

Abstracts

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Electrostatic Detection Apparatus Enhancement Using Astronomical Image Stacking and Processing Software

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To overcome the practical challenges of imaging very distant, dim, and moving astronomical objects, astronomers have well developed techniques for “tracking and stacking” multiple images of the same object to increase the signal-to-noise ratio of the final image. We have successfully applied the same techniques to multiple electronic detection device (EDD) lifts off the same document to enhance impressions too weak to be read from a single film.

Does My Output Change with Age?

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Document examiners are often asked to determine whether multiple documents or pages of the same document were produced on the same printer or on different printers. There are several aspects of the document that can be examined in that regard. Documents produced on different laser printers can exhibit differences in the microscopic appearance of the surface of the toner printing, while documents produced on the same laser printer at the same time do not exhibit such differences. This study assesses whether there are any appreciable differences in the microscopic appearance of the surface of the toner printing produced using the same laser facsimile machine over a period of approximately 5 years. No appreciable differences were observed.

Indentations Produced by the Document Feeder Mechanisms of Two Black and White Photocopiers

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Recent casework revealed that indentations found on a questioned document could be associated with a photocopier's document feeder. This research was undertaken to analyze indentations produced on original documents by the document feeders of 2 black-and-white photocopiers. The copiers, located at the IRS National Forensic Laboratory, were of the same make and model. The goals were to determine what indentations occurred in both single- and double-sided copy modes and whether they exhibited any class, or even individual, characteristics.

Examination of a Collection of Arabic Signatures

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Arabic is the national language of the 22 Arab States, where it is spoken and written by about 300 million people. Forensic document examiners are often required to examine Arabic signatures, but without the help of any reference library of signatures. This study generated a unique collection of signatures and multiple replicates on various occasions from 188 participants (128 male and 60 female). From this collection, 10 features common to all of the signatures were identified and used to examine the variation between signatures and generate quantitative data. The features (variables) selected included 3 measurable variables (i.e., height, length, height/length [H/L] ratio) and 7 features which could be classified according to a code (i.e., number of strokes, number of dots, direction of ending stroke, legibility of signatures, slant, starting position, and ending position).

Using frequency plots generated from 10 signatures produced on 1 occasion by all of the 188 participants, the distribution of data for each feature could be observed. These results indicated that only 15% of the applicants produced a legible signature, and legibility was shown to have a considerable influence on features such as the number of dots, number of strokes, slant, and ending and starting positions. Some unusual frequency distributions can be observed with several features (e.g., the number of dots, number of strokes and the H/L ratio), thus highlighting the uniqueness of some signatures. This form of visualisation also illustrated some unexpected results. For example, more participants produced right- as opposed to the normally expected left-slanted signatures, and a larger number of females were identified as using more strokes than males.

These frequency plots also confirmed that all the classified features and, to a lesser extent, the measurable variables were not normally distributed. Hence, a Mann-Whitney statistical test was used to determine if, for any feature, there were any significant differences between signatures produced by the male and female participants. Significant differences in data for 5 of the features can be identified; namely, number of strokes, number of dots, height, length, and H/L ratio. With the exception of the H/L ratio, a replicated study using a 2nd set of signatures produced by all the participants on another occasion gave virtually identical Mann-Whitney results, thus indicating the high degree of consistency of some of the selected features.