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PREDICTING END-TO-END COLOR CONSISTENCY FOR A REAL USER PLOT

HP INC

Title:

Predicting end-to-end Color Consistency for a real user plot.

Abstract:

Currently Color Consistency is communicated using a single spec which is generated with a complex experiment and statistical method. The disclosed proposal can predict color consistency for a specific image/media/print mode combination by using a machine learning model which was trained with structured data based on a Coor Consistency test method.

Prior Solutions:/ Problem Solved:

In previous products a generic single number CoCo spec. was communicated to the customer. To generate this number many variables had to be assumed constant and statistical processing had to be applied. This was useful for an overall statement but lacked any detailed information. Different Colorant combinations can generate different consistency. While some combinations perform very well or consistent others can only be reproduced with large variability. As the single number spec was not universally met (only for 95^{th} percentile of tested color combinations) it generated distrust and a climate of suspicion which was a severe inhibitor for a fact-based conversation with customers.

Description:

Color Consistency is a complex concept, and different colors have different levels of color consistency along the length and breadth of a long printing job. Multiple tests conducted on the Latex XX printers have proved that across print runs, the colors have a repeatable trend in color consistency. This means that across multiple print runs, the worst performing colors in one job, perform worse in other jobs as well. The same trend is followed for good performing colors.

The idea is to cluster this behavior to learn a model which can predict color consistency performance based on the printed color, so that the user can be provided with a warning in advance for worse performing colors.

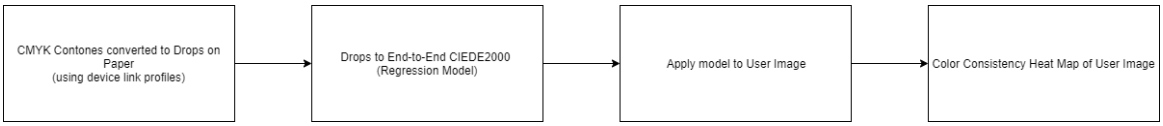
The input variables for this model are in the ink space, and the target values are the end-to-end pairwise CIEDE2000 values for a long job for every patch. The end to end CIEDE2000 values are acquired by doing pairwise comparisons of CIEDE2000 for all possible pairs for every patch in an OCTP plot and taking a 95 percentile for the population of every patch. The OCTP plot is used for quantifying color consistency in Latex printers.

Once this model is learnt, it can predict the end-to-end 95 percentile CIEDE2000 for any color (ink drop) combination. This model can then be used to on a real user image to predict color consistency for every pixel and displaying a heatmap to signify which pixels/parts of image has a high risk of performing worse in terms of color consistency. In this way, without printing a long job, a user can know in advance which colors are going to perform worse and take preventive actions whatsoever.

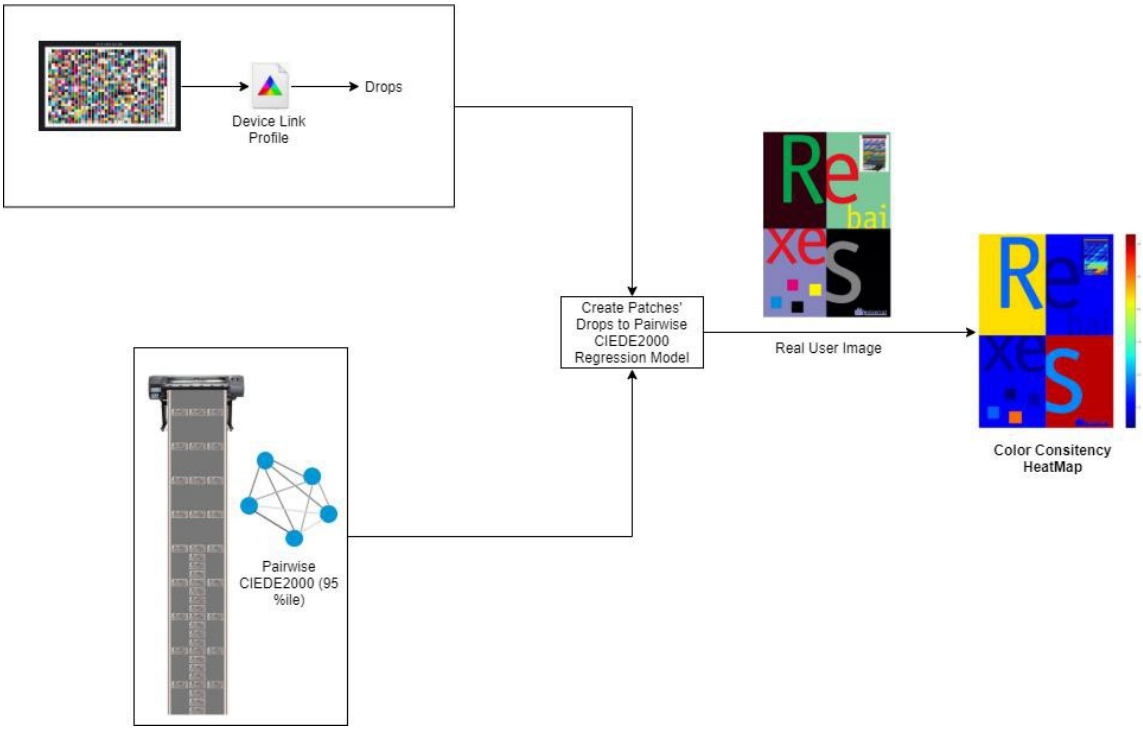
Data capture:

The strength of the proposed method is entirely dependent on the amount of data we can capture for the prediction model. It is critical to enable CoCo data capturing in all already existing Media Versatility qualifications.

Flowchart:



An example:



Advantages:

The main advantage of the disclosed method is the ability to communicate Color consistency performance of a printing system (including media) for specific image content. It enables us to convert a generic spec which is generated by a complex methodology, usually not well understood in the market, into an image content specific evaluation. The customer can decide case by case if the predicted Color Consistency is good or if the specific image content will create risks for Color Consistency. This converts a sterile Spec into relevant and actionable feedback.

Detectability:

Detectability is high as this tool would be implemented as an interface in the RIP, the IPS, the front panel or as a stand-alone software.

Disclosed by Pooshpanjan Roy Biswas, Andreas Muller and Francesc Ros, HP Inc.