

Test Targets Showcase: Color Rendering from Scan to Print

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Objectives

This is a study to illustrate how ICC color management can be applied from scan to print. We compared the difference between image quality using different rendering intents namely perceptual and absolute rendering intents.

Procedures

1. Scanning

A number of 35mm transparencies shot by Donna Crowe were scanned on a Nikon Coolscan Scanner.

2. Scanner Profiling

A IT8.7/1 Target. by Fuji was scanned along with the images and scanner ICC profile was built with the use of GretagMacbeth ProfileMaker software*.



Figure 1. The Nikon Super Coolscan 2000 Desktop Scanner.

3. Press Profiling

The profile of the Indigo UltraStream 2000 device was created by printing GretagMacbeth Profiling Target on the device. The printed target was measured on the GretagMacbeth Spectrolino Spectroscan and a printer ICC profile was created using GretagMacbeth ProfileMaker software*.

4. Image Cropping and resizing

The raw image was opened in Photoshop 6.0 without color management. It was cropped and resized so that the image is 3.5" wide with a spatial resolution of 300 ppi.

5. ICC based color workflow

The color settings in the ICC-based workflow is shown in figure 2. First, the cropped image was opened in Photoshop 6.0 by assigning the Nikon Scanner ICC profile to the raw data and converted to the ColorMatch RGB working space. This provided the appearance match between the original painting and the monitor display. The second step was to convert the image from the ColorMatch

RGB space to the Indigo UltraStream CMYK space via the "Convert to Profile." The Kodak CMM with perceptual and absolute colorimetric rendering were used in the conversion.

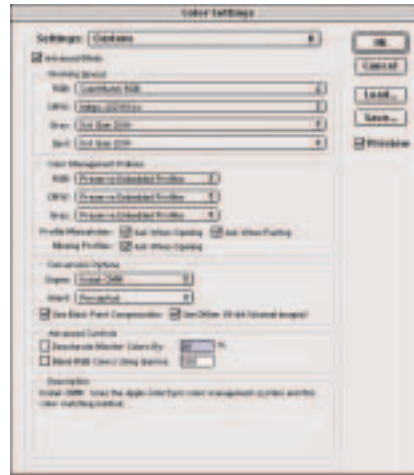


Figure 2. ColorMatch RGB was used as the RGB working - space, Indigo UltraStream 2000 was used as the CMYK working space in the ICC workflow with perceptual rendering Intent.

6. Pagination and Hardcopy output

The pagination was implemented in Quark 4.0. The images rendered by the ICC method with perceptual rendering intent are placed at left, figure 3a and 4a and the images with absolute colorimetric rendering are shown at right, figure 3b and 4b. The page was printed to Indigo UltraStream 2000 under known printing conditions.

7. Visual assesment

When comparing between Images with perceptual and absolute rendering intent , images with perceptual rendering intent show rich and bright colors with good contrast while the images with absolute rendering are a bit darker.

Discussion

To understand the cause of visual difference between two intents we must first understand the approach taken by the rendering intents during the conversion of colors from source to destination color space. Converting colors to a different color space which in our case is from ColorMatch RGB working space to Indigo UltraStream CMYK space, usually involves an adjustment of the colors to accommodate the gamut of

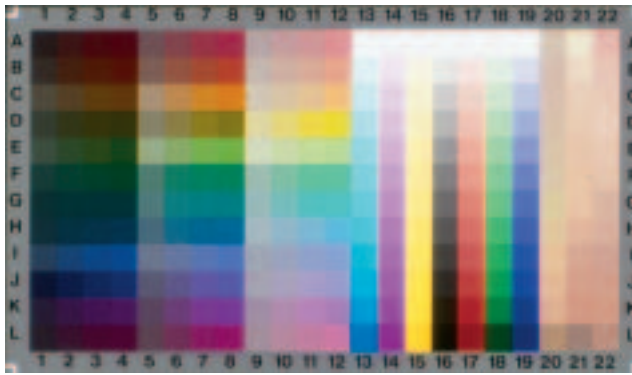


Figure 3a : Perceptual Rendering.

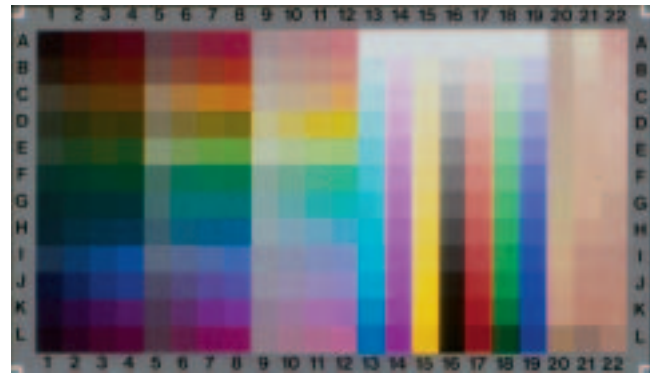


Figure 3b : Absolute colorimetric Rendering.



Figure 4a : Perceptual Rendering.



Figure 4b : Absolute colorimetric Rendering.

the destination color space. Different translation methods use different rules to determine how the source colors are adjusted; for example, colors that fall inside the destination gamut may be rendered accurately or they may be adjusted to preserve the original range of visual relationships during translation to a smaller destination gamut. These translation methods are known as rendering intents because each technique is optimized for a different intended use of color graphics. The translation methods used by perceptual and absolute rendering intents are as follows:

Perceptual rendering

Perceptual aims to preserve the visual relationship between colors in a way that is perceived as natural to the human eye, although the color values themselves may alter. This intent is most suitable for pictorial image rendering.

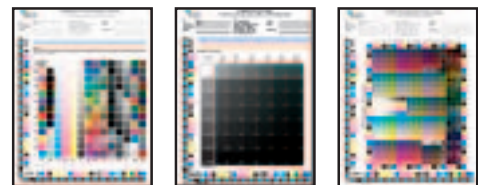
Absolute Colorimetric rendering

Absolute colorimetric leaves colors that fall inside the destination gamut unaltered. This intent aims to achieve color accuracy at the expense of preserving relationships between colors. Absolute Colorimetric

can be more accurate if the image's color profile contains correct white point (extreme highlight) information.

With perceptual rendering, tonal values in figure 3a & 4a are lightened such that the chroma of the image preserved. With absolute colorimetric rendering, tonal values in figure 3b and 4b are darkened and the images appear less colorful suggesting that the preservation of tonal values at the expense of preserving chroma.

Print•RIT Test Forms used in this study:



* ProfileMaker Professional 3.1 is a color management software by GretagMacbeth. It has a suite of software applications to build profiles for scanners, digital cameras, monitors, printers, and presses.