessary. Refer to *ASTM Guide E2825 for Forensic Digital Image Processing*.

6. Comparison Method

There is no one specific methodology for photographic comparisons. Any methodology applied to photographic comparison should incorporate an analysis of the imagery, a comparison of individual features, an evaluation of the significance of the comparison, and a verification of the comparison. The repeatability of the procedure and documentation of the workflow is of paramount importance.

6.1 If the images include more than one depiction of the questioned and known objects, then the practitioner should screen them to determine which images will be useful for comparison. This determination will depend on a number of factors, including (but not limited to) the specific discipline, the nature of the request, and the content and/or quality of the images.

6.2 A thorough assessment of the properties and attributes of the features contained in the images under examination should be conducted. This includes determining which

features are class or individual characteristics, as well as identifying issues of image formation, such as resolution, lighting, focus, and camera-to-subject geometry. (See 5.2)

6.2.1 If logical or at all possible, specific disciplines should define the features compared during examination.

6.3 Compare features to identify similarities and differences.

6.4 Similarities and differences should be documented. In some disciplines, this may be by use of a checklist or by marking working copies of the images.

6.5 An evaluation of the similarities and/or differences should be conducted to determine if they reflect true similarities or differences between the objects. Specific disciplines should define the significance of similarities and differences to aid in reaching a conclusion, taking into account numerous factors. These factors can include (but are not limited to) defining whether a feature is a class characteristic or an individualizing characteristic, an assessment of the resolution of the imagery for the determination of significance, and an assessment of other imaging conditions when determining significance.

Features considered will allow the examiner to determine whether there is support for an identification or elimination, based on the weight associated with the feature(s), as well as the imaging conditions. For example, whether a feature is a class characteristic or an individual characteristic will tend to lend different amounts of weight when reaching a conclusion.

7. Conclusions

Based on the observations and assessments, a conclusion should be reached. There may or may not be an appropriate statistical basis for the conclusion reached.

7.1 In the cases where an appropriate statistical basis for a conclusion exists, the level of finding should reflect the probability. The underlying assumptions, particularly simplifying assumptions, for the statistical model should be reported along with details of the population statistics.

7.2 If no appropriate statistical model is available, a clear indication of the strength of a conclusion should be reported. This will necessarily be a descriptive statement and not a numerical probability. Care should be taken to avoid implying probability where none exists.

7.2.1 Specific disciplines should incorporate a standardized scale to indicate the strength of the findings. Specific disciplines should define the observations (or features) that correspond to given levels of conclusion, and report what the characteristics were that support the specified conclusion.

7.3 The results of the examination should undergo independent review by a comparably trained individual. If disputes during review arise, a means for resolution of issues should be in place.

8. Limitations of Methodology

Specific disciplines should strive to establish confidence levels for conclusions. This may be accomplished through the use of large scale testing of examiners when ground truth is known (e.g., black box testing). These confidence levels and any uncertainties associated with the conclusions should be disclosed.

One potential source of uncertainty in any forensic analysis results from bias. It is the responsibility of the organization and the examiner to minimize the effects of bias when conducting examination and performing reviews. Minimizing the effects of bias can be accomplished through awareness, training, documentation (of any potential sources for bias and the steps taken to minimize) and quality assurance measures including the limitation of task irrelevant information and blind verification.

Appendix A. Work Flow Scenario: Photographic Comparison Example

An FBI field office investigating a report of child abuse recovers a compact disc containing digital image files that appear to depict the suspect's left hand upon a victim. A second compact disc is received containing digital image files of a known suspect's left hand. An FBI image analysis unit is requested to perform a photographic comparison of the questioned and known hands to determine if the hands belong to the same individual.

Following the work flow described above, the unit proceeds:

1. The agency reviews the request and:
    a. determines that they perform this type of analysis,
    b. determines that all necessary items to support the requested exam have been submitted,
    c. determines that they have the necessary equipment, materials, and resources needed to conduct the requested analysis, and
    d. assign the analysis request to an analyst.
2. The analyst acquires the necessary imagery.
    a. The analyst calls the investigating agency and determines that copies of the original images have been received. The authentication was performed by the investigating agency.
    b. The practitioner reviews the imagery and selects several images for further analysis.
3. The analyst makes copies of the selected imagery for use as working copies, and safely stores the received data.
4. Image processing techniques such as brightness and contrast adjustments, unsharp masking, and multi-pixel averaging may be performed. The use of these techniques are documented per the unit's SOP.
5. The resulting images are analyzed and it is determined that compression artifacts present in the questioned images prevent unambiguous identification of individualizing features on the hand. The class characteristics of the questioned and known hands, however, are observed to be similar. Therefore, the analyst concludes that weak support exists which allow the inclusion of the suspect, but do not permit the identification or elimination of the suspect.
6. A comparably trained individual in the laboratory independently reviews the results of the examination.
7. The analyst writes the report. Per the unit's SOPs, the report includes a review of the materials received, the request, the methods used, the results obtained, the basis for the conclusion, and the conclusion.

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History

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