Technical Bulletin

TB-2014-013

Alternate ACES Viewing Pipeline User Experience

The Academy of Motion Picture Arts and Sciences

Science and Technology Council

Academy Color Encoding System (ACES) Project Committee

March 29, 2016

Summary: The majority of products that implemented pre-release ACES adopted an approach that combined the RRT and ODT into a single transform. It may useful to have one transform that has both ACES rendering components (from the RRT and ODT) that outputs the desired display colorimetry followed by a simple transform that converts that colorimetry into display code values. The ACES User Experience Working Group is developing an alternate UX proposal for products that wish to structure their viewing pipeline using this approach. This work is put forward for consideration as a possible recommended approach for a future ACES release.

NOTICES

Revision History

Version	Date	Description
1.0	12/19/2014	Initial Version
1.0.1	04/24/2015	Formatting and typo fixes
	03/29/2016	Remove version number - to use modification date as UID

Related Academy Documents

Document Name	Description	
TB-2014-002	Academy Color Encoding System Version 1.0 User Experience Guidelines	

Table of Contents

NOTICES 2
Revision History 3
Related Academy Documents 3
Introduction 5
1 Challenges 6
2 Structuring the choices 6
3 Filtering the available View Transforms 7
4 The role of the RRT 7
5 Terminology 7
6 Mapping from the engineering-centric to user-centric terms 7

Introduction

The majority of products that implemented pre-release ACES adopted an approach that combined the RRT and ODT into a single transform. This makes sense since the output of the RRT (OCES) is not useful for end-users. However, some products do have a need for a more modular approach. In particular, it is useful to have one transform that has both ACES rendering components (from the RRT and ODT) that outputs the desired display colorimetry followed by a simple transform that converts that colorimetry into display code values.

The ACES User Experience Working Group is developing an alternate UX proposal for products that wish to structure their viewing pipeline using this approach. This is useful for those wanting to implement ACES in products that also need to support ICC monitor profiles. It is also useful since it allows the configuration of the viewing pipeline to be done from two smaller menus rather than one long menu.

This work is put forward for consideration as a possible recommended approach for a future ACES release.

1 Challenges

In many implementations of pre-release ACES, products required users to select from a long list of transforms essentially consisting of the RRT combined with an ODT. The ODTs supplied with pre-release versions of ACES varied along the following characteristics:

- released version of the CTL transforms
- display calibration aim
- cinema simulation mode vs. adapted mode
- target gamut limiting
- legal vs. full range
- forward and inverse transforms

Furthermore, we are introducing additional factors such as:

- viewing environment
- target dynamic range (for HDR displays)

The factorial combinations of these transforms implies that it would be overwhelming to users to ask them to select from amongst dozens or even hundreds of possible transforms. Some principle must be found to organize them.

Further complicating matters is that the algorithms currently in use do not support all possible combinations of parameters (nor do all combinations even make sense as user options). For example, the target gamut limiting is very device specific. Likewise options for HDR video displays do not make sense for typical video displays or cinema projectors. So as with Input Transforms, it is not feasible to present the choices as a consistent and well-ordered set of parametric options.

Finally, the notion of an RRT + ODT and other aspects of the pre-releases are unique to ACES and become difficult in the context of products which simultaneously need to support other methods of color management.

2 Structuring the choices

Fundamentally, there are two main decisions to be made by the user: first, what device is being used to display the images; and second, how are the images to be viewed. As is the goal in UX design, the first decision, the display, is something that is intuitively obvious and expected.

The second decision is less obvious but there is precedent for it. For example, many users are already familiar with the notion that logarithmically encoded images (e.g. negative-film scans) require some type of transformation (e.g. a print-film emulation) in order to be viewed correctly.

By splitting the decision-making process into two steps, rather than requiring the user to select from a long list with M x N choices, they are able to make two separate choices, each from a much shorter set of options (of length M and N). (This is an over-simplification of the system, but hopefully the concept is clear.)

This particular decomposition into Viewing and Display Transforms allows ACES to fit into some color management UX models that are already in common use. For example, OpenColorIO already structures its viewing pipeline into View and Display choices.

Another example are the products that use ICC-based color management. These products make use of the ICC monitor profile that is ubiquitous within the Mac and Windows operating systems and which convert desired colorimetry to display code values. Structuring the choices as View and Display allows ACES to be more easily integrated into ICC-based products.

3 Filtering the available View Transforms

Metadata is now added to the ACES transforms which include a unique transform identifier. Additionally, metadata could be added to Display Transforms to include the IDs of the View Transforms for which they are authored. For example, a digital cinema projector and an HDR monitor will be authored using different View Transforms. For a typical Display Transform, this will be a list of 1-2 View Transforms. For example, in the case of a broadcast monitor there are two: one for video mastering mode and another for simulating the D60 white point of the cinema mode (e.g. for on-set use). So once the Display Transform has been selected, the application should filter the list of ACES View Transforms to only the appropriate ones (usually just 1-2).

4 The role of the RRT

Please note that although the RRT acronym is not used in the suggested terminology, it still remains an essential piece of the engineering and conceptual model of ACES. The role of the RRT is to define the baseline ACES rendering. Even though there are multiple Viewing Transforms for the viewing environments and classes of display (e.g. standard and extended dynamic range), these are all designed to match the RRT to the extent possible. This is what gives the ACES renderings a consistent appearance across a wide range of viewing environments and display technologies.

5 Terminology

These terms should be introduced:

Viewing Transform (or View Transform) – Generally, a color transformation that converts values from a working space into colorimetry for a display device. Specifically in this context, the Viewing Transform is what contains the Academy-supplied algorithms for converting scene-referred ACES values into colorimetry for a given viewing environment and class of display.

Display Transform – A color transformation that converts colorimetry intended to be reproduced on a display into the code values that must be sent to the device.

6 Mapping from the engineering-centric to user-centric terms

There is not a one-to-one mapping of the RRT to a View Transform or from an ODT to a Display Transform.

Figure 1 shows the ACES viewing pipeline using the engineering-centric LMT, RRT, and ODT terms. Figure 2 shows how the recommended terms apply to the same underlying blocks being used in Figure 1. Note that both pipelines produce exactly the same numerical results.

Two new engineering-centric acronyms are used here since there is a need to be able to refer to the part of the ODT which contains the Academy-developed part of the algorithm (which is key to the look of the system), from the more typical conversion from colorimetry into code values for a given display.

Target Conversion Transform (TCT) – The TCT may be thought of as the part that “fits” the idealized colorimetry from the RRT into what is appropriate for a viewing target. A viewing target consists of a family of display devices (i.e. devices which have similar dynamic range and gamut characteristics) and associated viewing environment.

Display Encoding Transform (DET) – The DET is simply a conversion from colorimetry into the code values necessary to produce that colorimetry on a given device. It is similar to an ICC monitor profile.

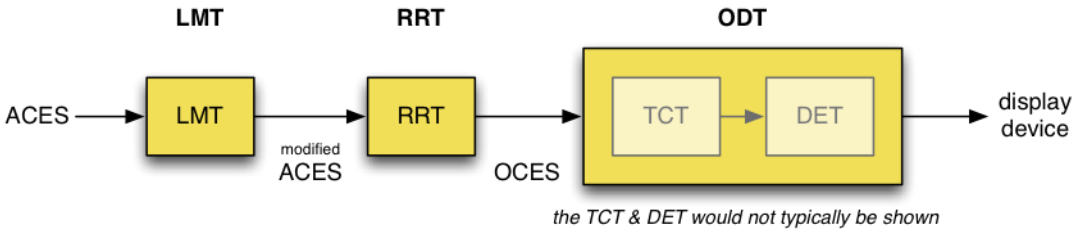

Figure 1 – The conceptual model of viewing ACES

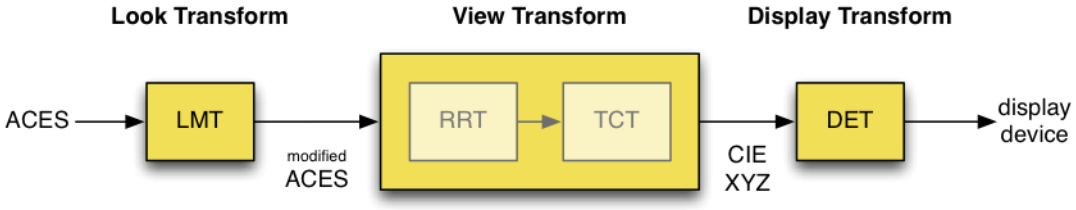

Figure 2 – Engineering-centric ACES viewing pipeline along with the user-centric model