

CIE Division 8 Meeting
Tuesday, November 11, 2008
Portland, Oregon, USA
D8N137

1. **Call to Order** at 10:30 a.m. by Sabine Susstrunk
2. **Roll Call** 8 countries represented, apologies from 7 others, and total attendance 18 people present. See attachment 1 for attendance list.
3. **Introduction of Members and Guests**
4. **Approval of Agenda** Motion to approve by Dr. Ellen Carter, approved without dissent
5. **Reports**
 - i. **Director.** See attachment 2 for slides.
 - a. *Introduction* – Division 8 is the newest, smallest division of the CIE. It was started in 1997 and chaired by Todd Newman. For the past year Sabine has been the chair. There are 40 national committees in the CIE. The division functions through technical committees and reporterships. Technical committees are a group of experts working with a defined terms of reference. The outcome is a report or a standard. A reportership is one expert investigating a topic and the final result is a report, which may encourage the formation of a technical committee. Sabine provided a summary of current and closed technical committees and reporterships for division 8. The publications were reviewed and finally the CIE Director and Board meeting was summarized
 - b. *Technical Committees* – There is a new draft document determining what a TC membership entails. This discussion included how members are added to technical committee and technical committee observers. The director suggested that memberships of current technical committees not be revisited but moving forward Division 8 follows these new guidelines. The topic of establishing a technical committee was presented and a summary of the process was provided, including the issue of inactive technical committees. Specifically, the technical committee shall be established for an initial 4-year term, with the technical committee chair also appointed for a 4-year term. The maximum term of the technical committee chair will be 8 years consisting of a maximum of two terms of four years. Moving forward there is a 4 year review process by the division to approve the renewal of technical committees.
 - c. *CIE Supportive Membership* – There currently is a drive to attract new supportive member, mostly companies. The CIE is looking at 3 different levels with varying benefits and costs. The letters will go out after board and National Committee approval.

d. *CIE midterm session* – A conference has been announced on solid state lighting to be held in Budapest May 27-29 in 2009. The web site is <http://cie-hungary.hu> and director strongly encourages submissions from Division 8 members, technical committees and observers. All relevant work, such as LEDs for backlit displays, should consider the CIE midterm meeting.

e. *CIE conference 2010* – The CIE conference will be held in March of 2010 in Vienna, Austria. The conference will be on "Light Quality & Energy Efficiency - Challenges and Chances" and each division is invited to add its "own" topic under the umbrella of this headline which covers the whole range of CIE expertise.

f. *Next Meeting* – The director closed with the question of where to have next meeting of D8? The suggestion was made not have the meeting again here in conjunction with the Color Imaging Conference since the majority of National Committees and Technical Committee Chairs did not come. This was followed by discussion on the topic.

ii. **Secretary** – The secretary reported that the new division 8 web site has been drafted and now follows the new CIE web page format. But this page has not yet been linked from the top level. The question of porting legacy material from colour.org also came up along with the question of who owns the domain name. Work is ongoing to complete the new web page and fill out the web pages for all of the active technical committees.

iii. **Editor** – The editor has not received any documents being prepared for publication. Dr. Carter noted the need for divisional activity reports.

iv. **Technical Committees**

a. *TC8-02*: Dr. Luo reported that the TC8-02 publication has reached the country ballot and that from December 2008 to January 2009 the voting will occur. The request was made that assuming the voting has been completed that the TC be closed at the next virtual or real meeting.

b. *TC8-07*: Dr. Parkkinen sends apologies for being unable to attend and due to a recent promotion proposes that Dr. Markku Hauta-Kasari be the new chair for TC8-07. A vote was held and Dr. Hauta-Kasari was unanimously approved as chair of TC8-07 until November 2012. The following status update was then presented for TC8-07. First were the requirements for a spectral data format. Two candidates were presented, Natural Vision Format and MUSP. The Matlab code, an image database and a Java tool for reading and writing spectral image formats will be published on web site and presented at the in Multi-Spectral Color meeting in Oslo, Norway in 2009. The goal is to propose a multi-spectral data format in 2009. Second was discussion on the proposed outcome of the TC. Currently set to deliver on one of five items in the terms of reference so additional discussion is necessary to determine the focus of any future efforts. Also instead of starting with drafting a standard the recommendation was made to draft a technical report as a starting point.

c. *TC 8-08* : Dr. Johnson reports that nothing has happened since January, but that TC8-08 is looking at using the IEC web tool. The

committee also remains committed to developing a color appearance vocabulary and corresponding test methods. The chair anticipates a draft technical report for August 2009. The next meeting of TC8-08 is planned for Electronic Imaging in 2009 in San Jose

d. *TC8-09:* Dr. Susstrunk presented attachment 3, an update on behalf of Dr. Buckley who sent his apologies. There is a recent possibility for this TC to collaborate with the Federal Digitization Guidelines Initiative, by the Library of Congress and other organizations. There will be a meeting Friday November 14 to explore this. There was subsequent discussion noting that this TC was formed in 2005 and that it has been relatively inactive.

e. *TC8-10:* Ms. McCarthy presented attachment 4, an update on behalf of Mr. Newman who sent his apologies. The TC has been using a reference lighting box to investigate office lighting conditions. They have developed guidelines for use, written a questionnaire, conducted a pilot study, prepared a revised methodology, and given a workshop at the CIE Session in Beijing. The TC is halfway through their worldwide study. Upcoming effort will focus on an analysis of the current data and first draft of a technical report. The update closed with a proposal that Dr. Yasuki Yamauchi be the new chair to replace Mr. This was unanimously approved.

f. *TC8-11:* Dr. Susstrunk presented attachment 5 on behalf of Dr. Li who sent his apologies. This TC is investigating the CIECAM02 mathematics has four specific items that it is considering, including the recommendations of Brill and Susstrunk and also the work by Li et al.

g. *TC8-12:* Dr. Susstrunk presented attachment 6 on behalf of Dr. Fernandez-Maloigne who sent her apologies. This TC is investigating quality assessment and subjective tools for video-compression. There are three parts to this effort and a presentation of the TC activities was recently made in Taiwan.

v. Reporters

a. *R8-05:* Dr. Fairchild presented an update on this reportership formed in 2003, on image appearance. He now feels it might be appropriate to revisit his terms of reference and perhaps form a new technical committee. The emphasis would be a summary of what exists and not an investigation of any new topics. After some discussion it was noted that reporterships can result in a technical report and in fact one option was to close R8-05 and start a new reportership with the terms of reference to publish a report on a framework. A vote was held and it was unanimously agreed that R8-05 be closed and that Dr. Fairchild start reportership R8-08 Image Appearance Model Framework.

b. *R8-07:* Dr. Susstrunk proposed that this reportership be closed. She acknowledged the contributions of Dr. Brill, Mr. Walowit and Dr. Mahy. There was unanimous approval to close R8-07.

6. Additional Discussion

a. Liaisons Discussion was on the liaisons and not the content of their reports. Discuss the need to clean up the to and from liaisons and the creation of a single, board approved list. Ms. McCarthy will work on this. Proposals were made for specific liaisons and it was noted that Dr. Pointer requests a replacement. Liaisons to be added to the web site once final official list is completed. See attachment 7 for more details regarding the liaison reports.

b. New TCs A question was made on behalf of Dr. Schanda about possibly going into camera and display characterization beyond color quality, such as MTF determination guidelines. It was noted that any camera work might overlap TC-42 and display characterization might be too device specific and overlap TC-159 visual display requirements. There was discussion between balancing applied research with more technology independent more fundamental research. This topic was closed with an open invitation by the director for new ideas for TCs or reporterships.

c. Next Meeting A proposal was made to have the next physical meeting at the CIE conference in 2010. An alternative was to meet in conjunction with CGIV 2010 in Finland. Another proposal was made to have a virtual meeting in 2009. This meeting will be some sort of audio conference, possibly with video, to be held in September of 2009. Division will need to plan ahead, prepare necessary documents in advance and perhaps synchronize with voting in order to maximize participation.

7. **The meeting was adjourned** at 1:00 p.m.

8. Acknowledgments

Division 8 thanks Dr. Jussi Parkkinen for his past leadership of TC8-07.

Division 8 thanks Mr. Todd Newman for his past leadership of TC8-10.

Division 8 thanks Dr. Markku Hauta-Kasari for assuming leadership of TC8-07.

Division 8 thanks Dr. Yasuki Yamauchi for assuming leadership TC8-10.

Division 8 thanks Dr. Mark D. Fairchild for his efforts on R8-05.

Division 8 thanks thank Dr. Mark D. Fairchild for undertaking R8-08.

Division 8 thanks Dr. Sabine Susstrunk for her efforts on R8-07.

Division 8 thanks the IS&T staff for assistance with meeting logistics.

ATTACHMENT 1

CIE Division 8 Meeting, Tuesday, November 11, 2008

Name	Status	email
Sabine Susstrunk	CIE D8 Director	sabine.susstrunk@epfl.ch
Grame Gill	Observer	grame@argyllcms.com
Ronnier Luo	UK (Representing Mike Pointer)	m.r.luo@leeds.ac.uk
Ellen Carter	US (Representing Allen Kravetz)	ellen.carter@alum.rpi.edu
Yasuki Yamauchi	Japan (Representing M. Aizu)	yasuki.yamauchi@fujixerox.co.jp
Noboru Ohta		
John Haikin	Observer	john.haikin@cda.canon.com
Eric Walowit	Observer	rikwalowit@aol.com
Koichi Iino	Observer	koichi.iino@toppan.co.jp
Shu Tanabe	Observer	stanabe@ta.toppan.com
John Dalrymple	Observer	jdalrymple@sharplabs.com
Jon Y. Hardeberg	Norway Representative	jon.hardeberg@hig.no
Markku Hauta-Kasari	TC 8-07 representing Jussi Parkkinen	markku.hauta-kasari@joensuu.fi
Fumio Nakaya	Observer (TC 8-07 member)	fumio.nakaya@fujixerox.co.jp
Ann McCarthy	TC 8-10 member, Div 8 Editor	almccart@lexmark.com
Nathan Moroney	CIE D8 Secretary	n8@hp.com
Klaus Richter	Member	klaus.richter@mac.com
William Li	Observer	william.li@kodak.com

Attachment 2

Director's Report

Sabine Süsstrunk
sabine.susstrunk@epfl.ch



CIE Division 8

- Commission Internationale de l'Éclairage
 - International Commission on Illumination
 - Internationale Beleuchtungskommission
- 40 National Committees
- 8 Divisions
 - Div 1: Vision and Colour
 - Div 2: Measurement of Light and Radiation
 - Div 3: Interior Environment and Lighting Design
 - Div 4: Lighting and Signaling for Transport
 - Div 5: Exterior Lighting and Other Applications
 - Div 6: Photobiology and Photochemistry
 - Div 8: Image Technology



Terms of Reference

- To study procedures and prepare guides and standards for the optical, visual and metrological aspects of the communication, processing, and reproduction of images, using all types of analogue and digital imaging devices, storage media and imaging media.

Workings of Div. 8

- Technical Committees
 - A group of expert working on a topic with defined terms of references
 - Outcome: a report or standard
- Reporterships
 - One expert investigating a topic
 - Outcome: a report



TCs and Current Chairs

- TC8-02 "Colour Difference Evaluation in Images", MR Luo (UK), m.r.luo@leeds.ac.uk
- TC8-07 "Multispectral Imaging", chairperson: J Parkinen (Finland), jussi.parkkinen@cs.joensuu.fi
- TC8-08 "Spatial Appearance Models", G Johnson (US), gmj@mac.com
- TC8-09 "Image Archiving", R Buckley (US), Robert.Buckley@xerox.com
- TC8-10 "Office Illumination for Imaging", T Newman (US), Todd.Newman@microsoft.com
- TC8-11 "CIECAM02 Mathematics", C. Li (UK), C.Li@leeds.ac.uk
- TC8-12 "Video Compression Assessment", Ch. Fernandez-Maloigne (Fr), fernandez@sic.sp2mi.univ-poitiers.fr



TC's Closed

- TC8-01 "Colour Appearance Model for Colour Management Applications", chairperson: N Moroney (USA),
- TC8-03 "Gamut Mapping", chairperson: J Morovic (UK)
- TC8-04 "Adaptation under Mixed Illumination Conditions", chairperson: N Kato (JP)
- TC8-05 "Communication of Colour Information", chairperson: R Buckley (USA),
- TC8-06 "Image Technology Vocabulary", chairperson: J Schanda (Hungary),



Reporterships

- R8-05 Image Appearance, M. Fairchild (USA)
- R8-07 CAT in CIECAM02, S. Süsstrunk (Switzerland)



Reporterships Closed

R8-01	Grading of Colour Measurement Equipment	Y. Ohno (USA)
R8-02	Fluorescence	C.McCamy (USA)
R8-03	Potential Interaction Between CIE and IEC TA2	H. Ikeda (JP)
R8-04	Effects of Fluorescence in Characterization of Imaging Media	D. Rich (USA)
R8-06	Results of CIECAM02	N. Moroney (USA)



Publications

Guidelines for the Evaluation of Gamut Mapping Algorithms	TC8-03	CIE 156:2004
A Colour Appearance Model for Colour Management Systems: CIECAM02	TC8-01	CIE 159:2004
Chromatic Adaptation Under Mixed Illumination Condition When Comparing Softcopy and Hardcopy Images	TC8-04	CIE 162:2004
The Effects of Fluorescence in the Characterization of Imaging Media	R8-04	CIE 163:2004
Criteria for the Evaluation of Extended-Gamut Colour Encodings	TC8-05	CIE 168:2005



CIE Directors and Board meeting

- Was held in Vienna, Austria, Sept. 15-17, 2008.
 - TC memberships
 - CIE supportive members
 - Publication numbering (later)
 - Website



TC Membership (1)

- New draft document determining what a TC membership entails:
 - The TC Chair (TCC) is nominated by the Division members; this nomination must be formally approved by the Board of Administration (BA).
 - The TC Chair, with the approval of the Division, is responsible for appointing members to the TC.
 - TC members must be experts in the technical area covered by the Terms of Reference (ToR) of the TC.
 - The membership of the TC should represent the range of knowledge and viewpoints which exist in the technical area covered by the ToR of the TC.



TC Membership (2)

- It is not necessary to have a TC member from each National Committee (NC). However each NC has the right to appoint one member to the TC, if they so wish.
- The TC members must be formally approved by the Division ???
- Should a TC member be inactive, the TCC shall write to the person (with a copy to the DD and the Division member and NC of the country from which the TC member comes). If necessary a TCC, on the authority of the DD, may revoke the appointment of an inactive member. If the member was appointed by the NC, the NC must be informed.



Establishing a TC

- The procedure for establishment of a TC is as follows:
 - A member of the Division responsible for the work to be done shall prepare a draft recommendation for consideration by the Division. This recommendation shall include a justification for the work and a proposal for the ToR of the TC.
 - The Division shall decide whether to recommend the establishment of the proposed TC and shall agree the ToR and the TCC.
 - Based on 1.1.2, the Division Director (DD) shall make a formal recommendation to the BA, either verbally or in writing.



Establishing a TC (2)

- The procedure for establishment of a TC is as follows:
 - The BA shall decide on whether or not to approve establishment of the TC. This may be subject to specified conditions, such as a modification to the proposed ToR, a change to the suggested TCC, a requirement to liaise with another Division or Divisions, or a requirement for a detailed membership list to be submitted (and agreed) prior to approval.
 - The TC shall be established for a 4-year term initially, with the TCC also appointed for a 4-year term.



CIE Supportive Membership

- Drive to attract new supportive members.
 - Mostly companies
 - 3 different levels with varying benefits and costs
 - Letters will go out after Board and NC approval.



CIE Midterm Session

- CIE Midterm Session - Conference on Solid State Lighting, Budapest, Hungary, 27 – 29 May 2009.
- Submission:
 - One page abstract no later than January 31, 2009.
 - <http://cie-hungary.hu/>
- Keynote: Solid State Lighting and LEDs
 - What is Division 8's contribution?
- D8 is strongly encouraged to submit.
 - TC8-10, others?



CIE Conference 2010

- CIE-Conference
 - Second Week of March 2010, Vienna, Austria
 - Title: **Light Quality & Energy Efficiency - Challenges & Chances.**
 - Each Division is invited to add its "own" topic under the umbrella of this headline so to achieve a program which covers the whole range of CIE-Expertise.
- If further Division Symposia are organized in 2009 or 2010, we need to let the central bureau know until the end of Nov. 2008.



TC Reports

TC Chairs



Division 8 - Imaging Technology

TCs and Current Chairs

- TC8-02 "Colour Difference Evaluation in Images", MR Luo (UK)
- TC8-07 "Multispectral Imaging", chairperson: J Parkinen (Finland)
- TC8-08 "Spatial Appearance Models", G Johnson (US)
- TC8-09 "Image Archiving", R Buckley (US)
- TC8-10 "Office Illumination for Imaging", T Newman (US)
- TC8-11 "CIECAM02 Mathematics", C. Li (UK)
- TC8-12 "Video Compression Assessment", Ch. Fernandez-Maloigne (Fr)



Reportership R8-07

- Sabine Süsstrunk sent final report.
 - Work will continue with TC8-11
- Asks that the reportership is closed.



Liaisons

- International Color Consortium (ICC)
 - Currently vacant.
 - **Proposal: Fumio Nakaya**
- ISO/TC 130, Graphic Technology
 - D. Rich
- ISO/TC 42: Photography
 - M. Pointer (**likes to be replaced**)
- ASTM
 - M. Pointer (**likes to be replaced**)
- IEC/TC100
 - Jack Holm (**likes to be replaced**)
- ISO/IEC JTC1 SC28
 - Klaus Richter
- ISO/IEC JTC1 SC28
 - Ann McCarthy



New TCs/Reporterships

- TC's:
 - Image Appearance Model Framework (Mark Fairchild)
- Janos Schanda (CIE VP Technical)
 - Should D8 not go into Techn. Reports and further standardization in the field of camera and display characterisation beyond colour quality? What about MTF determination guidelines?
- Others?





Attachment 3



TC8-09: Archival Colour Imaging

Robert Buckley
Chair, TC8-09

CIE Division 8 Meeting
11 November 2008
Portland, Oregon

Reminder: Terms of Reference

To recommend a set of techniques for the accurate capture, encoding and long-term preservation of colour descriptions of digital images that are either born digital or the result of digitizing 2D static physical objects, including documents, maps, photographic materials and paintings.

Approach

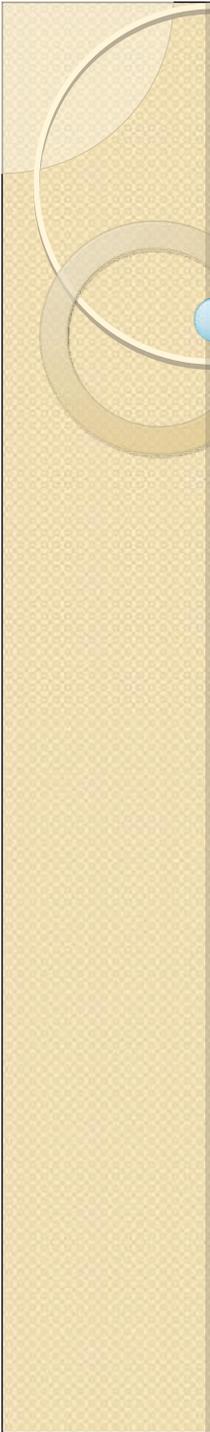
- Identify a specific problem, or small set of problems, that:
 - is consistent with the Terms of Reference
 - people need the answer to and are therefore willing to sign up to work on
- Bring together people from the color and archiving communities
 - Collaborate with Federal Digitization Guidelines Initiative

Practical Digitization

- Federal Digitization Guidelines Initiative
 - collaborative effort by US federal agencies to define common guidelines, methods, and practices to digitize historical content in a sustainable manner
 - Members include LOC, NARA, NGA, GPO
- Color-related topics
 - Match of color space encoding to original material, integration with production workflows, specification of illuminant

Next step

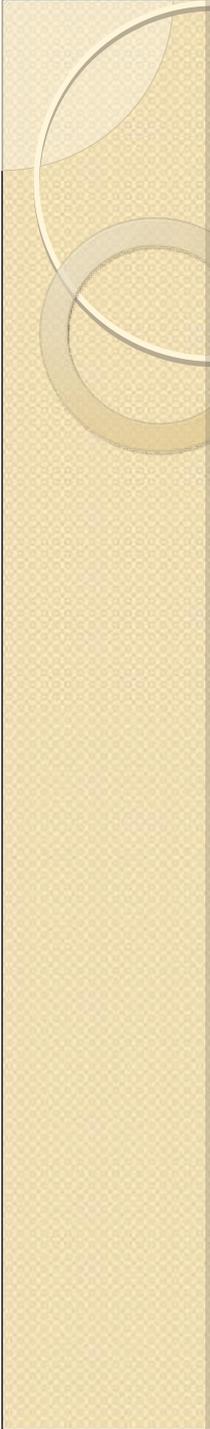
- Informal meeting of interested parties Friday morning, Nov. 14
- Discuss current state with a view to getting work commitments



Attachment 4

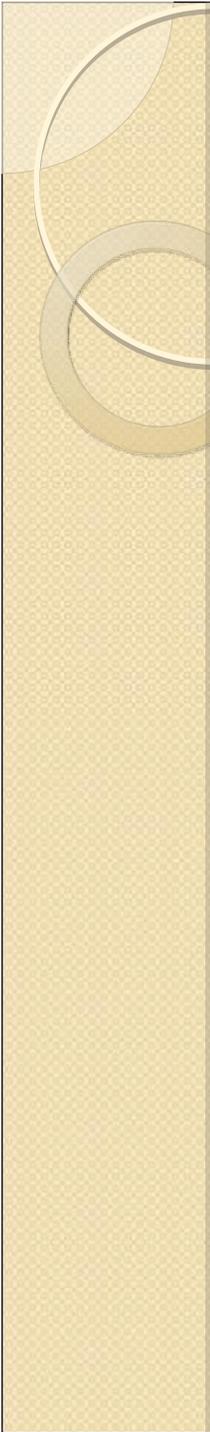
TC8-10 Office Illumination for Imaging

Todd Newman



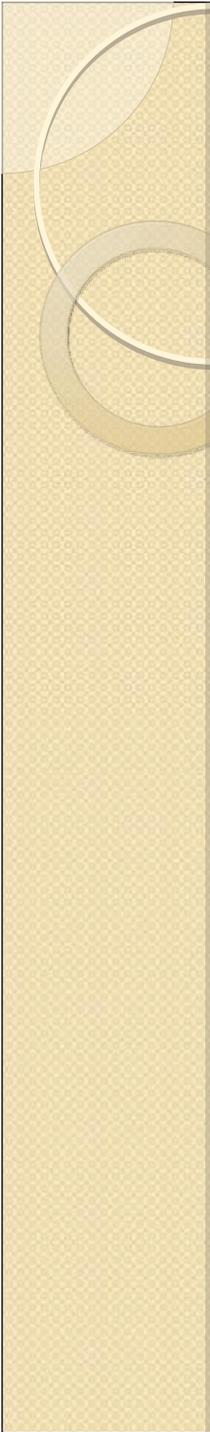
Terms of Reference

- To report on the spectral power distribution and illumination levels used to view images in office lighting conditions. The report is to be based on empirical research.



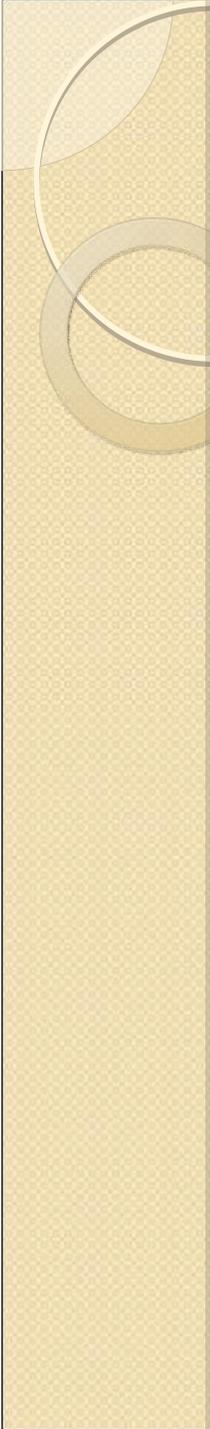
Work Programme

- ✓ Develop guidelines for the experiment
- ✓ Develop a questionnaire to use with each measurement set
 - Develop analytical techniques to assess the captured data
- ✓ Conduct a pilot study to test the methodology
- ✓ Revise methodology based on pilot study
- ✓ Hold workshop at CIE Session to start the worldwide study
 - Conduct the worldwide study
 - Analyze results
 - First draft of Technical Report
- ✓ means we have completed this part



TC Members

- Masao Aizu (JP)
Seth Ansell (United States)
Jordi Arnabat (Spain)
Gisela Cakir (Germany)
Andrew Chalmers (New Zealand)
Mark Fairchild (United States)
Phil Green (Great Britain)
Jack Holm (United States)
Byron Jordan (Canada)
Dr. Tran Quok Khanh (Germany)
Alan Kravetz (United States)
Marc Mahy (Belgium)
Ann McCarthy (United States)
Dave McDowell (United States)
Todd Newman ((United States)
Danny C. Rich (United States) (Advisor)
Janos Schanda (Austria)
Hirohisa Yaguchi (Japan)
Yasuki Yamauchi (Japan)
Eric Zeise (United States)



Change of Chair

- The TC would like to change the Chair from Todd Newman to Yasuki Yamauchi
- The TC asks the Division to request permission from the Board of Administration

Attachment 5

TC8-11: CIECAM02-Mathematics

- Formed During CIE 26 Session in Beijing, July 2007.
- Terms of Reference:

Terms of Reference: To investigate the improvements to the CIECAM02 model to avoid mathematical inconsistencies.



TC8-11: Members

Name	Institution
Michel Brill	DataColor
Mark D Fairchild,	Rochester Institute of Technology
Youngshin Kwak	Samsung Advanced Inst. of Tech.
Changjun Li	University of Leeds
M Ronnier Luo	University of Leeds,
Nathan Moroney	HP
Sabine Suesstrunk	EPFL
Francisco Miguel Martínez Verdú	University of Alicante



Problems with CIECAM02

During CIC15, an open meeting was organised. Problems related to CIECAM02 were raised during the meeting. The main problems can be listed as the followings:

- 1) Mathematical failure; (J becomes complex for certain input)
- 2) CIECAM02 domain is smaller than the domain of ICC-PCS;
- 3) CIECAM02 domain is illuminant dependent. There is a need to find out the domain under each of the illuminants;
- 4) Q function problem (raised by Paula Alessi (Kada) and Youngshin (Samsung).)



Problems with CIECAM02

Consensus Items during the meeting were agreed on:

- 1) We should expand the domain.
- 2) We shouldn't break (or change) anything that is currently working well.
- 3) First we should check for which illuminant CIECAM02 works, and at what illuminance levels it works.
- 4) We should make an action item to specify the domain that is desired.



The Work of Mike (Brill) & Sabine

It was believed that if we can correct the CAT02 failure, we may correct the CIECAM02 failure problem. So much work has been done with improving the CAT02 problem.

They found that red and green CAT02 primaries lie outside the HPE triangle (see their paper) and called this as the 'Yellow-Blue' problem. They suggested the Yellow-Blue problem can be corrected by changing the last row of the CAT02 matrix to (0, 0, 1).



The Work of Mike (Brill) & Sabine

However, this repair seems neither correcting the failure of CAT02, nor the failure of CIECAM02.

So they further suggested that the possible repair to the CIECAM02 failure is by modifying R' , G' , B' using:

$$R' = \max(R', 0), G' = \max(G', 0), \text{ and } B' = \max(G', 0):$$

Thus, we always have

$$A = [2 R_a' + G_a' + 0.05 B_a' - 0.305] N_{bb} \geq 0$$

Therefore, $J = 100 (A/A_w)^{cz}$, is well defined since A_w is always a positive value [Li & Luo].

Disadvantage: have problem with inverse .

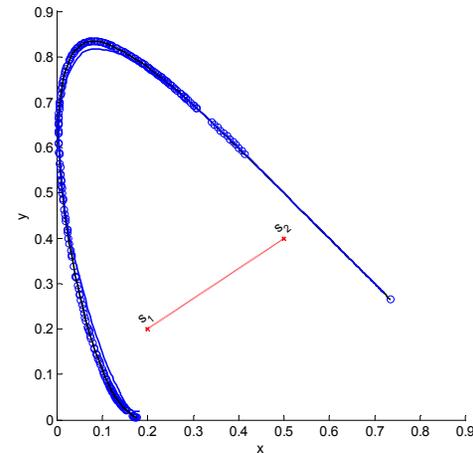


The Work of Li, Perales, Luo and Verdú

They tried to correct the CAT02 failure by a mathematical approach:

1) the CAT matrix M so that

$$g_c = M^{-1} \Lambda M g \geq 0$$



Here Λ is a diagonal matrix depending on the test and reference illuminants. g is the vector of TSV with its chromaticity coordinates located on or inside the CIE chromaticity locus. g_c is the corresponding colour's TSV.

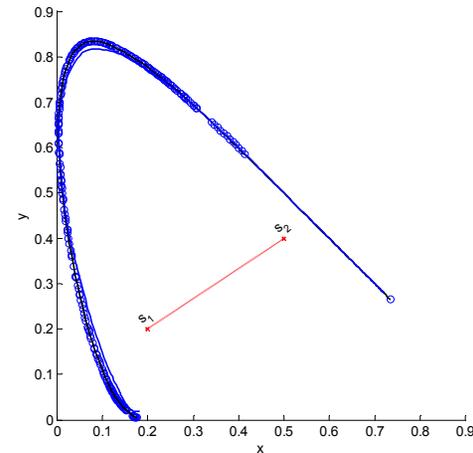
2) Fitting the visual data sets (used for deriving CAT02).

1) and 2) result in a nonlinear optimization problem.

The Work of Li, Perales, Luo and Verdú

By solving the optimization problem, a new matrix was derived and given by:

$$M_{new} \begin{pmatrix} 1.007245 & 0.011136 & -0.018381 \\ -0.318061 & 1.314589 & 0.003471 \\ 0 & 0 & 1 \end{pmatrix}$$



1. It was found that the CAT02 failure problem is solved, i.e., for any colour g with its chromaticity coordinates located on or inside the CIE chromaticity locus, the corresponding colour $g_c \geq 0$.
2. The accuracy for fitting the visual data sets is about $1\Delta E_{ab}$ worse than before; It seems we have to sacrifice certain accuracy for the repairing the CAT02 failure.
3. This approach does not correct the failure of CIECAM02 either.

On Going Work at Leeds

Ideal Case: the maximum domain for the CIECAM02 includes all the colours with their chromaticity coordinates located on or inside the CIE chromaticity locus.

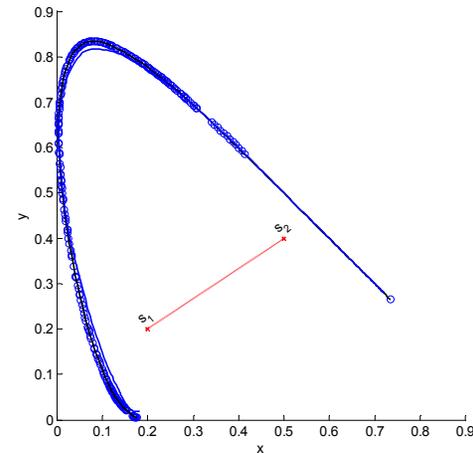
Toward this and motivated by our previous work, we need:

1) Choose CAT matrix M so that

$$g' = M_{HPE} M^{-1} \Lambda M g \geq 0$$

Here Λ is a diagonal matrix depending on the test and reference illuminants. g is the vector of TSV with its chromaticity coordinates located on or inside the CIE chromaticity locus. g' is the vector consisting of R' , G' and B' ;

2) Fitting the visual data sets (used for deriving CIECAM02).



Attachment 6

HVS-based quality assessment : Application to image sequences compression

Pr. Christine Fernandez-Maloigne
Laboratory Xlim-SIC- CNRS 6172
Signal Image Communications
University of Poitiers, FRANCE
tel : 33 5 49 49 65 73 – fax : 33 5 49 49 65 70
email : fernandez@sic.sp2mi.univ-poitiers.fr

TC's Purpose

- Quality assessment is becoming an important issue with the wide existence of visual contents.
- Several tools have been defined but standards are very restricted to one domain
- TC8-12 aims to provide to the community subjective tools to deal with different media and different viewing conditions

Addressed domains

- Mobile phones, Smart-phones, PDA
 - Small devices and various viewing conditions
- Web
 - Multimedia content
- Television, High definition television
 - Link with MPEG
- Digital cinema
 - Link with JPEG and TC 1-58

Related works

- ITU Video Quality Expert Group (VQEG):
 - Test plans: RRNR-tv, Multimedia, HDTV, Hybrid
 - Mainly objective tools
- Advanced Image Coding (AIC) Adhoc group
ISO/IEC JTC1/SC29/WG1
 - Assessment methodologies dedicated to compression
 - Objective and subjective tools

! Do not address different media and different viewing conditions

Proposal

- Part1 : models of human perception used for quality assessment
 - Study of the role of human perception in the task of quality assessment
- Part2: Assessment protocols
 - Define subjective paradigms adapted to different media and different viewing conditions
- Part3: Subjective Databases
 - Provide quality assessment databases for different media and viewing condition that allow to study the correlation of developed metrics

Activities

- Presentation at the JPEG committee meeting in Poitiers in July 2008
 - Around 40 attendees
- Presentation (planned) in Taiwan in december
- Call for participation submitted to international image experts and will be closed in january 2009
 - We invite to spread out this call through the appropriate chanel
 - Work plan will be defined after this deadline

All Comments are welcome :

fernandez@sic.univ-poitiers.fr

Liaison with other groups

- Liaison statement with JPEG2000 (ISO/IEC JTC1/SC29/WG1)
 - Dr M.C. LARABI (official since september 2008)
- Liaison statement with VQEG
 - Contact with Vittorio Barroncini

Participants (to be completed)

- Dr M. Brill, Datacolor, Lawrenceville, NJ, USA
- Pr C. Fernandez-Maloigne, University of Poitiers, France
- Dr M.C. LARABI, University of Poitiers, France
- Pr R. LUO, University of Leeds, UK
- Dr L. Gloetzer, Technische Leitung, SCHWARZ FILM AG, Switzerland
- Dr M. MAHY, Agfa Gevaert , Belgium
- Dr H. SAADANE, Polytechnica School, Nantes, France
- Dr. Didier Nicholson, Thalès, France
- Prof. Sabine SUSSTRUNK, LCAV, EPFL, Switzerland
- Dr Yasuki Yamauchi, Titech, Japan

Attachment 7

Liaison Reports

International Color Consortium Liaison Report

11 Nov. 2008

Slides provided by

Fumio Nakaya

Fuji Xerox Co., Ltd.

ICC introduction part provided by

Ann L McCarthy

Lexmark International, Inc.

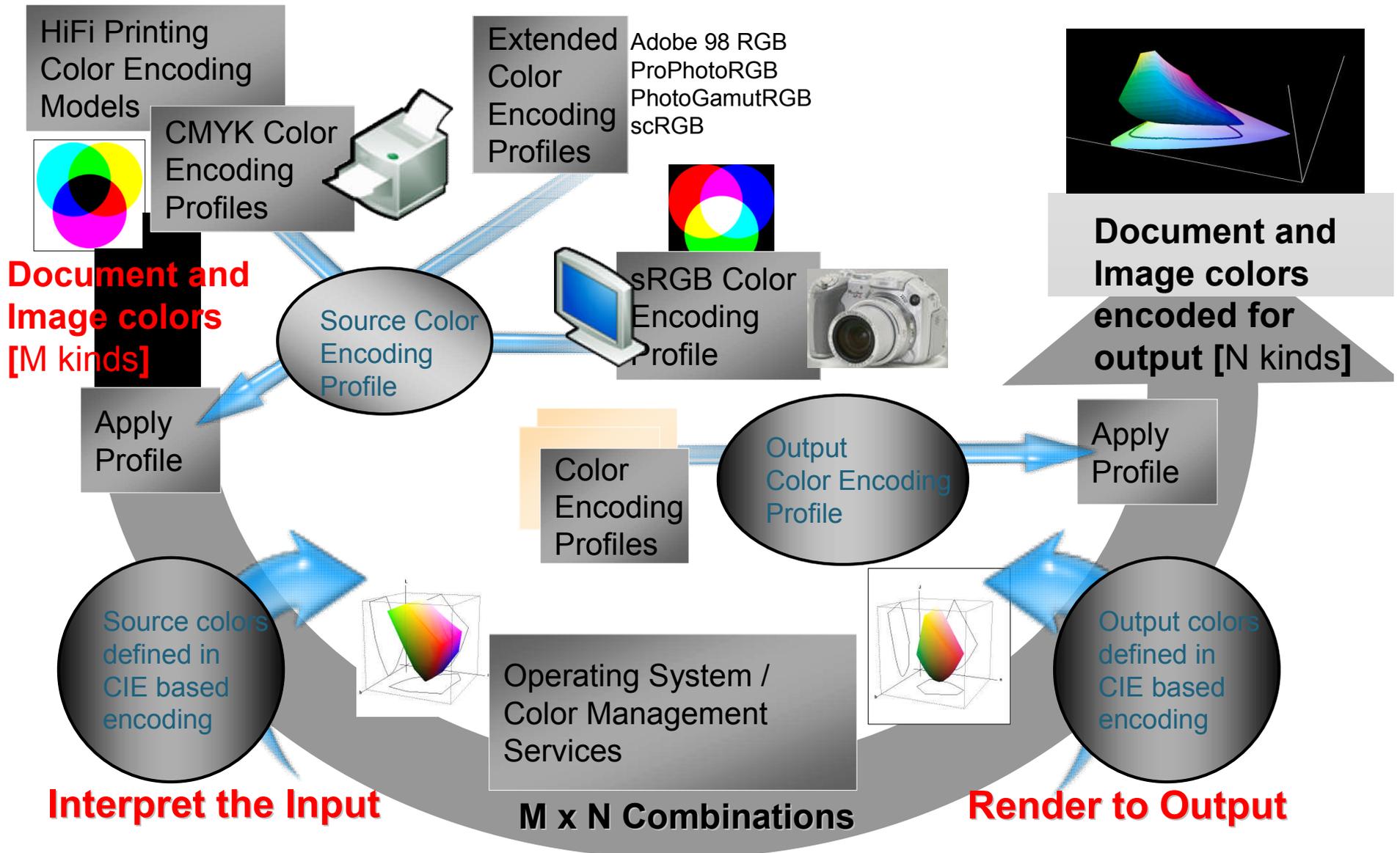
ICC Steering Committee and

ICC Automated Workflow WG Chair

The Scope of ICC Color Management



General view: source to output color management



ICC Structure and Working Groups

- **Industry consortium with liaisons to ISO TC42, ISO TC130, ISO/IEC JTC1 SC29, IEC TC100, CIE Div 8**
- **Steering Committee elected each year**
- **Working Groups focused in a use case area and on aspects of the ICC Specification**
 - Architecture
 - Specification Editing
 - Profile Assessment
 - Graphic Arts Special Interest
 - Digital Motion Picture
 - Digital Photography
 - Automated Workflow (chartered in February 2008)

ICC Automated Workflow WG Charter

- Ensure successful automated color management workflows by
 - Proactively evangelizing color management requirements with leading application developers, equipment vendors, operating system builders and system certification test methodology owners.
 - Identifying a small number of the most commonly used workflows in automation-required environments (such as digital equipment and applications for **common office and amateur photography**).
 - Recommending effective ways for operating systems, applications, and devices to use ICC color management in **automation-required environments**.
 - Recommending improvements to the ICC specification, and implied architecture, in order to improve such automation-required workflows.
 - **Working closely** with ISO/IEC JTC1 SC28, ISO TC130, IEC TC100 TA2, Ghent WG, CIE Div.8 and other standards committees **to achieve workflow system-level color management automation**.

ICC update

- ICC requested ISO/IEC JTC1 SC28 to have a category C liaison and it has been accepted by JTC1 in October 2008.
- Digital Photography WG made a demo on the scene referred workflow at the Portland meeting in November 2008 (DNG2 -> RIMMRGB -> PRMG).
- ICC version 4 profile update finalized and ISO15076 second edition will be circulated for DIS voting in early 2009.

Liaison report to CIE Div 8 from SC28

**Ann L McCarthy
Lexmark International, Inc.**

- **Gradual increasing awareness of the particular aspects of communicating and reproducing color information in office environments**
 - Uncontrolled viewing environments
 - Mobile environments
 - Range of quality expectations
 - Cross-media is the rule rather than the exception
- **JTC1 and SC28 have established a new liaison with the International Color Consortium**
- **Official WG for color topics formed AWG/PWG5**
- **Strong interest in the results of TC8-10**

Background on New Work Items under Discussion SC28 AWG/PWG5

Key User Needs	Status quo	enablers	New NWI No	Possible New Wrok Items
User expect that the office colour system unique terminologies clearly defined.	There are several office colour system unique terminologies not clearly defined.	Provide an office colour system unique terminology standard.	0	Terminology for office colour systems
Original documents, their copies and the stored scan-in documents, when printed out should all have matching colours.	JP1: Original documents, their copies and the stored scan-in documents, when printed out, all have different colours.	Provide enough correct information been stored with the scanned document so that it can be printed correctly at a later time.	1	Copy colour metadata
Would like to match the colour appearance of projectors and monitors.	JP2: Because the colour appearance of projected document and document on monitor are different, material used for important meetings are edited by matching them with the projector. JP3: Satisfied with default monitor settings, but new monitors are too bright.	Provide a way to incorporate viewing environment, and to ensure sufficient colour capability overlap between monitors and projectors.	2	Monitor and digital projector colour metadata
		Provide a test method standard that can be used by monitor and projector manufacturers to establish a claim for "ISO approved office colour display".	3	Monitor and digital projector office colour test method
Users expect the same colours as with previous printers when buying new printers, they expect the same colours from all printers, and they expect the colours to match the colours of previous print outs by the same printer.	The expected colours are not produced (the same colours as with previous printers when buying new printers, the same colours from all printers, and colours that match those of previous print outs by the same printer), but because users do not know how to make the proper adjustments, they are using the printers with their default settings. JP6: Even though monitors show the different colours correctly, when they are printed out, they are all mapped to similar colours.	JP4: Provide a way to stabilize manufacturing capability	4	Measurement and Control of Colour Characteristics in Printers
		US2: This test method evaluates the consistency of a print system over time, with repeated printing of colour documents. The print system is compared to itself at different times, not to a colour quality standard, so this is different from an image quality test.	12	Colour repeatability test method
		JP9: Provide a common colour space standard for office printer	7	Office reference print gamut - RGB encoding
Would like to get the desired colours without thinking about them.	The expected colours are not produced (the same colours as with previous printers when buying new printers, the same colours from all printers, and colours that match those of previous print outs by the same pinter), but because users do not know how to make the proper adjustments, they are using the printers with their default settings.	JP10: Provide a device independent common colour space for office equipments	9	colour space standards for offices
		Provide a test method standard that can be used to characterize Gamut mapping algorithm	10	Test method of colour gamut mapping algorithm for office colour printer
	JP7: Even if the user cannot get the desired colour, he/she is not aware the observation environment mis-match.	TBD	6	Office viewing environments - user interface specification
	JP8: Satisfied with default settings. In the near future, office user might encounter camera raw image, but there is no default rendering method available.	provide a camera raw image rendering method standards	8	Camera raw image rendering standards for office printers
	The expected colours are not produced (the same colours on print, monitor, projector, etc.), but because users do not know how to make the proper adjustments, they are using the color equipment systems with their default settings.	JP5: Provide a (ICC profile) automatic setting standards	5	Automated selection of colour print conditions
		US1: Provide a tools standard that can be used by enduser to check and setup color equipment systems	13	Office color management workflow for digital color documents including many different devices and time dependency. NWI-4a includes 4 separate yet related parts: 13-1 Monitor setup procedure help user to setup color, because in office, monitor is typically a reference for colour. 13-2 User friendly diagnostic method of comparing the color of each device in the workflow 13-3 Colour adjustment method for outlier devices
Every named color must have an ICC profile in XPS, but there is no definition in an ICC named color profile to put a tint LUT for a named color.	US3: Provide a tools standard that can be used by enduser to produce an ICC profile including a tint LUT for a named color.	11	Specification of named color in office document	

0	Terminology for office colour systems
1	Copy colour metadata
2	Monitor and digital projector colour metadata
3	Monitor and digital projector office colour test method
4	Measurement and Control of Colour Characteristics in Printers
5	Automated selection of colour print conditions
6	Office viewing environments - user interface specification
7	Office reference print gamut - RGB encoding
8	Camera raw image rendering standards for office printers
9	Colour space standards for offices
10	Test method of colour gamut mapping algorithm for office colour printer
11	Specification of named color in office document
12	Colour repeatability test method
13	<p>Office color management workflow for digital color documents including many different devices and time dependency. NWI-13 includes 3 separate yet related parts:</p> <p>13.1 Monitor setup procedure help user to setup color, because in office, monitor is typically a reference for colour.</p> <p>13.2 User friendly diagnostic method of comparing the color of each device in the workflow</p> <p>13.3 Colour adjustment method for outlier devices</p>

Report by Klaus Richter to CIE Division 8, Portland, Nov. 11, 2008
Activity of CIE Div. 1 "Colour" related to a recommendation of ISO/TC159

Conclusions of the 53rd meeting of ISO/TC 159/SC 4/WG 2 "Visual display requirements" on 2007-05-19 to 22, Long Beach, CA, USA

Conclusion 31/2007

ISO TC159/SG4/WG2 "Visual Display Requirements" realizes that the colour spaces CIELAB and CIELUV of CIE Division 1 will soon become ISO/CIE standards. In applications we use these CIE colour spaces and device-dependent relative RGB colour spaces. For users of visual display systems a device-independent RGB colour space is useful.

This produces via software the elementary hues Red, Green and Blue for the RGB data 100, 010 and 001 and equally spaced output in CIE colour spaces for equally spaced RGB input. We recommend that CIE Division 1 study the colorimetric definition of such a space, which can be used in visual display applications.

Remark: We have realized that an example colour space of this type is published in CIE X030:2006, p. 139-144.

CIE-Reportership in CIE Div. 1 on Hue Angles of Elementary Colours

Some background information:

Achromatic colours	Elementary colours <i>"Neither-nor"-colours</i>	Reproduction colours <i>Television (TV), Print (PR)</i> <i>Photography (PH)</i>
<i>five achromatic colours:</i>	<i>four elementary colours:</i>	<i>six reproduction colours:</i>
<i>N</i> black (french noir)	<i>R</i> red <i>neither yellowish nor blueish</i>	<i>C</i> cyanblue
<i>D</i> dark grey	<i>G</i> green <i>neither yellowish nor blueish</i>	<i>M</i> magentared
<i>Z</i> central grey	<i>B</i> blue <i>neither greenish nor reddish</i>	<i>Y</i> yellow
<i>H</i> light grey	<i>J</i> yellow (french jaune) <i>neither greenish nor reddish</i>	<i>O</i> orangered
<i>W</i> white		<i>L</i> leafgreen
		<i>V</i> violetblue

Fig. 1: Four elementary and 6 device colours according to ISO/IEC 15775

The device colour hues are device dependent and the elementary hues are device-independent.

If the CIE test colours no. 9 to 12 are used as reference for RJGB, then a user expects the device independent colour output with the CIELAB hue angles 26, 92, 162 and 272 for RJGB.

CIE-Reportership in CIE Div. 1 on Hue Angles of Elementary Colours

If a user wishes the device independent elementary hue output of RJGB on two devices, for example a printer and a monitor, then the following figure shows a solution. The device primaries (OYLCVM, *in black*) are different, but the elementary hue output of RJGB (*in colour*) is the same on the two devices.

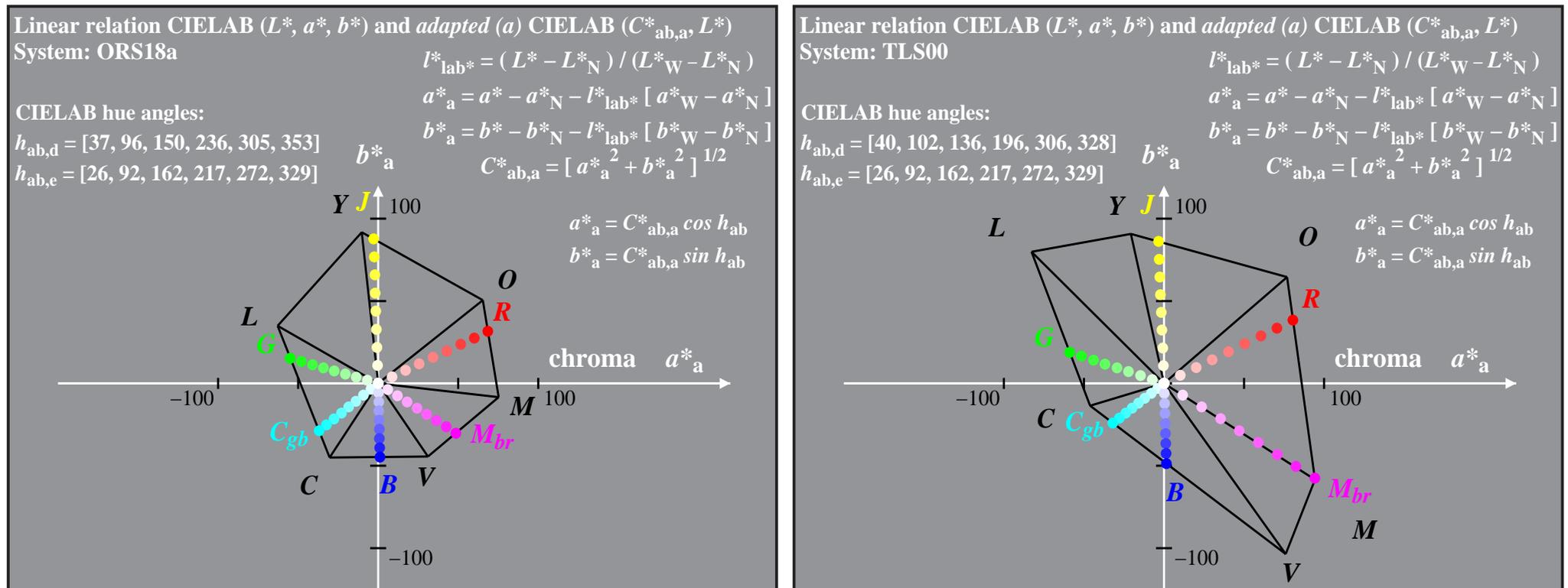


Figure 2: Device independent hue output on two different devices (printer ORS18 and monitor TLS00 according to ISO/IEC TR 24705). The six CIELAB device hue angles $h_{ab,d}$ and the elementary hue angles $h_{ab,e}$ are shown.

CIE-Reportership in CIE Div. 1 on Hue Angles of Elementary Colours

1

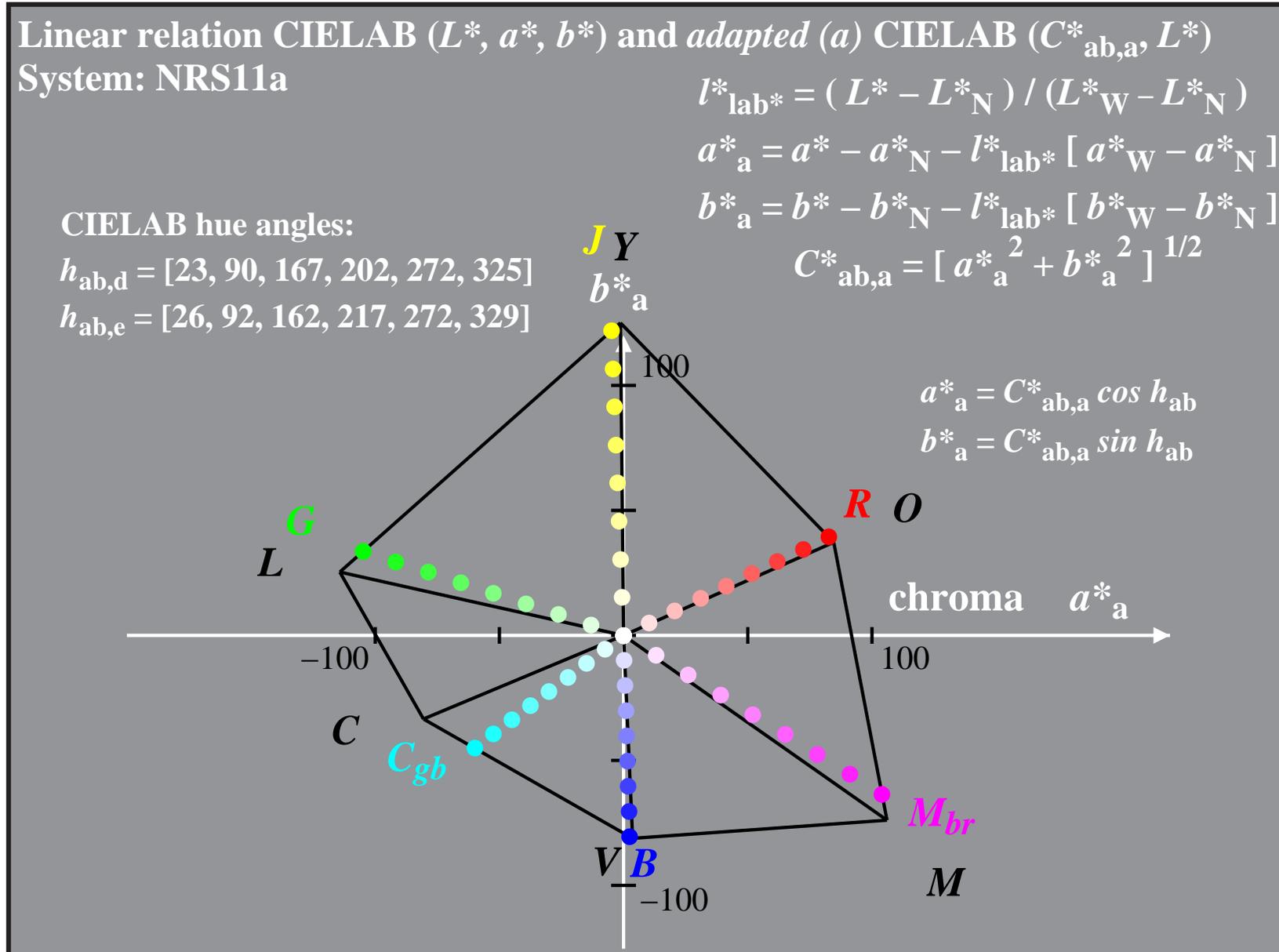


Fig. 3: Elementary hues defined by the CIE-test colours and the NCS system.

CIE-Reportership in CIE Div. 1 on Hue Angles of Elementary Colours

Figure 3 shows good agreement of the four elementary hues RJGB defined by the CIE test colours no. 9 to 12 of CIE 13.3 and the hues (here called OYLV) calculated from the Swedish Standard series of the Natural Colour System *NCS*.

The Swedish elementary colours are defined by *the neither nor criteria* of Fig. 1 and additionally by the criteria that the elementary colours appear *neither blackish nor brilliant* (also they appear *neither greyish nor fluorescent*).

The four elementary colours have device independent CIELAB values L^* , C_{ab}^* , h_{ab} . A visual model which can calculate the hue angles and the CIELAB data, for example by using the cone sensitivities of CIE 170-1, is not known up to now.

Example for colour output of elementary hues instead of device hues:

CIE-Reportership in CIE Div. 1 on Hue Angles of Elementary Colours

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	A	B	C	D	E	F	G	H	I	c_t^*
<i>Y</i>		rgb^*_3	LCH^*_a	LAB^*_a	nch^*	olv^*_3	LCH^*_a	LAB^*_a		<i>J</i>
01		B01 1.0 1.0 0.0	C01 81.26 71.61 92	D01 81.26 -2.89 71.56	E01 0.0 1.0 0.256	F01 1.0 0.911 0.0	G01 86.6 88.16 92	H01 86.6 -3.55 88.09		1.0
02		B02 0.75 0.75 0.25	C02 68.98 35.8 92	D02 68.98 -1.44 35.78	E02 0.25 0.5 0.256	F02 0.75 0.705 0.25	G02 71.65 44.08 92	H02 71.65 -1.77 44.04		0.5
03		B03 0.5 0.5 0.5	C03 56.71 0.0 0	D03 56.71 0.0 0.0	E03 0.5 0.0 0.0	F03 0.5 0.5 0.5	G03 56.71 0.0 0	H03 56.71 0.0 0.0		0.0
04		B04 0.25 0.25 0.75	C04 43.64 23.24 271	D04 43.64 0.7 -23.23	E04 0.25 0.5 0.754	F04 0.25 0.492 0.75	G04 49.17 22.36 271	H04 49.17 0.67 -22.35		0.5
05		B05 0.0 0.0 1.0	C05 30.57 46.49 271	D05 30.57 1.41 -46.47	E05 0.0 1.0 0.754	F05 0.0 0.484 1.0	G05 41.64 44.72 271	H05 41.64 1.35 -44.7		1.0
<i>V</i>		CIE18a		$c_t^* = c^*$		ORS18a			<i>B</i>	

De520-3A, 2

Fig. 4: Colour series *Y* – *V* and *J* – *B* with device independent rgb^*_3 and device dependent olv^*_3 data to produce colours of the elementary hues *J* and *B*.

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In Fig. 4 for Blue B both the device independent colour coordinates $rgb^*_3 = (0, 0, 1)$ and the CIELAB data of the CIE-test colour no. 12 are given (*left side*).

The corresponding device dependent colour data o/v^*_3 are calculated for the device system ORS18, compare ISO/IEC 15775. The output of a device colour V (*reddish blue, left*) is shifted towards the intended output of the colour Blue B (*neither reddish nor greenish, right, compare Fig. 2*)

Remark: The equations for the transfer of the data, which are given in the Fig. 4, have been published and in a Publication of Richter (Colorimetric model of logarithmic colour spaces LMSLAB, Part II, The Proceedings of the 26th Session of the CIE, 2007, Beijing, Proceedings Volume 2.pdf, 199-230).

An example in Fig. 4 shows the transfer from the device independent data rgb^*_3 , LAB^*_a , LCH^*_a , nch^* of CIE18 to the device dependent data o/v^*_3 , LAB^*_a , LCH^*_a of the device system ORS18.

For the transformation the hue angles of RJGB are sufficient. The $L^*a^*b^*$ values of the elementary colours are not necessary.

CIE-Reportership in CIE Div. 1 on Hue Angles of Elementary Colours

Results of the CIE Division 1 meeting in Stockholm:

Based on conclusion 31/2007 of ISO/TC 159/SC 4/WG 2 and the publication of DIN E 33872-1 to -6:2007 which uses the CIE test colours no. 9 to 12 for RJGB, the CIE Division 1 “Colour” has created a CIE reportership for this topic area at the CIE Division 1 meeting (June 15, 2008, Stockholm).

This CIE-Reportership has been confirmed by the CIE Board of Administration.

R1-47 Hue Angles of Elementary Colours

Terms of Reference:

To review the current literature on elementary (unique) hues for potential imaging applications.

Thorstein Seim NO (Norway)

This information was included in an email of the secretary of CIE Div. 1 (Mike Pointer, October 1, 2008)

CIE-Reportership in CIE Div. 1 on Hue Angles of Elementary Colours

References

CIE13.3:1995: Method of measuring and specifying colour rendering of light sources.

CIE 170-1:2006: Fundamental chromaticity diagram with physiological axes - Part 1

DIN E 33872-1 to -6:2007 (in publication stage), Information technology - Method of specifying relative colour reproduction with YES/NO criteria.

Richter, K. (2008). Colorimetric supplement to DIN 33872-1 to -6, see the URL (1 MB, 41 pages)

<http://www.ps.bam.de/D33872-AE.PDF>

Swedish Standard SS 01 91 00:1982, Colour notation system – SS 01 91 01:1982, CIE tristimulus values and trichromatic coordinates for some 16 000 colour notations according to SS 01 91 00 – SS 01 91 02:1982, Colour atlas – SS 01 91 02:1982, CIE tristimulus values and chromaticity coordinates for the colour samples in SS 01 91 02.

Richter, K. (2007). Colorimetric model of logarithmic colour spaces LMSLAB, Part II, The Proceedings of the 26th Session of the CIE, 2007, Beijing, Proceedings Volume 2.pdf, p. 199-230

Richter, K. (2008), Ergonomic color image technology with high visual and material efficiency based on elementary (unique) hues, Sixteenth Color Imaging Conference, IS&T, p. 259-264

Remarks: For the DIN-test charts according to DIN 33872-1 to -6 and questions about the output properties of any printer or monitor device, see

<http://www.ps.bam.de/33872E>

For information about the availability of an analog and digital colour atlas “Relative Elementary Colour System RECS”, see

<http://www.ps.bam.de/RECS>