STANDARDS

# STANDARDS UPDATE

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This issue of Standards Update will depart somewhat from my usual format. I want to try to describe some of the quiet, but extremely important, interaction that is going on between several of the standards groups involved in imaging. So instead of describing the work of individual committees I will focus on a series of activities that are mutually supportive.

**Where to start?** There is no single correct place to start in describing this interaction so I will start with the area closest to my primary interest - the graphic arts.

**Graphic arts file formats**

As ISO/TC130 (Graphic technology) was developing the PDF/X family of data exchange standards (ISO 15930-1, -2, and -3) there was a clear need to define the meaning of the data being exchanged. The "meaning" we were struggling with was the color that would result on the printed page when the data files were printed as the sender intended.

The method that was chosen was to use characterization data and/or ICC profiles. This was enabled by the addition in PDF version 1.4 of the "OutputIntents" array in the Catalog object of a PDF file.

The PDF/X file format requires that print elements in a PDF/X file, be prepared for a single characterized printing condition prior to exchange. The PDF/X standards go on to say that this characterized printing condition is defined by either a named condition or an ICC output profile.

In addition, the recently completed revision of TIFF/IT, more properly known as ISO 12639, made provision for use of a very similar mechanism to define the color meaning of the data contained within the file.

These steps clearly tied the success of the PDF/X and TIFF/IT data exchanges to the success of the ICC in developing and defining the ICC Profile specification.

**Printing condition registry?**

The words "defined by either a named condition or an ICC output profile" created the need for some sort of registry of named printing conditions. Discussions between the ICC and TC130 resulted in the establishment of two registries by the ICC. These may be accessed at www.color.org.

The first is a registry of CMYK characterization data that has been prepared by various standards groups. This registry includes a short name used to identify the named condition and various pointers to the documentation, source and availability of this data.

The main source of the data in this registry are the printing tests being conducted by the various printing research institutes (e.g. FORGA in Germany), printing trade organizations (IFRA, SWOP, GRACoL) and standards groups (CGATS).

These printing tests typically build on either individual trade association specifications such as SWOP or the various parts of ISO 12647, *Graphic technology - Process control for the preparation of half-tone colour separations, proof and productions prints.* Current parts of ISO 12647 (completed or in preparation) include offset lithographic processes, coldset offset lithography and letterpress on newsprint, publication gravure processes, screen printing, flexographic printing, and reference printing conditions for electronic data exchange.

The second registry is of three-component ("RGB") color spaces, their description, and characterization. This is required in particular to support PDF/X-3 files which may include 3-component data as either source information or as an intended output condition.

This registry will prove valuable far beyond the PDF/X-3 file format requirements. It will be one of the few well documented, publically available, sources of this type of data.

**RGB registry and TC42 connection**

In developing the RGB registry and defining the data that are required, the ICC drew upon the work being done in ISO/TC42 (Photography). The recently completed TC42 standard ISO 22028-1, *Photography and graphic technology - Extended colour encodings for digital image storage, manipulation and interchange - Part 1: Architecture and requirements*, lays out a set of requirements for color encoding which are being followed by the ICC in creating the ICC RGB registry.

This standard also documents the relatively new concept of an image-state-based imaging architecture.

**Image-state architecture?**

As described in ISO 22028-1, the architecture of a digital imaging system can be described, on the one hand, as the sum of its components and how those components are interconnected and, on the other hand, as the functions of those components and how they interact with each other as an integrated system. One important aspect of a digital imaging architecture is how the digital image data is encoded as it progresses through the system workflow from image capture/creation, through image processing/storage/interchange, and finally to output on one or more output devices.

The need for various color encodings and the rationale for their specifications can be best understood in the context of the particular industry and workflow for which they are intended. The digital photography and graphic technology industries are very diverse and often complex. However, their core activities can be represented by a fairly simple model where images are classified according to their image state.

An image state diagram in ISO 22028 shows that most color encodings can broadly be categorized into scene-referred or picture-referred image states.

Scene-referred colour encodings are representations of the estimated color-space coordinates of the elements of an original scene, where a scene is defined to be the spectral radiances of a view of the natural world as measured from a specified vantage point in space and at a specified time.

On the other hand, picture-referred color encodings (often called output referred) are representations of the color-space coordinates of a hardcopy or softcopy image.

All of the CMYK and RGB color space definitions and characterizations included in the ICC registries are for output referred color spaces

**Other 3-component color spaces**

The US ANSI Photographic standards committees under the leadership

of I3A () has already standardized two color spces identified as ROMM RGB, RIMM RGB. In addition work has been started to standardize Adobe RGB. It is anticipated that these will be offered to ISO/TC42 to be included as subsequent parts of ISO 22028.

**Other related activities**

At the same time this work is going on several other standards activities are underway that help in various ways to support the documentation of this characterization work.

**Densitometry standards**

TC42/JWG21 is currently revising the ISO 5 series of densitometry standards. The goal of these revisions are to (1) separate the definition of density and the tolerances on the measurement of density and (2) to extend the spectral definition of status density to include computation from spectral measurements as well as the use of filter type instruments.

Many people have used the current spectral products data as weighting factors for spectral computation. While this is technically an incorrect procedure, fortunately, the numerical values computed do not differ significantly from the values computed with the new weighting factors.

It is expected that this revision of the ISO 5 series will be completed early in 2004.

**Calculation of colorimetric data**

The primary reference for the calculation of colorimetric data has traditionally been CIE Publication 15.

This is a Technical Report prepared by CIE Division 1 and its introduction notes. "The document reports on current knowledge and experience within the specific field of light and lighting described, and is intended to be used by the CIE membership and other interested parties. It should be noted, however, that the status of this document is advisory and not mandatory."

In spite of this caution, most treat CIE Publication 15 as though it were a standard. CIE TC1-57 was created in 2002 to address this concern and to prepare a multi-part standard that is intended to be a duel-logo (CIE/ISO) standard. The current CIE identification is CIE SO14 and the titles of the intended parts are:

- Part 1: Colour matching functions
- Part 2: Standard illuminants
- Part 3: Calculating tristimulus values
- Part 4: CIELAB colour space
- Part 5: CIELUV colour space
- Part 6: CIE DE2000 colour difference equation

When completed,these standards will make it much easier to reference the computation of colorimetric data and should also insure consistency in these computations between organizations.

**Targets for CMYK characterization**

Currently the only standardized data set (target) used for characterization of CMYK printing is the 928 element data set defined in ISO 12642. This data set was earlier defined in ANSI IT8.7/3 and is still more commonly know by that designation.

Recently there has been a need expressed for a data set with more elements. One such data set that has become relatively widely used is known as the ECI data set. Recent work in the US relating to package printing characterization used a data set tentatively identified as IT8.7/4.

TC130/WG2 has initiated a new work item to develop a Part 2 of 12642 which will standardize a merger of these targets. Support is expected for this proposed data set which will include 1610 elements and should meet the needs of most groups involved in CMYK characterization data.

When approved, which should occur very quickly, this data set will become the primary reference for characterization data included in the ICC CMYK registry. It deliberately includes all of the elements included in the earlier Part 1 (IT8.7/3) data set. Therefore, application software based on the use of the earlier data set can use a subset of the new data set.

**ICC Profile specification**

The ICC recently approved Specification ICC.1:2003-09

File Format for Color Profiles (Version 4.1.0) which is out for public review until Nov. 24, 2003. (Anyone wishing a review copy is asked to contact ksmythe@NPES.org.)

The ICC has also completed a "Cooperative agreement between ISO/TC130 and the International Color Consortium". This agreement signed by the ISO Secretary-General and the ICC Secretary provides the mechanism for joint development of documents between the ICC and ISO/TC130.

One unique aspect of this relationship is that ".. all documents developed under this agreement, including the final ISO standards, will be made available through ISO sources and also through normal ICC sources, including publically available channels."

In preparation for this, a draft of ICC.1:2003-09 has been prepared in the ISO format. The ICC is currently reviewing this document and will be asked to agree (by ballot vote) that the ISO formatted draft is technically equivalent to the ICC version.

This standard will be know as ISO 15076, *Image Technology - ICC Colour Management - Architecture, profile format, and data structure*. The responsibility for preparation of the document, and carrying it through the ISO process, has been assigned to TC130/JWG7. This joint working group, which is administratively under TC130, will include active participants from TC130, the ICC, TC42, CIE, and possibly other ISO Technical Committees.

**Standard in Review**

Current imaging related standards in various levels of public review.

**ISO 15469**, *Spatial distribution of daylight - CIE standard general sky*, is a joint ISO/CIE standard which is in international ballot as an FDIS. In support of the ANSI public review process, I am helping collate a US position on this standard .

If you are willing to review and provide comments on this proposed standard please contact me at mcdowell@kodak.com

TC42 Standards in review which may be obtained from isotc42@i3a.org

ISO/DIS 15740 *Photography – Electronic still picture imaging - Picture transfer protocol (PTP) for digital still photography devices*

Ballot closes 2004-03-02

ISO/CD 17321-1 *Graphic technology and photography — Colour characterisation of digital still cameras (DSCs) — Part 1: Stimuli, metrology, and test procedures.*

Ballot ends 2004-01-16.

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