ACEScg: A Common Color Encoding for Visual Effects Applications

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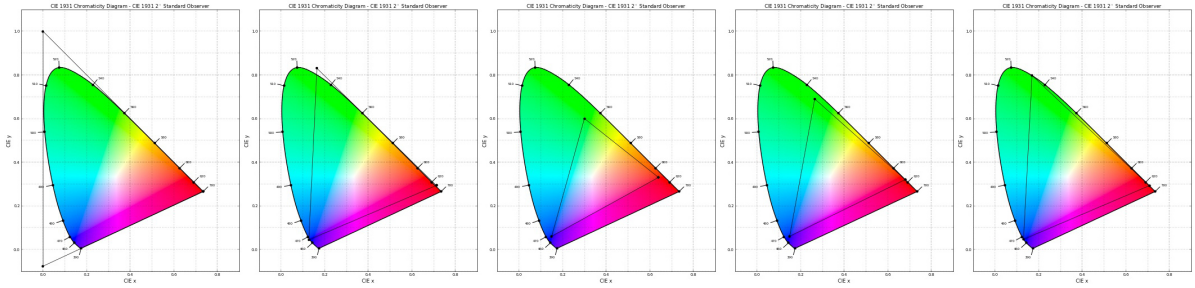

Figure 1: Gamuts: *ACES AP0, ACES AP1, Rec.709, DCI-P3, Rec.2020*

Abstract

The Academy Color Encoding System 1.0 (ACES) was launched in December 2014 by the Academy of Motion Picture Arts and Sciences. The result of over 10 years of industry-driven development and testing, ACES provides a standardized color management infrastructure to replace what was lost in the transition away from film. A key application addressed by ACES 1.0 is visual effects production. The addition of the ACEScg color encoding to compositing, lighting, rendering and other CG workflows will simplify element interchange and preview, as well as enable high dynamic range and wide gamut deliverables.

Keywords: color management, color space, color encoding, color, ACES, visual effects, digital cinema, digital capture, lighting, rendering, compositing

1 The Color Space

The ACEScg specification, S-2014-004, defines a 16-bit or 32-bit floating point color encoding corresponding to linear exposure values encoded relative to the ACES AP1 primaries. The AP1 primaries lie near the spectral locus and encompass the Rec-2020 gamut and the DCI-P3 gamut for a range of white points. The AP1 primaries are within the ultra-wide AP0 primaries, used for the ACES2065-1 color encoding, and are well-suited for lighting, rendering, and compositing applications.

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2 Core challenge: Multiple sources of live-action footage and multiple displays

Visual effects productions are confronted with the problem of receiving footage shot on multiple cameras, each with its own gamut, encoding and file format, and having to produce final frames for a number of display environments. Existing techniques largely fall back on the reasonable, if limited, approach of converting input data to a linear representation using either the encoding of the 'main camera' or the gamut of the 'main output'. This approach allows for reasonable results in what is considered to be the most important footage and display environment, but quite often involves manual matching of results and falls short or forces compromises for the other cameras and other display environments or devices.

3 Advantage

Using the AP1 primaries, ACEScg provides a color gamut wide enough to represent all of Pointer's Gamut and the majority of visible colors, without requiring negative values and without dedicating a significant portion of the gamut to implausible colors. ACEScg is a suitable space to target color from different cameras and from which to generate output for multiple displays. Because ACEScg can be used with multiple types of input and output, it also reduces the need for a new working space for each production. This reduces setup time and provides a better basis for reuse of textures, materials and lighting assets from one show to the next. The combination of ACEScg and the other major elements of ACES, the Input Transforms and Output Transforms, forms an end-to-end solution to the problem of using multiple types of cameras and targeting displays of varying dynamic range and color gamut that is common in modern productions.

References

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