



B94 Using Eye Tracking to Understand Decisions Made by Forensic Latent Print Examiners

Bradford Ulery, MS, 2002 Edmund Halley Drive, Reston, VA 20191; R. Austin Hicklin, MS*, 3150 Fairview Park, Falls Church, VA 22042; Tom Busey, PhD, 1101 E 10th Street, Bloomington, IN 47405; Maria A. Roberts, 2501 Investigation Parkway, Quantico, VA 22135; and JoAnn Buscaglia, PhD*, FBI Laboratory, CFSRU, 2501 Investigation Parkway, Quantico, VA 22135

The goal of this presentation is to assist attendees in understanding how the eye-tracking behavior of professional latent print examiners is associated with their decisions.

This presentation will impact the forensic science community by describing the underlying bases of forensic latent print examiners' conclusions.

A variety of studies have been conducted evaluating the latent print examination process, but there has been relatively little research regarding the fundamental basis of this visual task: how examiners use their eyes to accomplish these tasks, and what visual information guides the examination process.¹⁻¹³ This presentation will discuss the results of a study conducted to gain a greater understanding of how latent print examiners perform analysis and comparison tasks and to gain a greater understanding of why examiners make different determinations. By asking examiners to annotate or mark up their work, some understanding of the information those examiners relied upon in making their determinations has been gained, but this is limited to the information they felt was worthy of annotating. Eye gaze can assist to better understand the factors that lead to differences in examiners' interpretations and, ultimately, their conclusions. The eye behavior of forensic examiners provides insight into how examiners make their decisions.

Eye-tracking technology was used to monitor examiners as they performed their tasks to learn what visual information they used and how they worked with that information. Eye tracking allows the determination of not only how examiners differ in the features they look at in the images, but also how they aggregate information from those images; that is, using spatial as well as temporal aspects of eye tracking. Analyses of why some examiners make inconclusive conclusions when others exclude or individualize will provide information that can be used to improve the reliability of the latent print comparison process, particularly for the more challenging comparisons.

In this study, more than 130 hours of eye-gaze information was collected from 121 practicing latent print examiners as they performed more than 2,000 fingerprint comparisons and more than 1,200 other tasks that were designed to isolate specific behaviors that arise during comparisons. The latter tasks included ridge counting, ridge following, and searching for a designated feature group in a comparison print. Eye gaze was sampled at a rate of 1KHz using a camera and infrared illumination. The raw data was calibrated, partitioned into saccades (rapid movements) and fixations (median duration of 0.27 seconds), and mapped onto image coordinates for subsequent analysis. Examiner annotations from previous studies were available for the majority of the comparisons.

This presentation will discuss how eye behavior is associated with examiners' determinations, including the extent to which eye behavior can explain erroneous determinations (false positive and false negative conclusions) and non-consensus determinations (conclusions that differ from the majority of examiners). This presentation will also discuss how eye behavior is affected by the difficulty of comparisons, and how the presence or absence of visual context affects eye behavior. The results of this study reveal explanations for how some errors occur. This presentation will describe how examiners use information in the latent print and how that relates to comparison efficiency and risks of misinterpretations. Variability in the eye-tracking data and issues in the interpretation of this data that will be important to future research will be discussed.

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Latent Prints, Eye Tracking, Examiner Behavior