Image based anti-counterfeiting
and
Improving the Yule-Nielsen Modified Spectral Neugebauer Model

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1. Image based anti-counterfeiting features developed at EPFL

EPFL's Peripheral Systems Laboratory, relying on its know-how in the field of halftoning, color reproduction and moiré theory, has developed several image-based document protection technologies. We will give a short overview of :

(a) document protection by microstructure imaging,
(b) document protection by color differences
(c) document protection by embedded metallic patterns
(d) document protection by moiré images.

2. Improving the Yule-Nielsen modified Spectral Neugebauer model by dot surface coverages depending on the ink superposition conditions

Dot gain is different when dots are printed alone, printed in superposition with one ink or printed in superposition with two inks. In addition, the dot gain may also differ depending on which solid ink the considered halftone layer is superposed.

We improve the Yule-Nielsen modified Neugebauer model by integrating into it our effective dot surface coverage computation model. We calibrate the reproduction curves mapping nominal to effective surface coverages in every superposition condition by fitting effective dot surfaces which minimize the sum of square differences between measured and predicted reflection density spectra.

In order to predict the reflection spectrum of a patch, its given nominal surface coverage values are converted into effective coverage values by weighting the contributions from different reproduction curves according to the weights of the contributing superposition conditions. We analyze the colorimetric prediction improvement brought by our extended dot surface coverage model for offset prints, thermal transfer prints and ink-jet prints. The Yule-Nielsen modified Neugebauer model, enhanced with the proposed effective surface coverage model, yields for classical 75 to 150 lpi dot screens good to excellent reflection spectra prediction accuracies.