

CIE Division 8

Technical Committee 8–03: Gamut Mapping

Minutes of 8th November 2001 Meeting in Scottsdale, AZ, USA

Compiled by Ján Morovic

1. Attendees

Attendees are listed in alphabetical order and TC 8–03 members are marked with a *.

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|------------------|-----------------------------------|
| James Chang | Lindsay MacDonald |
| John Dalrymple | Tom Maier |
| Dimitri Gusev | John McCann * |
| Patrick Herzog * | David McDowell |
| Tony Johnson * | Ján Morovic (TC Chairman) * |
| Byoung-Ho Kang * | Todd Newman (Division Director) * |
| Naoya Katoh * | Mike Pointer |
| Al Kravetz | Steve Viggiano * |
| Ronnier Luo * | Hiro Yaguchi |

2. Agenda

The meeting began at 5pm and lasted for one hour. The following agenda was followed:

1. Publication of GMA source code
2. Provision of test images
3. Guidelines
 - a. Will chromes of the obligatory test image be made available? (Section 3.1)
 - b. What should be the number of bins in the 3D histogram?
 - c. Should we use hue-preserving minimum ΔE instead of minimum ΔE_{94} ?
 - d. What should we say about analysis of raw pair-comparison data?
4. Publication of guidelines
5. Participation in coordinated research
6. Any other business

3. Publication of GMA source code

As discussed at a previous meeting (14/04/2000 in Derby), the point of whether the source code of gamut mapping algorithms (GMAs) proposed by various authors will be made available was raised. Patrick Herzog pointed out that providing code that is thoroughly tested is a lot of work and that it would be better not to provide code that might have bugs in it. This question will again be put to the entire TC via email.

4. Provision of test images

The idea of providing a set of test images from which participants in this coordinated research could choose some for their experimental work was revisited. It was again confirmed that such a set should be provided. The business graphic images provided earlier by Todd Newman (Canon) will be part of this set of test images and it was suggested that Kodak should be contacted and asked whether they could provide further test images.

5. Guidelines

The bulk of discussion at this meeting focused on the following issues in the guidelines that were still unresolved:

5.1. Will chromes of the obligatory test image be made available?

As the guidelines make one test image obligatory and as the transparency to print workflow needs transparencies of the original, the question of how these will be provided was discussed. It was suggested that as the obligatory SKI image was provided by Fuji Film Electronic Imaging Ltd., it would be worth asking them whether they had copies of the transparency that they could make available. Alternatively, a set of duplicates could be made from the single copy of the transparency available at Derby and one of these duplicates could be scanned in to provide the original for the work-flows that start with a digital image. David McDowell suggested that either Geoff Woolfe or himself could arrange for the duplication and scanning of the obligatory image's transparency.

The concern was voiced that even under these circumstances the originals from the different workflows will not be the same and that it will therefore be questionable whether results from various workflows can be compared. This indeed is a question that was previously discussed in the TC and the conclusion was reached that even though there cannot be a match between originals from different workflows, it is still worthwhile to have as much in common between them that as is possible.

5.2. What should be the number of bins in the 3D histogram?

As the guidelines specify that 3D histograms need to be provided for test images used in any experiment that is to comply with the guidelines. However, it was not specified what level of details these histograms are to have. It was first suggested that the histogram should have single-unit steps in the dimensions of CIELAB space but this was deemed to result in too large quantities of data. Alternatively Naoya Katoh proposed that fine sampling (i.e. single unit) should be applied in a^*b^* and coarser sampling in L^* . It was also suggested that the entire space could be sampled with into intervals of 5 units in each dimension as the purpose of this data is only to have a general idea of the images' colour characteristics.

Finally it was proposed that the guidelines should specify that the test images themselves should be made available as it would be then possible to extract any image characteristics from them (including image gamut and image 3D colour histogram).

At this point the issue of copyright was raised and it was agreed that permission must be given to this TC to use the images tested in studies that adhere to its guidelines.

5.3. Should we use hue-preserving minimum ΔE instead of minimum ΔE_{94} ?

Jan Morovic suggested that one of the two obligatory GMAs – minimum ΔE_{94} gamut clipping should be replaced by hue preserving minimum ΔE in CIELAB in light of the results Pei-Li Sun and he published at this years Scottsdale conference regarding the differences between various possible implementations of minimum ΔE clipping algorithms. Because of the degree of variation of these 3D clipping algorithms due to different implementation approaches, it was proposed that the simpler 2D clipping method be used. Naoya Katoh agreed with this proposal but said that 3D clipping gives better results than the hue-preserving 2D approach. At this point it was noted that the purpose of the two obligatory algorithms is (in Stephen Viggiano's words) 'to reconcile different interval scales' and that, as such, stability of the algorithm is more important than it performance. However, it was also said that algorithms that perform very badly should not be used as obligatory ones. In the end it was agreed that the performance of hue-preserving minimum ΔE clipping is acceptable and that it will be one of the obligatory algorithms alongside the SGCK gamut compression algorithm already in the guidelines.

5.4. What should we say about analysis of raw pair-comparison data?

In light of communication from John Handley about alternative data analysis of pair-comparison raw data, the pros and cons of the existing approach and the proposed alternative were discussed extensively via email before this meeting. It was agreed here that John Handley's papers should be referred to in the guidelines, that it should be left up to individual participants what method of analysis they use and that it should be made obligatory to report the raw preference matrix when pair comparison is used (as this will allow for other methods of analysis).

6. Publication of guidelines

The question of how to publish the guidelines when they are finished was put to those present and Mike Pointer said that they should appear as a CIE technical report. This needs to be prepared according to a template available from the CIE and Mike Pointer will in fact be the one who edits them before they are submitted for international ballot. A summary of the guidelines can also be published elsewhere (e.g. in some academic journal).

7. Participation in coordinated research

There was no response to the question of who of the TC members will participate in the experimental work based on the guidelines and this question will again be put to all TC members via email.

8. Any other business

Patrick Herzog raised some concerns about the performance of IPT and its inclusion in the colour space section of the guidelines. It was decided that he should communicate these concerns with Fritz Ebner and Gus Braun who prepared that section. It was also pointed out that IPT is only a recommendation rather than an obligatory element. Todd Newman also suggested that corrected CIELAB should be mentioned in the colour space section and he will provide a reference for this.

Todd Newman also asked the question of whether we can vote about the guidelines via email and Mike Pointer confirmed that we could. Like this we do not need to wait until our next physical meeting before the guidelines can be published.

Mike Pointer asked whether the names of authors of the various sections of the guidelines will be kept in when they get published and suggested that it would be a good idea to do it even though it is not common on other TCs.

Finally, the date of our next meeting will be discussed via email.