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MODEL-INDEPENDENT SPOT COLOR TONE-VALUES COVERAGE ESTIMATION

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Model-independent spot color tone-values coverage estimation

In the printing industry spot color is a definition of color $L^*a^*b^*$-value. Emulation of spot color is usually done by printing process inks with various coverage values. The printed result would have the desired $L^*a^*b^*$ color coordinates. Furthermore, emulated spot color tone-values are subject to definition of a specific tone-value model. This is as opposed to spot color ink, where the tone-values are defined simply by printing various coverage values of the ink.

We hereby disclose a process that derives practically and accurately the process inks coverage values that emulates gray-level tone-value of the spot color. Initially, a tone-value model is constructed. Based on the model, the $L^*a^*b^*$-value for a given tone-value is estimated.

For each $L^*a^*b^*$-value, the theoretical coverage values of the press process inks are evaluated, such that printing these coverage values should result in the required $L^*a^*b^*$-value. A common method for this evaluation is a color-model-based “searching” algorithm.

The searching stage requires that the coverage values of the process inks are a continuous function of the spot color gray-level. A method to obtain such a function, is by applying constrains on the searching method, such as specific GCR usage.

The following step of the proposed method would be a color refinement of the emulated spot color tone-values (as obtained from the previous stage). In order to obtain high color accuracy, the coverage values of the press process inks (required to emulate the $L^*a^*b^*$-value) are refined. This refinement stage is essential since the press color may vary over time. Similarly to the previous step (color-model-based “searching” algorithm), some care is required, as the refined coverage values should be “close” to the values obtained from the color model.

Practically, it is not possible to perform this process for every tone-value. Therefore, this is done only for a selected few tone-values. The number of selected tone-values, will determine the color accuracy of the full tone-values range.

The final step includes a construction of a look-up-table, in which the input channel is the coverage values of the color model and the output channel is the press refined coverage values. The look-up-table construction utilizes the previous steps output. A flowchart of the described method is presented in Fig 1.
Get an input on the desired accuracy level, in terms of interpolation points.

Estimate tone value model needed quantities, such as spot-color L*a*b or spectral values.

Perform spot-color refinement for the desired number of interpolation points.

Estimate the coverage values from the color model.

Construct a function: 
\[ [C,M,Y,K] = f(\text{Spot-color tone-value}) \]

**Fig 1.**