

CIE TC 8-05

Nov 5, 2001, Sun Burst Resort, Scottsdale, AZ

Meeting called to order by chairman R. Buckley at 3:40pm

Present were Rob. Buckley, Chairman, Kevin Spaulding, Alan Kravetz, Lindsay MacDonald, Gene Martinez, Po-Chieh Hung, Tony Johnson, David McDowell. Ellen Carter and Todd Newman joined by telephone conference.

Review of Agenda.

A Kravetz requested input for the CIEUSA meeting next week. He also requested time to present some recent activities on standards for visual evaluation of video images.

L. MacDonald reported on concerns of UK committee on MPEG about the recent negative votes on sYCC and scRGB drafts. He believes that this situation falls under the concerns of this committee as these definitions will be involved in JPEG2000 and MPEG. A. Kravetz reported on activities in the ICC meeting and they will formulate a response about the changes in the drafts as they impact the ICC.

Regular Agenda Items:

1. Kevin Spaulding's progress report.
2. A. Kravetz's report on Sarnoff work on video image quality evaluation.
3. Items for report to CIEUSA
4. Position report on extended gamut RGB spaces.

I. Metric IA and IB.

Kevin had tried to email the report to the committee but it proved to be too large for most people's email system. The main thrust of his work was reported in Montreal and today's report now fills in the details on the tests and metrics that were proposed in Montreal. Work was done by both Kevin and Gus Braun. First part of report covers the issue of gamut volume. Test both the total volume and the volume of usable colors mapped by various encoding schemes. More recently added a test to describe the percent of encoding code values used by target color gamut. Suggested a list of typical colors such as real world surface colors, optimal colors, legal colors, photographic print colors, CRT colors. Photographic print gamut was based on three typical photographic dye sets and an idealized paper model. Individual manufacturers of the print papers will not be identified.

Kevin defined the various encoding metrics and the colors used to test the encodings. Generated colors by uniform random number generation. Generated only 20,000 colors out of the millions of possible code settings. Found the random sampling to be more consistent than uniform fixed sampling.

Real World Surface Colors – 1739 measured surface colors taken from Munsell Color Cascade, Surface colors from Trussel, DuPont automotive paint samples, Graphic Arts spot colors.

61% of real world colors are within sRGB, 81% of sRGB are within real world colors and 75% of color encoding values are used by real world colors.

99% of real world colors are within sYCC, 7% of sYCC are within real world colors and 28% of color encoding code values are used by real world colors.

100% of real world surface colors are covered by e-sRGB.

See report to be posted on the web site for more details

T. Newman emphasized that whatever data are presented in graphical form in the committee report should be archived at CIE Central Bureau so that it can be accessed and reproduced at a later date. Kevin indicated that he planned on burning a CD to make the data available to anyone who desired it.

II. Metric II.A and II.B

Review of Quantization error for single code value change using 20,000 random sRGB values randomly distributed in CIELAB. Repeat for each dimension of the color encoding, changing the aim points by 1 digit in various bit precision (8, 12, 16). In metric B they interpolated between the computed quantization errors to determine how many bits are required to achieve a certain error levels. Errors were measured as both CIELAB and CIE94 mean and max color differences. Simulations were created by MATLAB scripts.

III Metric III – Complexity of transform metric A table was prepared to highlight the complexity of the various encodings. Again, see the report for details.

IV Other proposed metrics discussed at Montreal included Visual uniformity based on standard deviations of  $\Delta E^* / \Delta E_{94}$  for a 1CV change. Or possibly the standard deviation of  $\Delta L^*$ , chroma uniformity, hue uniformity. Also of interest was a metric for the effect of compressibility which Kevin suggested the Sarnoff work of M. Brill may be useful. Other areas include ICC Compatible and Completeness of definition. Lindsay MacDonald indicated that Derby might be interested in having some students do the visual uniformity studies. Kevin commented that he had some ideas for developing a metric for uniformity of  $\Delta E^*$  or  $\Delta L^*$  under various encodings but how would one define uniformity of hue or chroma under sRGB?

T. Newman commented that the committee had set itself a guide early on to not constrain applications. R. Buckley indicated that not constraining the possible applications does not mean that we cannot think about or address certain broadly interesting applications such as gamut mapping and the effect of hue uniformity on gamut mapping under various encodings.

V Issues related to color accuracy and compressibility. M. Brill and Sarnoff have been working on a standard for digital video compression. The technology is patented by Sarnoff but appears to be placed into the public domain for use with certain restrictions. Detailed questions may need to be forwarded to either Mike Brill or Jeff Rubin.

VI Alan Kravetz requested that we supply to him any topics that need to be presented to either CIE Division 8 main meeting or the CIEUSA meeting.

VII Lindsay MacDonald reported that Kate Grant reported to him that the UK MPEG committee was to meet next week and was complaining about the recent results on JPEG2000 and the file format using sRGB. Rob and Gene are familiar with the issues. The Japanese camera manufacturers want a format for YCC with subsampling. But the current standard does not have that capability. The issue seems to focus on the wider gamut of YCC and its effects on the compression. Originally, the committee merely wanted a reference to work done at PIMA to have compatibility. But unfortunately, when the USA voted negative wanting to have the PIMA reference added to the document it opened the door for other issues such as the IEC TC-100 version of sRGB and sYCC. R. Buckley wants to know what Kate needs from the CIE? Lindsay does not know what is being requested of us. Gene seems to remember that the BSI members were against the PIMA reference. David McDowell read a statement from ICC concerning the issue that different organizations are developing standards regarding color management, some of which are incompatible. Therefore they are requesting that the ISO/ IEC joint working group correct the fact that within their recommendation, invokes the name sRGB for both an 8bit and a 10bit encoding. Rob Buckley further commented that there are a multitude of encodings based loosely on sRGB including

sYCC, scRGB, scYCC, e-sRGB. Todd commented that if IEC TC-100 has internal inconsistencies then we may have some success in getting them to change their nomenclature. It may be more difficult to convince them to change their standards to be in conformance with a PIMA standard. D. McDowell agrees. R. Buckley asked how the CIE comes to or extracts a position on this IEC standard; it was sent to the committee in the summer, but no responses were received. T. Newman suggests that the TC meet over dinner and draft a position on the confusing notation and the proliferation of RGB encoding spaces. R. Buckley asked: should the committee draft a position. The consensus was yes. T. Johnson then asked what should the response be – that has yet to be determined. Lindsay will draft a position. A team of Todd, Rob, Lindsay, Po-Chieh and Kevin will carefully read the IEC draft standard and form a position.

#### Action Items

1. Lindsay MacDonald to look into getting a student to work on the metrics of visual uniformity.
2. Ask committee members for contributions to a bibliography for the web site
3. Alan Kravetz will summarize Sarnoff reports, including their potential applicability to the committee's work
4. Todd will create an account so Rob and Kevin can modify the TC8-05 web site
5. Todd, Rob, Lindsay, Po-Chieh and Kevin will read the 2 IEC CDVs and prepare a TC8-05 position; due in 2 weeks. The position will be based on the TC8-05 Terms of Reference and the criteria list.

Meeting Adjourned 6:25pm.

Respectfully submitted,

Danny Rich