Identification of chronological order of crossed lines in real documents by hyperspectral image in the visible region

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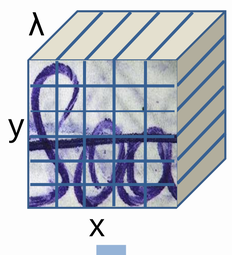
Introduction and Objective

- Determining the chronological order of crossed lines is a recurrent problem in forensic analysis of documents.
- More objective methods have been developed in order to reduce the influence of the analyst experience [1].
- This work assesses the potential of hyperspectral image in the visible region and MCR-ALS in the analysis of a real case of crossed lines of ballpoint pens.

Materials and Methods

The forensic case work was provided by the Federal Police. It is a "signin-in register" book, where an employee signature was intercepted by a trace indicative of missing work. The question raised was whether the employee had missed work and signed the corresponding days over the sign or if the fault signal was written by someone in bad faith.

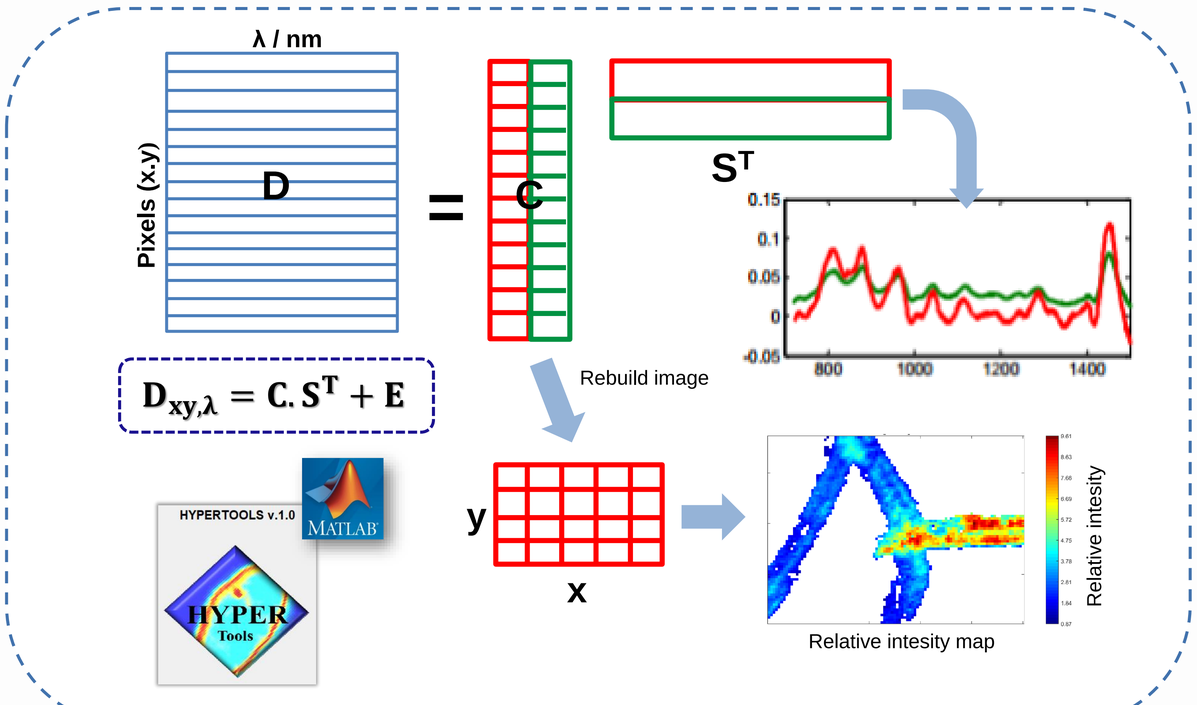
HyperTools

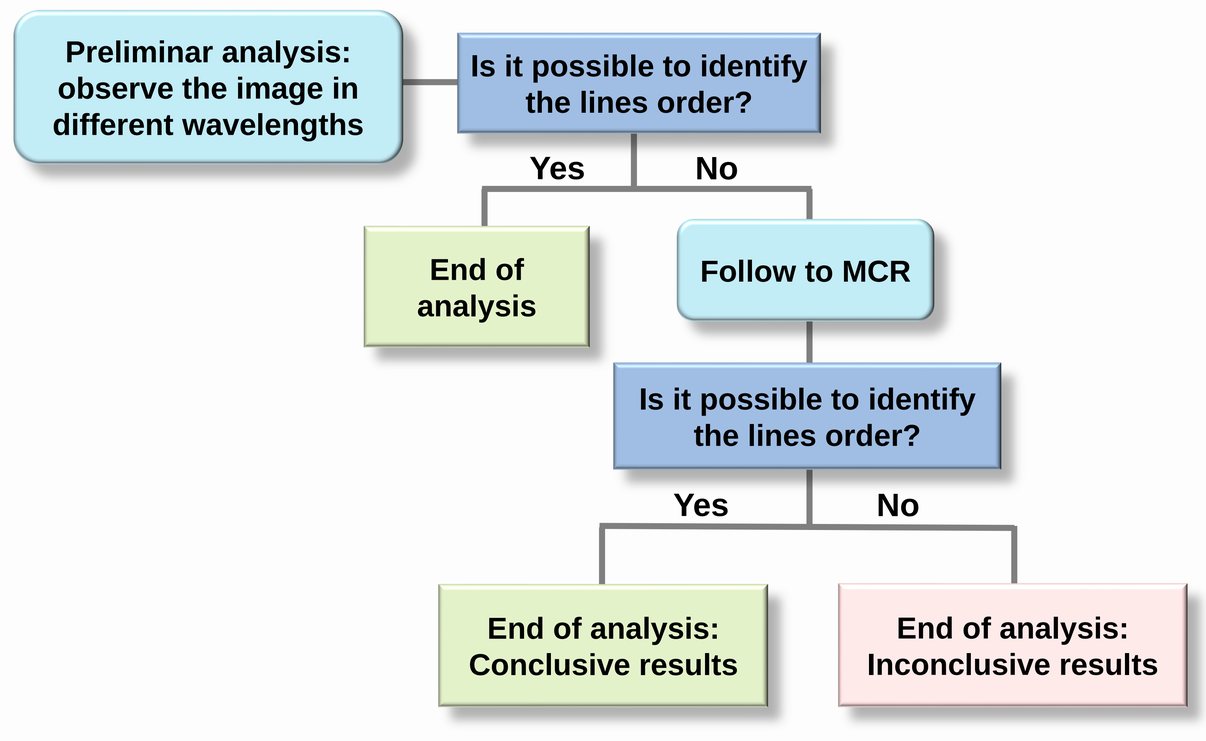


VSC 6000 (Foster and Freeman)

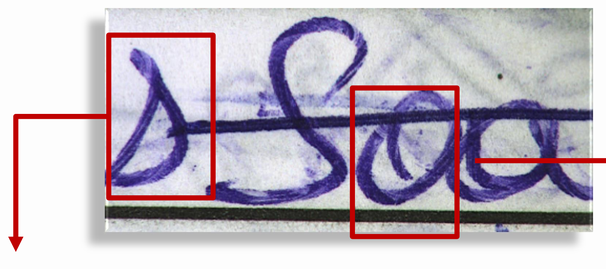
Unfolding

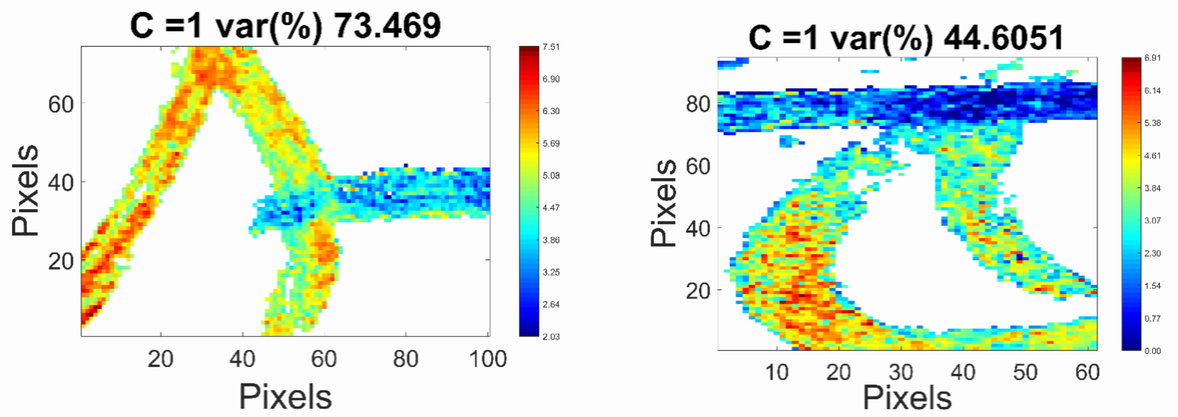
MCR-ALS

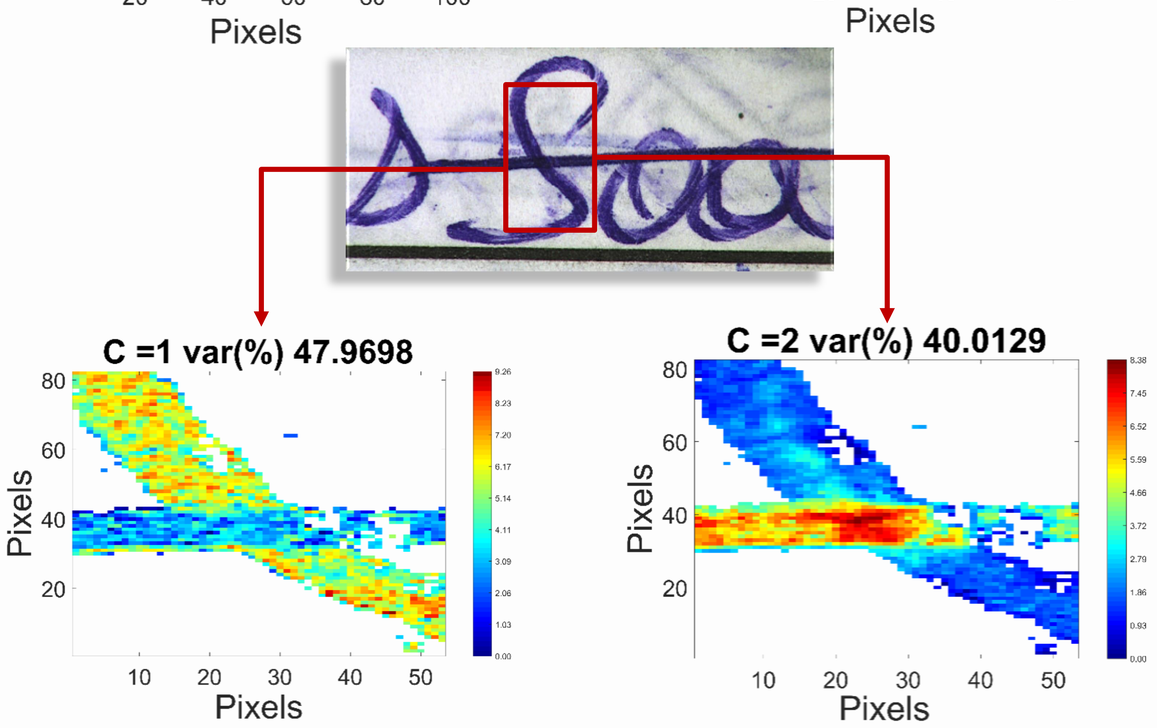




Results







Conclusions

- ✓ The proposed method obtained a chemical characterization of a large area of the evidence, conferring objectivity and increasing the reliability of the investigation;
- ✓ The method has been successfully applied in other real criminal investigations;
- ✓ Future perspectives include implementation of the method in routine analyzes.

References

[1] Brito, L. R.; Martins, A. R.; Braz, A.; Chaves, A. B.; Braga, J. W.; Pimentel, M. F. Critical review and trends in forensic investigations of crossing ink lines. Trends in Analytical Chemistry. 2017; 94: 54-69.

[2] Amigo, J. M.; Mobaraki, N. HYPER-Tools. A graphical user-friendly interface for multivariate and hyperspectral image analysis. Chemometrics and Intelligent Laboratory Systems. 2018, 172: 174-187.

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