CIE TC 8-16 meeting in Lillehammer – meeting notes

11th September 2017

Attendees (TC members): W Craig Revie, Yasuki Yamauchi, Po-Chieh Hung, Peter Nussbaum, Gregory High, Phil Green, Susan Farnand, (remote attendees) Yuan Jiang Ping, Andreas Kraushaar, Nikolaus Pfeiffer, Don Hutcheson, David McDowell, Marc Mahy, Danny Rich, Juergen Seitz, Elena Fedorovskaya. [16]

Attendees (observers): Michael Chang, Oliver Guth, Chandler Abraham, Kaida Xiao, Dirk Hertel, Gurav Sharma, Laurens Orÿ, Mathias Elvesberg, Jan Berguist, Yoav Bressler. [10]

Presentations are available on the ICC web site and from COLLTOOL in the 'Meeting records' folder.

The recording of the meeting is available from https://goo.gl/ZKCgEB. This recording is hosted by the ICC.

Chat log

The times listed below are the UK times – the recording started at 16:55 UK time (17:55 local time).

JIANGPING (to Everyone): 17:22: for subjective scaling experiments, is there a recommend for how many copies?
JIANGPING (to Everyone): 17:34: For the color naming method, the test including language color data can be available for other national observers (international samples), since the images with consistent color appearance is subjective feeling
Andreas Kraushaar (to Everyone): 17:53: The hypothesis is: Colour naming boundaries do correlate with what people perceive as consistent colour appearance
Andreas Kraushaar (to Everyone): 18:07: Hypothesis: If A then B; Thesis: B is so and so; so there is a difference :-)
Don Hutcheson (to Everyone): 18:09: Difference is assumed. The question is, is it an acceptable difference?
Juergen Seitz (to Everyone): 18:19: how were the 4 images prepared? relative or perceptual rendering?
Don Hutcheson (to Everyone): 19:03: Very productive meeting! Thanks
Don Hutcheson (to Everyone): 19:04: Week of November 6th doesn't work for me

Overview of Consistent Colour Appearance reproduction objective

Members of the committee who have not done so to date should check that they are familiar with the CIE COLLTOOL area and that you can access the CIE TC8-16 area on the ICC web site. Both areas require login details which you should have received.

Fogra has released the FOGRA53 characterisation data set which is designed as an exchange space for digital printing. ECI has produced an ICC Profile for this data set (eciCMYK.icc). The ICC web site has been updated to include details of these.

(00:20:00) Research projects overview

The goal for this part of the agenda was to provide an overview of each of the proposed research projects so that TC members and observers can provide feedback to the researchers. In preparation for this discussion a short summary of each project was prepared and circulated in advance of the meeting. These documents will be updated following the meeting and will be posted in the COLLTOOL area. We expect to review these in the next meeting. DQM: these should be in the form of a hypothesis and not the procedures to be used to solve it.

(00:21:50) Fogra research project (Philipp Tröster)

As Philipp was not available to present this work, Andreas Kraushaar made the presentation in his place.

Fogra Hypothesis: colour naming boundaries correlate with what people perceive as consistent colour appearance (AK, chat log).

A number of proprietary colour rendering algorithms will be tested to determine which produce consistent colour appearance. Observers will be asked to select which of two sets of images shows the most consistent colour appearance. These responses will be analysed statistically to determine whether observers agree. Andy reported that in previous experiments there is good agreement between observers.

Mapping of white points is currently under investigation. Next steps: selection of test images and running a pilot experiment. Work will be done in conjunction with Prof Karl Gegenfurtner of Giessen University, an expert in colour psychology who will provide input on the experimental setup and will use the colour naming database developed by Dimitri Mylonas of University College London to determine whether there is a correlation between colour naming boundaries and consistent colour appearance. The thesis is that the number of colour naming boundaries crossed correlates with the consistency of colour appearance.

DH question about perceptual rendering: other proprietary rendering algorithms will be tested as well.

(00:46:00) Yamagata University research project (Yasuki Yamauchi)

Yamagata University hypothesis: consistent colour appearance is achieved when colour mapping follows the colour trend lines developed in a previous project.

Trend lines are similar to lines of constant hue but includes lightness mapping and are not necessary straight lines in CIELAB. Mapping in this way may be similar to mapping in a uniform colour space or appearance space such as CIECAM02. Trend lines were developed by looking at how colours are mapped to the gamut boundaries of the CRPCs.

SF: observers don't agree unique colours (yellow, blue etc) and so there is a question as to whether observers agree about what is a uniform space.

Trend lines were developed by presenting colours on a display which simulated CRPC colour gamuts using 10-12 observers which is a relatively small sample set and may need further testing.

(01:10:00) NTNU, Gjøvik research project (Gregory High)

NTNU hypothesis (tentative): a metric of 'visual difference' can help towards understanding of consistent colour appearance.

Images rendering using ICC perceptual rendering to a set of print gamuts and then presented on BenQ display simulating the print spaces. Observers are then asked to assess

Proposal to adapt experimental content to D65 white point instead of D50 white point to avoid clipping issues which occur when D50 is used. Ratio of gamut volumes is a big driver for visual difference. A 0-9 scale is used to assess visual difference.

Observers will be presented with pairs of images and asked to assess the visual difference.

SF: would it be better to assess similarity rather than difference? Looking at differences may not be the same as assessing similarity. Observers may search for differences whereas we are interested in assessing similarity or consistency of colour appearance.

DQM: it would seem to be more intuitive to provide a set of variations of an image in a selected gamut, for example newsprint, and compare these with the same image render to the large gamut that we started with to try to determine which is most consistent and what colour characteristics between the three make the selected image more consistent.

(01:30:00) RIT research and review of print samples (Elena Fedorovskaya)

RIT hypothesis (tentative): the principles behind the ISO 15339 CRPCs produce consistent colour appearance. The perceived difference between images correlates with the 95-percentile of the CIEDE2000 colour difference between a pair of images.

The experiment will look at two aspects: a single image reproduced across a range of printing conditions and a set of images reproduced in a single printing condition.

Single image and multiple printing conditions: a range of synthetic gamuts is created using the principles of the ISO 15339 CRPCs. These synthetic gamuts have been designed so that they have the same difference in gamut volume. Images will be presented in three gamuts of different sizes; reference images with assumed consistency of colour appearance will be presented in the largest and smallest colour gamut and a set of variants of the same image will be rendered to the intermediate gamut and presented to observers who will be asked to select the variation with best colour consistency.

Multiple images and single printing condition: a range of images is converted to a single printing condition (reference set) and the colour of one of the images is varied in a measurable way to create a test set. Observers are asked to select the version of the image from the test set which is most consistent with the reference set.

DQM: concern that the set of images were not optimised for a particular print medium and so the assumption that the test images have any degree of consistency may be incorrect.

(01:57:00) CIE TC8-16 project plan (Yasuki Yamauchi)

Yasuki-san presented a first draft of a plan which shows the timescale for the work of CIE TC8-16. We had little time to review this. The plan includes the schedule for each of the research groups. This will be posted in the COLLTOOL area and will be updated as the projects progress.

Assessment method for Consistent Colour Appearance rendering algorithms

We had no time to review this proposal.

Summary and next steps

The next meeting is planned for the week of 6th November