J7 A Novel Method for the Examination and Characterization of Documents Printed With Inkjet Printers

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After attending this presentation, attendees will understand the basic principles of hyperspectral imaging and how hyper spectral imaging can be a useful method for inkjet printer ink analysis.

This presentation will impact the forensic science community by introducing a new, nondestructive method for characterizing different brands of inkjet printer inks.

The pricing and widespread market availability of ink-based home/office machine systems (printers, copiers, fax machines) has yielded an increase in the submission of printer ink-based material evidence to the Forensic Document Examiner (FDE). For this type of evidence, various types of examinations occur, including paper analysis, physical examinations, and chromatographic methods. Unfortunately, chromatographic methods, including Thin-Layer Chromatography (TLC), are destructive to the evidence and physical examinations do not usually provide enough information about the sample. Due to the increasing number of submissions of printer ink-based documents, the ability to categorize, discriminate, and/or identify colored inks from different manufacturers, using a nondestructive method is important to the FDE.

In this study, the feasibility of hyperspectral imaging as a technique for examining inkjet printer documents is explored. Hyperspectral imaging combines digital imaging technology with conventional spectroscopy for evidence analysis. It provides high spatial resolution, high image definition, and full spectrum analysis. In operation, digital images of the sample are recorded as a function of wavelength through the use of an electro-optic imaging spectrometer, generating a fully resolved spectrum for each pixel location in the multi-frame image. The combined spatial and spectral information reveals subtle features of a material that, often, cannot be observed using traditional imaging techniques. Hyperspectral imaging is a validated technique that is becoming a commonly utilized technology for the analysis of other types of questioned documents (travel documents, pen inks, etc).

Various inkjet printers were selected to print an assortment of pictures. The pictures were examined using hyperspectral imaging technology. It was found that the cyan, yellow, and magenta components of each type of inkjet printer brand have their own unique spectroscopic responses. The results demonstrate how hyperspectral imaging can be used as a nondestructive method for connecting different printer samples to a common manufacturer or ink formulation.

Hyperspectral Imaging, Inkjet Printer, Questioned Documents

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