

Standards Update

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This issue of Standards Update will briefly review some of the standards activities in the world of color science that potentially impact our imaging world. I will immediately start with the caveat that this area is so diverse that I am sure that some areas will be missed or under-reported. Therefore, this is an invitation, to any who are involved in activities that are not reported, to contact me and provide input for a follow-up Standards Update.

The ICC

One area that is currently very visible is color management and the International Color Consortium (ICC). The ICC is continuing to work aggressively to help move color management from being a theoretical concept to practical implementations that we use daily.

At the recent ICC meeting in Barcelona Spain, the relationship between the PDF/X International Standards and the ICC characterization data registry and ICC profiles was emphasized. Briefly, every PDF/X file (file format for graphic arts data exchange defined in ISO 15930-1, -2, or -3) must point to either a characterized printing condition listed in the ICC registry or contain an ICC profile that colorimetrically describes the intended printing condition. In this way the intended printed color of all PDF/X data is either directly or indirectly described using ICC tools. This is an excellent example of synergy between two different organizations as well as a major step forward for the printing industry.

Other areas, receiving attention at the ICC meeting, were the rewriting of the ICC Profile Specification in a form compatible with national and international standards procedures, color managed workflow descriptions and scenarios, and requirements that should be considered for a possible CMM specification. It should also be noted that the ICC and ISO TC130 (Graphic technology) have jointly developed and approved a letter of agreement that is presently with ISO Council for ratification. This agreement will allow the ICC and TC130 to jointly publish the ICC Profile Specification, and other ICC Specifications, both as ISO Standards and as ICC documents.

The main thrust of the workflow discussions has been to develop a general understanding of color managed workflows and how they can be applied in many different industry sectors. Such an understanding will help define and develop implementation strategies for both users and developers, but more importantly will help identify areas in which the current ICC architecture and specifications need modification or strengthening. These workflow discussions are in turn building on the work of TC42/JWG23 and CIE Div8,05, both of which will be discussed later.

The CMM is the generic name given to the computational engine that processes the image data based on instructions contained in the associated ICC profiles. All CMMs must properly use all ICC defined profile tags but may also use privately defined tags. Many of the baseline capabilities and requirements are defined as part of the profile specification, but there is a growing desire to more explicitly define a default set of CMM requirements to ensure interoperability.

CIE Division 8 (Image Technology)

The work of CIE Division 8 was summarized in the Nov/Dec issue. Briefly as a review, CIE Division 8 (Image Technology) was formed in 1998, at the urging of the imaging technical community, to enable the CIE to better address the needs of the imaging industry and specifically the emerging world of color management. It works in cooperation with the other CIE Divisions, particularly Division 1, Vision and Colour, and Division 2, Measurement of Light and Radiation, to provide the imaging industry with the tools necessary to measure, manipulate, communicate, and interpret color.

CIE Division 8, Image Technology, Division 8 consists of seven Technical Committees (TCs) which are:

- TC8-01 Colour Appearance Modeling for Colour Management Applications
- TC8-02 Colour Difference Evaluation In Images
- TC8-03 Gamut Mapping
- TC8-04 Adaptation Under Mixed Illumination Conditions
- TC8-05 Communication of Colour Information
- TC8-06 Image Technology Vocabulary
- TC8-07 Multispectral imaging

Two of these TCs have reports out for Divisional ballot (the first step in the CIE approval process).

The TC 8-01 report is titled "A colour appearance model for colour management systems: CIECAM02", and the TC 8-03 report is "Guidelines for the evaluation of gamut mapping algorithms".

TC8-02, TC8-04, and TC8-05 all plan to prepare intermediate or final reports in 2003. TC8-06 is an ongoing effort in support of the larger CIE vocabulary project and TC8-07 is a new activity that was started late in 2002.

TC42 and TC130

Our traditional standards committee are also doing color related work. Much of this is occurring in Joint Working Groups (JWGs) between TC42 and TC130.

TC42/JWG 20 is developing the multi-part standard ISO 17321 which includes specifications and procedures for the color characterization of digital still cameras (DSC). The standard will include options for using either physical targets or spectral illumination techniques and will include recommended methods for determining transforms from raw DSC data to scene-referred image data.

The term "scene-referred" comes from Part 1 of ISO 22028, *Photography and graphic technology — Extended colour encodings for digital image storage, manipulation and interchange*, being developed by TC42/JWG23. Part 1 lays out the Architecture and requirements and introduces a very significant concept that is essential to many color imaging applications.

That concept is the idea of an "image state" and the recognition that there are scene image spaces and picture or output image spaces and that there is no simple transform between the two. This is further complicated by the fact that we often use the same color encoding for both.

A typical example is that if we had a digital still camera that exactly captured the colorimetry of every object in the scene we could not, and indeed would not want to, replicate the scene colorimetry in a print of the scene. Yet we often report and talk about the colorimetry of the reproduction and the original using similar metrology and data encoding. Again as color management systems incorporate digital still camera input,

and build transforms to typical output spaces, these concepts become critical to enable a common understanding of data between applications.

Although not directly a color issue, TC42/JWG21 is continuing to revise the ISO 5 series of densitometry standards. Of particular interest is the revision of ISO 5.3, *Photography and graphic technology- Density measurements - Part 3: Spectral conditions*. The current draft is based on the concept of spectral products which are essentially filter functions. The revised draft will be based on computations based on spectral data. While the numerical differences are small, the theoretical base and traceability issues are significantly different. Suffice it to say we will soon have clearly defined procedures to compute density from spectral measurements.

ISO 12646, *Graphic technology — Displays for colour proofing — Characteristics and viewing conditions*. The ability to match color images displayed on monitors (often called a soft proof) to the images produced when the same digital file is proofed and printed is increasingly expected in many applications. The appearance of a color image on a monitor is influenced by many physical factors in addition to viewing conditions. Among the most important of these are uniformity, convergence, size and resolution, freedom from flicker, the calibration of the display and the settings of its display driver software. Therefore, ISO 12646 also specifies minimum requirements for factors such as uniformity, convergence, refresh rate, size and spatial resolution.

TC130 has recently approved *ISO 12640-2, Graphic technology — Prepress digital data exchange — Part 2: XYZ/sRGB encoded standard colour image data (XYZ/SCID)* is in DIS (final approval) ballot. This standard defines a set of reference images that are constrained to fit within the sRGB color gamut. They compliment the popular CMYK/SCID image set of ISO 12640 (soon to be re-designated ISO 12640-1). However, to insure that the two image sets are not confused, different images were selected for the new image set. These should be available for widespread use shortly after the ballot closes in April 2003.

As part of the development of ISO 12640-3, a large gamut set of SCID images which is the third part of the

SCID image sets, there was a need to define the gamut limit for expected colors. At the same time the ICC has been investigating the pros and cons of defining a gamut limit for the PCS to be used in gamut mapping applications.

This has led to the possibility that together the ICC and TC130 can agree upon and standardize a reference gamut of real world reflection colors. This could provide a useful reference in many applications. It is too soon to tell if this is possible, but is an example of the synergy we are seeing between the various groups involved in color imaging standards.

I3A

I3A (International Imaging Industry Association) is the new name for the trade association that supports the Photographic Industry. It is the secretariat for ISO TC42 and for the ANSI standards committees responsible for photographic standards.

One of these committees, IT10, has approved three extended gamut color space standards for photographic data application. These are: I3A 7466, *Electronic Still Picture Imaging - Reference input medium metric RGB color encoding (RIMM-RGB)*; PIMA 7666, *Electronic Still Picture Imaging - Reference output medium metric RGB color encoding (ROMM-RGB)*; and PIMA 7667, *Electronic Still Picture Imaging - Extended sRGB color space - e-sRGB*.

As TC42, the TC42/TC130 JWGs, and the ICC get more involved in extended gamut color spaces I am sure we will be hearing more about these color spaces.

Summary

The world of color science can be daunting. A lot is going on, much of which can have a direct impact on the imaging community. This has been a brief look at some of the more significant recent activities.

Other Standards Items of Note

TC130 (Graphic technology)

The DIS ballots on the revisions of PDF/X-1 and PDF/X-3, adding PDF 1.4 compatibility, as well as the DIS ballot on PDF/X-2 have all been approved. It is expected that these standards will be published within the next few months. In addition the DIS of the revision of ISO 12639 (TIFF/

IT) has also been approved.

A new work item (NWI) ballot is being circulated in TC130 which proposes the development of an ISO standard which will define an XML based file format to enable the exchange of information about the color characteristics of reflection or transmission materials.

TC42 (Photography)

The DIS ballot of ISO 22028-1 (see above) has been approved and it is being prepared for publication.

TC 171 (Document Management)

A new joint activity has been initiated between NPES The Association for Suppliers of Printing, Publishing and Converting Technologies, and the Association for Information and Image Management, International (AIIM International) to develop an International standard that defines the use of the Portable Document Format (PDF) for archiving and preserving documents.

The project, currently referred to as PDF/A, will address the growing need to electronically archive documents in a way that will ensure preservation of their contents over an extended period of time, and will further ensure that those documents will be able to be retrieved and rendered with a consistent and predictable result in the future.

This need exists in a growing number of international government and industry segments, including legal systems, libraries, newspapers, regulated industries, and others.

The intent is to create a Joint Working Group, under the auspices of ISO/TC171, that will include participation from at least ISO/TC171, ISO/TC130 (Graphic technology), ISO/TC46 (Information and Documentation), and ISO/TC42 (Photography).

This work is seen as a parallel effort to the PDF/X work in TC130, but addresses a different market need. It will draw upon both the knowledge gained in the PDF/X work as well as potentially parts of the PDF/X standards themselves. More information and contact data is available at www.aiim.org.

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