ABSTRACTS

Volume 18, Number 1

AIn Situ Analysis of Ink Lines Made by Blue and Black Ballpoint Pens by Reflectance and Luminescence Spectroscopy Using the VSC6000HS

Saqar Alzaabi and Gordon Sharfe

In situ discrimination of blue and black ballpoint pen ink lines on paper was performed using the visible-infrared reflectance and visible-infrared luminescence spectroscopy functions of the VSC6000HS. Ink lines from 30 blue and 30 black ballpoint pens were examined. It was found that about 92% and 94% of the ink lines of the blue and black ballpoint pens respectively could be distinguished using these methods.
The outcomes of this project demonstrated that this methodology of differentiating ballpoint inks did not only provide reproducible results, but also offered a satisfactory, simple, rapid, non-destructive and objective way of differentiating ink entries of blue and black ballpoint pens.

The results have also demonstrated that the paper color has an effect on reflectance and luminescence spectra obtained by VSC6000HS. As a result, comparing ink entries on different colored-paper substrates by these methodologies is not acceptable.

Line Direction Determination of Ballpoint Pen Ink Writing

Andrea Devlin, Claire Graydon and Steven J. Strach

Determining the direction in which written lines have been executed is an important part of the work of the forensic document examiner. This information can be of key importance in the comparative examination of questioned and specimen signatures and handwriting and also in determining the presence of altered writings (Fryd, 1975).
The purpose of this paper is to report on an initial assessment of the reliability of a documented method of determining ballpoint pen ink line directions by observing the preferential build-up of ink on the upstream side of paper fibres.

During 2013 and 2014 document examiners with several organisations in Australia took part in a blind trial. Each examiner was asked to determine the direction of writing of forty short, straight lines written with two black ink ballpoint pens. The samples were prepared so that other direction information was excluded. Participants provided an unqualified or qualified determination or an inconclusive result for each line. Examiners' results were assessed to determine the overall reliability of the method. Factors that appear to allow a confident determination and factors that detract from making a determination are discussed.

The Effects of Constraint on a Signature's Static and Dynamic Features

Kristen Fazio

Forensic document examiners are tasked daily with determining the authenticity of signatures. The majority of these signatures are found on a line, within a box or within text. A major concern with this type of examination is the presence of these lines, boxes and text, since they can pose a form of constraint resulting in variations to an individual's natural signature. This study examined the effects of constraint on an individual's signature with the use of a digitizing tablet and inking pen to measure both the dynamic and static characteristics of the signature. Forty participants ranging in age from 16 – 83 provided a series of signatures for a total of 2400. Each participant signed in the presence of five different constraints, mimicking actual Canadian Government forms, including: a 4.7 cm line, a 6 cm x1.2 cm box, a 4.8 cm x 0.96 cm box, a 6.4 cm length and 0.4 cm height space within text, the Adult General Passport Application box produced by Passport Canada and a blank sheet as a control. This study suggests that when constraint is introduced, the pen speed, pen jerk, overall length, ascenders and descenders all vary significantly from that of the unconstrained signature. Pen pressure was the only feature to not show significant difference in the presence of constraint. In addition to these dynamic characteristics, anomalies such as extra artefacts, variation in complexity, hesitations, health issues and signs of anxiety were observed. This study demonstrates the impact that constraint has on a signature and indicates to forensic document examiners the need to carefully consider and evaluate these variations in the examination process.

Computer-Scored Test Answer Marks, Aka Bubble Marks: How Individual Are They?

Janet Fenner Masson

Funding for schools is increasingly based on the results of standardized tests administered to the student. In administering these tests, many states and education-related organizations use computer-scored answer sheets. On these sheets, a writer indicates his or her answers by using a pencil to fill in printed circles or ovals, making what are sometimes called bubble marks or grid marks. These answer sheets are then graded or scored electronically.

Document examiners are sometimes asked to examine computer-scored test answer sheets in order to determine whether they were completed by a specific student or whether they were each fully completed by one person. Since the sheets typically contain handwriting other than the answer marks themselves, the opinion reached, if any, is often based primarily on evidence in the handwritten text. However, sometimes the answer marks themselves become the issue.

The questions studied in this project are (1) whether writers have a consistency in making answer marks, (2) whether answer marks have individuality, (3) what conditions need to exist in order to reach a meaningful opinion about these marks, and (4) how the marks should be examined.

Spatial Pyramid Matching-based Multi-script Off-line Signature Identification

Ranju Mandal, Srikanta Pal, Partha Pratim Roy, Umapada Pal, Michael Blumenstein

Among all of the biometric authentication systems, handwritten signatures are considered as the most legally and socially accepted attributes for personal identification. The objective of this investigation is to present an empirical contribution towards the understanding of a signature identification technique involving multi-script off-line signatures. In our experiment, SIFT (Scale-Invariant Feature Transform) descriptors with Spatial Pyramid Matching (SPM)-based approaches have been used for feature extraction of signatures written in multiple scripts. Support Vector Machines (SVMs) are employed as the classifier in this experiment. 300 classes from the publicly available GPDS[16] dataset consisting of 7200 (300×24; 24 signature samples in each class) genuine signatures, 300 classes from a Devnagari signature dataset consisting of 7200 (300×24) genuine signatures and 200 classes from Bangla signature dataset consisting of 4800 (200×24) genuine signatures have been considered for this experiment. The signature identification experiment is conducted on these three datasets separately as well as 800 classes from a combined dataset of English, Devnagari, and Bangla signatures. The identification accuracy on the datasets is encouraging and 99.32% accuracy was obtained on the combined dataset of signatures, while 99.95%, 99.25% and 99.57% accuracy were achieved on experiments conducted separately on English, Devnagari, and Bangla signature datasets.

Keywords: Document image retrieval; Signature identification; Dense SIFT; Bag-of-Features; Spatial Pyramid Matching

Near-Infrared (NIR) lighting, in support of determining the sequence of non-intersecting media on documents: Ballpoint Pen Ink and Laser Toner entries

Francesco Dellavalle

Certifying the entry chronology of signatures or printed text on documents represents an important issue for the examination of forged documents. While in the case of intersecting signatures, numerous analysis techniques have been reported in the literature, much less is known about non-intersecting signatures, which also occur very often in practice.