ABSTRACTS

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Preliminary Study on Inkjet Classification Based on Satellite Droplet Distribution

Joerg A. Greis

While there have been several approaches to identify originating printers of questioned documents by the use of texture analysis and pattern recognition most of these articles did not target documents that have been produced by inkjet printers. In this paper a new method for the statistical analysis of the spatial distribution of satellite droplets on inkjet printed documents is presented. The drops are connected to a graph and global graph features are calculated to build a profile vector of the distribution which is then classified. While it turns out that differentiating individual devices is not possible the classification per model yields an accuracy of approximately 84%.

The Preliminary Attempts to Quantify the Three-dimensional Details of Document Surfaces with Reflectance Transformation Imaging

Ning Liu[1], Lichao Zhang[2]

Reflectance Transformation Imaging (RTI) is a computational photographic method that captures a subject's surface shape details and enables the interactive re-lighting of the subject from any light direction. Multiple rendering modes of this computational photographic method could be very helpful for the analysis of morphological characteristics, among which the normal visualization mode provides the three-dimensional details of the surfaces of documents. However, since there might be visual illusions among different examiners, analyzing three-dimensional details just by observing the normal maps seems incomplete. With the method developed by the authors, the pen pressures of signature samples were experimented on by quantifying the three-dimensional surfaces with the normal data derived from the normal maps. By comparison, the 3D data derived from the normal maps of the signatures were similar to those generated with Confocal Laser Scanning Microscopy. Normal errors were discussed via the quantification method as well. For the inherent error of the RTI technique, the methods of error correction were developed by the authors.

A Study of Photocopier Distortion Through Interactive Animations[1]

Robert Gervais[2]

This paper explores the nature of distortions introduced by the photocopying process. Two types of pens were used to execute both a fast and a slow sample of handwriting. These were then reproduced on photocopiers of various makes and models, both analog and digital. Successive copies were created from each sample, extending twenty generations from the original. The copying process was repeated for each series using the photocopier's light, medium and dark settings. Overall, the combination of writing instrument and speed together with photocopier model and darkness settings yielded eighty-four permutations. The resulting 1680 images (84 permutations x 20 generations) were then integrated into an interactive graphic interface allowing the user to select a set of parameters and explore the distortion, moving back and forth through the twenty generations at will. Trends in the observed distortions were investigated, both at a localized level and across the page as a whole.

Copiers were found to create both distortions (changes in shape and/or size) and image degradation (breakup, thinning, thickening, etc.). The extent of these effects varied between machines and also showed differences across the platen area of single machines (e.g. enlarge in one area while reducing in another). Breakup was found to be more pronounced in areas of the image that are perpendicular to the paper feed direction (i.e. horizontal lines breakup faster than vertical lines when the paper feed direction is along the vertical axis of the page). Given the limited sample size, findings are presented qualitatively, as well as in the graphical interface itself.

The Challenge of Determining the Fraudulent Use of Postage Stamps

Paul Leonard[1]

The policing of the worldwide use of postage stamps and items sent through the mail provides many challenges. Not only are millions of stamps used every day, the potential for fraud may take many forms. This technical paper considers primarily historically important philatelic material rather than assessing current counterfeit postage, although the methodology of analysis is similar.

Around the world, there are individuals who will provide certificates that will provide an opinion on whether philatelic items are deemed 'good' or 'bad'. To address this challenge, The Royal Philatelic Society formed an Expert Committee (RPSL) http://www.rpsl.limited/Home.aspx that seeks to establish a concluding opinion based on the evidence obtained at that time. This process will follow a series of analytical steps.

The RPSL has extensive museum facilities and over 225,000 records of worldwide significance. Analytical techniques will be used extensively to aid opinions, whether from comparison of reference material, accessing material from other collections such as the British Library or undertaking tests using the Video Spectral Comparator, VSC6000 manufactured by Foster Freeman http://www.fosterfreeman.com/questioned-document-examination/vsc6000-hs-col-180-comprehensive-examination-system.html. This equipment has enabled comparison with previously published information and assessment of whether there are printing differences of philatelic material. Future work is likely to include international collaboration with other scientists, comparing analytical techniques on a weight of evidence approach to conclude with an opinion. Specifically on whether items are fakes, for example where a philatelic item has been manufactured to deceive the purchaser, forgeries where part of a stamp or envelope has been changed or in all aspects is considered genuine.