

Standards Update

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The increasing interest use of color management has prompted more cooperative activities within the imaging industry. There is interest in finding common solutions to issues that have been around in one form or another for some time.

The recent meeting of ISO/TC130, Graphic technology, was the focus for several proposals that tie into such concerns. Because these ideas are still in the formulation stage, I am describing them here with an invitation to provide comments, or get involved, or both. While these are separate proposals, they are synergistic with one another and together point the way to a more organized (one might almost say engineered) workflow in the imaging industry.

The three topics described below, Profile registry, CMYK exchange spaces, and paper classification, are all issues that are being actively pursued by both TC130 and the International Color Consortium (ICC).

Profile Registry

Currently, all PDF/X files must point to the characterized printing condition for which the data in the file was prepared. In addition, where color managed files are exchanged an ICC profile must also be included. Color managed files are defined as any files where the data are not in the same color space as the characterized printing condition. In the latest revision of the PDF/X standards, the ability to include a profile by reference is also being studied.

The primary objective in establishing a registry is to allow profiles to be uniquely identified through a reference to an established registry in place of having them embedded in the file. However, this led to a larger discussion of the confusion on the part of many new users of color management, as to what profile to use and where to find the correct (or any) profile for registered characterized printing conditions. It was generally agreed that we need to make it easy for creators and readers of PDF/X to identify profiles and relate these to printing conditions. More generally, we need to make it easy for users to find profiles for registered printing conditions.

Three use cases have been identified:

1. Users know the reference printing condition and wish to select a suitable ICC profile for that condition. Profile selection in this case is a manual process.
2. Users have received a PDF/X-1a file with a reference printing condition but no embedded profile and wish to have an automated method of selecting a suitable profile for this printing condition in order to make a proof.
3. Users have received a PDF/X-5 file with an externally referenced profile and must obtain that specific profile to properly process the file.

It is proposed that profiles be identified by means of a URL (uniform resource locator). Making profiles available in this way for PDF/X would mean that conforming readers would need to be able to access the internet or provide some form of local cache for profiles.

Four possibilities must be considered:

1. Profiles may be posted directly on the registry web site
2. A link to the profile is presented on the registry web site.
3. A link to a set of click-through pages that provide con-

ditions of use is presented on the registry web site. In this case some user intervention is required to access the profile, this would include the case where the user must read and agree to a licence agreement before downloading the profile.

4. The profile exists but must be licensed and is not available for direct download.

At this point both the ICC and TC130 are committed to creating such a registry under the auspices of the ICC. The ICC is studying implementation options, as well as the issues of required metadata (such as a short, easily understood description of the conditions for which the profile is intended, TAC, GCR, and so on), registry location, confirmation of profile identity, IP issues, persistence, naming conventions, etc.

If you have any inputs or ideas I am sure that both the ICC and TC130 would be interested.

CMYK Exchange Color Spaces

There is a growing concern that the industry seems to be generating more characterized printing conditions than are really necessary. This issue has come up within the Printing Across Borders (PAB) initiative, as well as within the ICC, TC130, and other industry groups. Currently the ICC Registry shows 46 reference printing conditions registered.

In the TC130 meeting it was noted that, because the colorants used in ink are relatively similar regardless of the printing process, the color gamuts of CMYK printing are generally shared across printing processes. The paper used for a particular class of printing seems to have a better correlation with achievable color gamut than does the printing process. Thus the question arises whether print process independent CMYK exchange color spaces could be identified as one step in minimizing the need for process-specific characterized printing conditions.

Clearly, even when different printing processes have the same color gamut, they often exhibit significantly different within-gamut characterization conditions. Within-gamut characterization is affected by tone value increase, trapping, hard-dot vs soft-dot printing (or no-dot printing, such as gravure), etc.

However, there is increasing confidence that color management can successfully adjust within gamut data between processes while preserving such things as the black-to-color relationship, etc. In addition, the approach being pursued by GRACoL (an industry group pursuing printing aims for commercial offset lithography), which involves a digital calibration process as a precursor or complement to color management, also offers promise as a way to bring together disparate processes that have the same basic outer color gamut.

Given these capabilities, it appears to make sense to see if there is a family of color gamuts that span the printing range from newsprint to high end "annual report" printing. At present the number of gamuts that would be required and their spacing in chroma is unknown. It is clear that as the quality of the printing stock increases it is able to support a greater ink load and generally has a bluer (whiter) color. This suggests that any family of color gamuts should not be completely symmetrical but have a white (or center) point that moves from yellow toward blue.

The additional consideration that was identified in these

discussions was that, because these are exchange spaces, they do not necessarily need to be tied to any specific printing condition. That is, as a group one of the set would be close enough to any particular printing condition to allow it to be used as the reference for CMYK data exchange, with color management or other calibration processes being used to accomplish the final matching to real printing data requirements. These exchange spaces could also become the reference for a family of proofing conditions that would allow greater flexibility for design and prepress to prepare material prior to final commitment of a printing process.

If this concept were to prove feasible, these exchange spaces could become the default reference printing conditions. This would greatly simplify the issue of a profile registry and would allow preparation and printing to be more effectively decoupled. This is an intriguing idea that needs additional study, but may offer some real simplification to the interface between preparation and printing. Again, any inputs and thoughts would be welcomed by the groups involved.

Paper Classification

Paper is a critical component in all process color printing. It is the fifth color and its characteristics determine both the appearance of and the amount of ink that can be printed. This function in turn defines the achievable color printing gamut. It is true that volumetric processes like gravure can, in general, print slightly more ink on a particular paper than can be achieved by a planographic process like offset, and thus can achieve a somewhat larger gamut. However, this gamut increase would be at most one step in any CMYK exchange space gamut family.

The sheer number of individual printing papers available from all suppliers is so vast that characterization data can never be provided for even a small number of them. Ideally, the color management community would like to be able to add metadata to printing characterization data, or CMYK color exchange space data, indicating the types of papers and printing processes for which the data are appropriate.

Unfortunately, the way papers are categorized gives little direct indication of the printing characteristics. In addition, paper categories and the measurements used to determine them are different in different parts of the world—North America, Europe, and Asia. Further, there are some fundamental differences in the way the papers typically used in the US, Asia, and Europe are made, which also affect printability.

From a color management perspective what we care about are the factors that affect reflectance, ink carrying ability, and tone value increase. Reflectance issues include brightness, whiteness, spectral reflectance, opacity, and shade. Ink carrying ability and tone value increase is dependent on physical characteristics such as ink absorptivity, smoothness, gloss, and surface topography. Tone value increase also has an optical component of diffusivity or scattering. An added factor that impacts the measurement of both paper and printing characteristics is the use of brightening agents.

As one step in starting a dialog about these issues, TC130 and the ICC are arranging an open meeting to be held as part of the ICC meeting and CGIV Conference (IS&T European Conference on Colour in Graphics, Imaging, and Vision) to be

held in Leeds, UK, in June of 2006. The intent is to invite representatives of the worldwide paper industry, color management experts, and printers to an open discussion of the issues. The goal is to identify a way forward to paper characterization parameters that would correlate with printing (and measurement) characteristics and allow better predictability of the applicability of color characterization data. Yes, a mouthful, but that is really the goal.

Other Notes

Other noteworthy items from the standards world include the following:

PDF/X-4 and PDF/X-5 PDF/X-4 and PDF/X-5 are just starting a 3 month CD ballot. Both PDF/X-4 and PDF/X-5 will be based on PDF 1.6 and the following new functionality in PDF has been permitted without comment:

- From PDF 1.5: 16-bit images, text streams, cross-reference streams, ICC v4 profiles, compressed objects, extensions to many annotations.
- From PDF 1.6: user space, the NChannel variant of DeviceN colour spaces (with some minor restrictions), embedding of OpenType fonts

In addition:

- The use of PDF transparency, as defined in PDF 1.4 and later, has been allowed. (An Adobe TechNote will be published, in support of the PDF/X standards, documenting the various transparency blending modes.)
- The use of optional content (often known as layers) has been allowed, principally to enable regional versioning.

PDF/X-5 requirements will match those of PDF/X-4 in all features PLUS PDF/X-4 will be required to allow external references for

- 1) external profiles,
- 2) external objects,
- 3) both external profiles and external objects, and
- 4) external output intent ICC color profiles for n-colorant print characterizations.

ISO Version of ICC Spec Published ISO 15076-1:2005, Image technology colour management—Architecture, profile format and data structure—Part 1:Based on ICC.1:2004-10, was published on December 1, 2005. This standard is technically identical to ICC.1:2004-10, Image technology colour management—Architecture, profile format, and data structure (Profile version 4.2.0.0). This represents a major step forward for both the ICC and ISO/TC130

CIELAB/SCID Images ISO 12640-3, Graphic technology—Prepress digital data exchange—Part 3: CIELAB standard colour image data (CIELAB/SCID), is in DIS ballot. The default color gamut used for these large gamut color test images, and defined in the standard, has also been adopted by the ICC as the gamut of the perceptual rendering intent reference medium.

Variable Data Printing ISO 16612:2005, Graphic technology—Variable printing data exchange using PPML and PDF (PPML/VDX), has been published.

For suggestions for (or input to) future updates, or standards questions in general, please contact the author at mcdowell@npes.org or mcdowell@kodak.com