Authenticity detection

Another application is checking the authenticity of documents. In addition to certified documents and banknotes, historical documents are also of interest here. On the one hand, the data can be used for reconstruction and on the other hand, the spectral signatures can be used to establish correlations between the paper, ink etc. used and thus draw conclusions about the author or the workshop and about authenticity.

Historical document with heavy soiling, HSI enables the original writing to be made visible (excerpts at 542 nm and 813 nm)

The basis for this is the so-called correlation analysis, in which a PCA is carried out separately for each of the documents examined and the Pearson correlation coefficient is then calculated on the basis of the loading vectors obtained:

$$r_{xy} = \frac{\sum_{i=1}^{I}(x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\sum_{i=1}^{I}(x_i - \overline{x})^2 \sum_{i=1}^{I}(y_i - \overline{y})^2}}$$

with r_{xy} - correlation coefficient, x_i, y_i - variables (pairs), empirical mean values

For a better overview, the results can be displayed in a correlation matrix or the determined coefficients can be evaluated automatically. From a correlation of ± 0.7, one speaks of a high correlation and thus of a significant connection between the documents examined. Of course, image analysis algorithms can also be included in this application.

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