Color Management

The State of the Affair

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Default color management: Windows

- The display is assumed to be sRGB.
- Untagged RGB content is assumed to be sRGB.
- Tagged content is normalized to sRGB, but only if the application supports Windows ICM.
- Print drivers usually are proprietary black boxes that assume all source content is sRGB; proprietary transformation from sRGB to print space.

Default color management: OS X

- automatically creates an ICC display profile from display's EDID (extended display ID), applications can discover this profile easily.
- Untagged RGB content: bit complicated but is either assumed to be the same as the display space, or sRGB.
- Tagged content is normalized to sRGB or DisplayRGB.
- Print drivers usually are proprietary black boxes that assume all source content is sRGB; proprietary transformation from sRGB to print space.

Default color management on Linux: systems using colord

- automatically creates an ICC display profile from display's EDID (extended display ID), applications can discover this profile easily.
- Untagged RGB content: unknown, could be deviceRGB or sRGB.
- Plan to normalize to destination, transform based on device mappings.
- Printing is really tricky: application and print driver settings must be set correctly

ICC Based color management

- CIEXYZ and CIEL*a*b* based.
- ICC v2, ICC v4 [1][2]
- It is still largely a v2 world. Why?
  - Users are largely unaware of any meaningful difference between v2 and v4.
  - Implementation bugs
  - v2 works pretty well for common use cases
  - Difficult to extend, fragile to edit.

- [1] Format version 2.x is specification version 3.x. Begins 1994.
- [2] Format version 4.x is specification version 4.x. Begins 2001.

ICC v5

- More questions than answers
- More extensible? Modifiable? Easier to build profiles and CMMs? Spectral support?
- Opportunity to be involved in features that make it useful for a broad user base. Developers are also users, so consider what sort of metadata you need for your work.

Typical user problem

- Prints are too dark, why does this still happen?
- Display absolute luminance is not required information in ICC display class profile.
- Veiling glare assumed or unknown.
- Viewing environment of the print is unknown.
- Therefore the need and amount of tone adjustment to account for dynamic range difference is a problem.
- Result: waste and frustration

New problem

- Standards and trade organization induced color appearance failure in hard proofing
  - ISO 3664:2009, viewing conditions for graphic arts and photography; D50 simulators and UV
  - Optical Brightening Agents (fluorescence)
  - Mismatching effect of OBA between press sheet and proof causes visual mismatch
  - Cause
  - Solution

LGM 2014 Color Sessions of Interest

- X Today 12:10: *End to End Workflow* explores the questions, "Does it work? How should it work? What are the steps?"
- Today 17:30: *The Multitoner: grayscale image reproduction*
- Today 18:10: *OpenHardware ColorHug Spectro*
- Today 18:30: *Magic Lantern*
- X Tomorrow 12:10: *What about the color?* BOF, informal.

Future work

- 3D capture and printing
  - How to color manage? Goniometric effects, ray tracing, and gaming collide with color management?
- (Digital) Video
  - Many codecs, wrappers, antiquated legacy methods
- OpenICC
  - Development of color management enabling technologies (applications, drivers, APIs) in open source software.

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