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Ph.D. thesis (2020-2023)
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Use of multispectral images in the analysis of coated prints to improve anti-counterfeiting strategies

Utilisation d'images multispectrales dans l'analyse d'impressions pelliculées pour améliorer les stratégies d'anti-contrefaçon

FunPrint

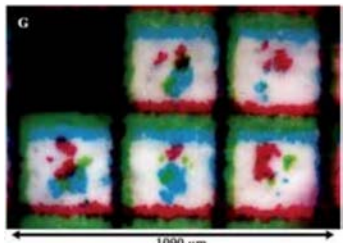
Context / Objectives

Anticounterfeiting: a major challenge of this century

- Economic issue: counterfeited products represented 2,5% of the global trade in 2019[1]
- Security issue: necessity to authenticate identity and fiduciary documents

Authentication strategies

- The LGP2 has developped an authentication strategy based on microcodes at the microscale.



Microcode[2]


Halo effect

- Optical phenomena within printed multilayer substrates are studied in the Laboratoire Hubert Curien. These color effects could be used as security features.

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[1] OECD/EUIPO, Illicit Trade, OECD publishing, Paris/European Union Intellectual Property Office, 2019.
[2] Louis Vallat-Evrard, Communauté Université Grenoble Alpes, LGP2, 2019.

Methods

Develop multiscale knowledge on halftones

- Study halftones at the microscopic and macroscopic scales.

Multispectral microscope

- Link microscopic halftone observation with the macroscale color rendering of this halftone.

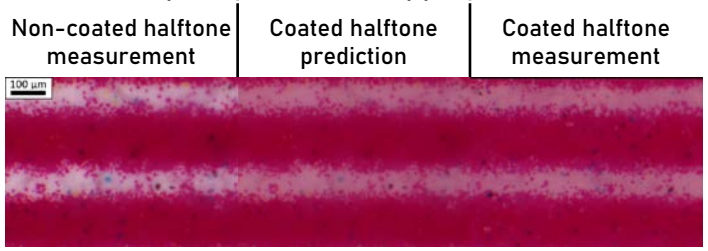
Develop anticounterfeiting strategies

- Use the layered structure of the printing material to produce hardly reproduceable color effects, especially when the print is coated with a transparent layer.
- Authenticate documents thanks to artefacts occuring in printed microcodes at the microscale.

Results

Coated halftone patterns

- Multiscale prediction of the appearance



- Image hiding

Invisible printed image when coated with one layer, revealed by addition or removal of a coating layer

Oral presentations at international conferences/workshop:
Electronic Imaging conference (2023). *IS&T*. San Francisco.
CCIW(2022). *GDR Appamat*. Online.
Optique des matériaux (2021). *GDR Appamat*. Online.
SSE#6 (2021). *Manutech SLEIGHT*. Saint-Etienne.

Publications:
Dailliez, F & al. *Journal of Imaging*, 8(9), 243.
Dailliez, F & al. *Coatings*, 11, 1465.
Hébert, M & al. (2021). *Color Imaging Conference*. Online.

Contribution to collective book:
Radiometry of wet surfaces – When Water Matters, Lionel Simonot, edp sciences, chapter 9