

MULTI- AND HYPERSPECTRAL IMAGING TECHNIQUE - NEW POSSIBILITIES IN DOCUMENT EXAMINATION

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Optical spectroscopy is an important technique that has established itself as a premiere quantitative analytical tool for determining sample composition in forensic document examination. The advantages of optical spectroscopy include minimal sample preparation, nondestructive analysis, high sensitivity, fast acquisition times and the possibility of quantitative measurements of localized areas of a questioned sample. However, for comparing the reflectance, transmittance or luminescence spectra of different areas of the sample, a researcher must repeat the analysis on another sample region. This type of point mapping investigations are often not fruitful from optical spectroscopical point of view due to sample heterogeneity, nonlinear dependence between spectra intensity and density of colorants and complex relations between light reflectance and scattering processes.

Visual inspection of a document is a fast and inexpensive way of examining a questioned document.. Modern technologies like high resolution CCD cameras and electronically tunable wavelength filters allow researchers to detect some heterogeneity in the field of view (FOV) of that system. Unfortunately, this type chemical imaging systems have only been used successfully for analyzing materials which have strong differences in local optical properties in certain parts of the spectrums. Some differences in the optical spectra provide qualitative output, i.e. via an 8-bit gray scale image format. Visual inspection techniques often fail to solve difficult problems of document investigators because of above reasons and several influences from heterogeneity of the sample: the type of paper used, the characteristics of writing material, the pressure exerted on writing material and the angle of a writing instrument, etc.

Using Multi- and Hyperspectral Imaging Spectroscopy techniques makes it possible to get quantitative spectral information about all pixels of the FOV and merges powerful advantageous of imaging and spectroscopy methods. Thanks to fast microprocessor technology it is possible to detect tiny differences in these spectra and which helps the examiner to make a valid decision.

Reference: 3D Graphics for Forensic Sciences