

# Numerical analysis and comparison of distorted fingerprints from the same source

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## **Abstract**

There has been significant recent criticism of conclusions of identity based on the subjective methods of visual comparison of fingermarks and fingerprints. This has led to much discussion and research directed at devising purely objective methods of fingerprint identification.

The aim of this research project is to develop a metric that will provide an objective test of the conclusion reached by a fingerprint examiner. The metric assumes that the examiner has carried out the usual visual comparison of a fingermark (left at a crime scene, and which will usually be distorted) and a fingerprint (in an official file) and has concluded that the two impressions were made by the same finger. The data used by the examiner, namely the selected minutiae (particular distinguishing features of the fingermark) are fed into the metric, which then estimates the deviation from what would be expected if, the fingermark and the official fingerprint were made by the same finger.

The model uses “within-source” distributions (each generated by systematically measuring distortions of impressions from the same finger) and “between-source” distributions (based on images not from the same finger). The outcome of a test depends on the location of the calculated output in relation to these distributions.

Preliminary results distinguish clearly between within-source and between-source comparison responses, thus enabling an objective test of an examiner’s conclusion of identity. Such a test can be used to support the examiner’s conclusion or, alternatively, indicate to the examiner that variations in the observed minutiae positions cannot be explained by normal

skin distortion. This could arise if poor minutiae marking has been applied by the examiner or if the fingermarks are actually not from the same source. The proposed approach therefore serves as an objective quality control mechanism.

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