Colour Look and Feel 2.0 User's Guide

Release 2.0

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Colour Look and Feel Plugins Version 2.0 User's Guide.

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CHAPTER

ONE

ABOUT THIS GUIDE

1.1 Legal Information

1.2 Feedback and Contact

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1.3 Audience for This Guide

The audience of this guide is assumed to be compositors who have experience with their respective compositing software.

1.4 How to Use This Guide

In this guide every node present in the software plugin is documented with all their input and output values.

Some knowledge of color theory, color spaces and tone curves is recommended.

CHAPTER

TWO

OVERVIEW

2.1 Introduction

Colour Look and Feel is a powerful professional technical color mastering plugin set for popular node based compositing software. It provides compositors access to state-of-the-art numerical methods to cope with any technical color mastering challenge posed. The nodes provided explicitly expose full control of their underlying algorithms and are not designed to hold hands.

The plugins are implemented using the standard OpenFX[1] plugin interface and should work across all compositing software supporting this standard.

2.2 Introduction to Chromatic Adaptation

Chromatic adaptation serves the primary purpose of maintaining color consistency and preserving artistic intent across various shooting and viewing conditions. It ensures that scenes shot under for example different lighting, with different cameras, or at different locations maintain a cohesive look and feel, enhancing the storytelling process and enabling directors and cinematographers to evoke specific emotions through color grading. By standardizing and adjusting colors throughout the film-making process, this technique guarantees that the final product aligns closely with the filmmakers' creative vision, regardless of where or how the film is viewed.

White balance is a camera setting that adjusts for the color temperature of the light source to ensure that white objects appear white, effectively neutralizing unwanted color casts caused by varying lighting conditions. On the other hand, chromatic adaptation is a more comprehensive and complex process that involves adjusting the overall color appearance of an image to account for changes in the viewing environment or to achieve a specific creative look. This process considers not just the light source but also the human visual system's ability to adapt to different lighting conditions, encompassing adjustments to hue, saturation, and brightness across the entire color spectrum. While white balance focuses on simple color correction, chromatic adaptation goes further to maintain the artistic intent and visual consistency of the final product.

[1] https://openeffects.org/

CHAPTER

THREE

COOKBOOK

3.1 What Algorithm to use when?

Colour Look and Feel includes a multitude of both state-of-the art, as well as established algorithms to accomplish the same thing with slight variances.

3.1.1 Chromatic Adaptation

For chromatic adaptation, the most basic and widely used algorithm is a linear *Bradford* transform. This can be accomplished with the *CLF_LinearAdaptation* node. Different other linear transforms can be easily evaluated for their suitability by selecting them in the *CLF_LinearAdaptation* node parameters.

The Bartleson transform implemented in the *CLF_BartlesonAdaptation* node also implements a straight-forward chromatic adaption by specifying a source and target white point.

The nodes *CLF_CMCCAT2000Adaptation* and *CLF_CMCCAT1997Adaptation* implement a more elaborate chromatic adaptation scheme for which additional luminance of the source and or target white points can be specified. In a similar manner *CLF_Fairchild1990Adaptation* allows an additional source luminance to be specified, as well as other transition factors.

The Zhai-Luo adaptation *CLF_ZhaiLuoAdaptation* is a state-of-the-art chromatic adaptation algorithm that takes into account multiple values including a sample and base-point white-point in addition to the source and target white points. As such this node requires more careful consideration for use and parameter value selection.

The CIE1994 chromatic adaptation *CLF_CIE1994Adaptation* is fairly hard to use and extremely sensitive to the provided input parameters and should be avoided unless required in a specific context.

The Burnham adaptation *CLF_BurnhamAdaptation* allows adaptation only between CIE A, B and C illuminants.

Note

If you are not sure start with a linear chromatic adaptation using the *CLF_LinearAdaptation* node and work from there.

CHAPTER

FOUR

REFERENCE

4.1 About Color Spaces

The standardized OpenFX[1] plugin interface used by *Colour Look and Feel* does not explicitly provide information or facilities to obtain the particular RGB color space passed onto the plugins. The standard only specifies that the RGB data is linear but no further tone curves are specified.

As such *Colour Look and Feel* allows nodes to accept XYZ as well as RGB data of varying color spaces for their inputs and outputs. This input and output color space can be selected for each node individually and is set to sRGB by default.

4.1.1 Color Space Transformation Pipeline

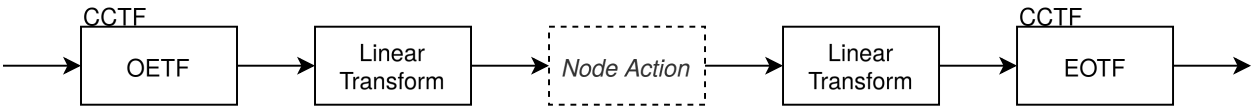

Fig. 1: Color space transformation pipeline used in *Colour Look and Feel*.

The above shows the color transformation pipeline used internally in the nodes. An arbitrary input image is passed in, if the source color space has a non-linear encoding the *OETF* function will be used to remove the non-linear component, subsequently a linear transformation is applied to convert the image to an unified internal color space. After the node action is applied the process is reversed by linearily transforming the color space back into the source color space followed by encoding non-linear aspects.

See *Color Component Transfer Functions (CCTF)* for more on the OETF/EOTF functions.

Note

Some compositing software's may already implicitly convert the input image to an unified node color space. In this case use the default *XYZ* color space.

[1] https://openeffects.org/

4.1.2 Color Component Transfer Functions (CCTF)

Color Component Transfer Functions (CCTF), also known as Electro-Optical Transfer Functions (EOTF) or Opto-Electronic Transfer Functions (OETF), are essential in video and imaging systems for mapping color values between linear light and non-linear signal domains. They optimize storage and transmission by aligning with human perception, which is more sensitive to darker tones. During encoding, the OETF converts linear light to non-linear signals, and during decoding, the EOTF reverses this process. Proper use of CCTFs ensures accurate brightness and color reproduction, maintaining image quality.

CCTF functions as such allow the application of non-linear color space transformation components. For linear color spaces CCTF functions are not implemented and as such will not provide any effect.

4.1.3 Available Color Spaces

The following color spaces are currently available to be selected for node input and output data:

Name	Description	CCTF
XYZ	CIE 1931 XYZ	No
sRGB	Standard sRGB	Yes
Rec. 702	ITU-R BT.709-6	Yes
Rec. 2020	ITU-R BT.2020	Yes
ACES2065-1	ST2065-1	No
ACEScg	ACES Comp.	No
ACEScc	ACES Col. Corr.	Yes
ACEScct	ACES Col. Corr.	Yes

The CCTF field refers to whether the color space has an associated CCTF function, if not the *Apply OETF* and *Apply EOTF* functions do nothing.

4.2 Common White Point Selection Parameters

White points can be defined using one of multiple methods in all of the nodes of *Colour Look and Feel*. The following methods are available.

Illuminant
: Select a white point using a standard illuminant. Currently supports most standard CIE illuminants, see Illuminants for further detail.

Color
: Select a white point using a color value.

Tristimulus
: Select a white point using a tristimulus value *xy*. This can be used to specify non-standard illuminants.

CCT
: Select a white point using a *Correlated Color Temperature* (CCT) in degrees Kelvin. This approximates the white point using a black body temperature formula.

The selected white point is handled independently of the node color space.

4.3 Illuminants

The following illuminants are available with their CIE 1931 2 degree standard observer tristimulus values.

Standard	Name	CCT
CIE 15:2004	CIE A	2856K
	CIE B	4874K
CIE 15:2004	CIE C	6774K
CIE 15:2004	CIE D50	5003K
CIE 15:2004	CIE D55	5503K
CIE 15:2004	CIE D65	6504K
CIE 15:2004	CIE D75	7504K
	CIE D93	9305K
	CIE E	5454K
CIE 15:2004	CIE F1	6430K
CIE 15:2004	CIE F2	4230K
CIE 15:2004	CIE F3	3450K
CIE 15:2004	CIE F3.1	2932K
CIE 15:2004	CIE F3.2	3965K
CIE 15:2004	CIE F3.3	6280K
CIE 15:2004	CIE F3.4	2904K
CIE 15:2004	CIE F3.5	4086K
CIE 15:2004	CIE F3.6	4894K
CIE 15:2004	CIE F3.7	2979K
CIE 15:2004	CIE F3.8	4006K
CIE 15:2004	CIE F3.9	4853K
CIE 15:2004	CIE F3.10	5000K
CIE 15:2004	CIE F3.11	5854K
CIE 15:2004	CIE F3.12	2984K
CIE 15:2004	CIE F3.13	3896K
CIE 15:2004	CIE F3.14	5045K
CIE 15:2004	CIE F3.15	6509K
CIE 15:2004	CIE F4	2940K
CIE 15:2004	CIE F5	6350K
CIE 15:2004	CIE F6	4150K
CIE 15:2004	CIE F7	6500K
CIE 15:2004	CIE F8	5000K
CIE 15:2004	CIE F9	4150K
CIE 15:2004	CIE F10	5000K
CIE 15:2004	CIE F11	4000K
CIE 15:2004	CIE F12	3000K
CIE 15:2004	CIE HP1	1959K
CIE 15:2004	CIE HP2	2506K
CIE 15:2004	CIE HP3	3144K
CIE 15:2004	CIE HP4	4002K
CIE 15:2004	CIE HP5	4039K
CIE 15:2018	CIE LED-B1	2733K
CIE 15:2018	CIE LED-B2	2998K
CIE 15:2018	CIE LED-B3	4103K
CIE 15:2018	CIE LED-B4	5109K
CIE 15:2018	CIE LED-B5	6598K

continues on next page

Table 1 – continued from previous page

Standard	Name	CCT
CIE 15:2018	CIE LED-BH1	2851K
CIE 15:2018	CIE LED-RGB1	2840K
CIE 15:2018	CIE LED-V1	2724K
CIE 15:2018	CIE LED-V2	4070K

CHAPTER

FIVE

NODE REFERENCE

5.1 CLF_LinearAdaptation - Linear Chromatic Adaptation

Internal Identifier: `de.adelsbach.clf.LinearAdaptation`

This node provides linear chromatic adaptation methods, given a source and target illuminant value. The node accepts RGBA data and outputs RGBA data, the alpha channel is passed through unchanged.

The following parameters are available:

Input/Output
Input output color space, see *About Color Spaces* for more information.

Apply OETF
Whether to apply the Opto-Electrical Transfer Function (OETF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Apply EOTF
Whether to apply the Electro-Optical Transfer Function (EOTF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Method
Specifies the linear chromatic adaptation transformer. The following transformers are supported:

VonKries
The traditional VonKries adaptation matrix.

Bradford
The commonly used Bradford adaptation matrix.

Wassef
The Wassef adaptation matrix.

Sobagaki
The Sobagaki adaptation matrix.

Sharp
The Sharp adaptation matrix.

CAT97
The CAT97 model adaptation matrix.

CAT02
The CAT02 model adaptation matrix.

CAT02 Brill
The Brill corrected CAT02 model adaptation matrix.

CAT16
The CAT16 model adaptation matrix.

CMCCAT1997
Linear CMCCAT1997 adaptation matrix.

CMCCAT2000
Linear CMCCAT2000 adaptation matrix.

BiancoSchettini
The Bianco Schettini adaptation matrix.

BiancoSchettini PC
The Bianco Schettini adaptation matrix with positive lobes.

Scaling
A simple scaling matrix.

Source White Point
Source white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Target White Point
Target white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

5.2 CLF_CMCCAT2000Adaptation - CMC CAT2000 Chromatic Adaptation

Internal Identifier: `de.adelsbach.clf.CMCCAT2000Adaptation`

This node provides CMC CAT2000 chromatic adaptation. This adaptation method in addition to the source and target white points also takes into account the luminosity of the latter in cd/m2 as well as a general induction factor. The node accepts RGBA data and outputs RGBA data, the alpha channel is passed through unchanged. The following parameters are available:

Input/Output
Input output color space, see *About Color Spaces* for more information.

Apply OETF
Whether to apply the Opto-Electrical Transfer Function (OETF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Apply EOTF
Whether to apply the Electro-Optical Transfer Function (EOTF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Source White Point
Source white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Source Luminance
Luminance of the source white point illuminant in cd/m2.

Target White Point
Target white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Target Luminance
Luminance of the target white point illuminant in cd/m2.

Induction
Induction value for the lighting conditions in the range [0,1] This is typically 1.0 for average lighting and 0.8 for dim lighting.

5.3 CLF_CMCCAT1997Adaptation - CMC CAT1997 Chromatic Adaptation

Internal Identifier: `de.adelsbach.clf.CMCCAT1997Adaptation`

This node provides CMC CAT1997 chromatic adaptation. This adaptation method in addition to the source and target white points also takes into account the luminosity of the target in cd/m2 as well as a general induction factor. The node accepts RGBA data and outputs RGBA data, the alpha channel is passed through unchanged.

The following parameters are available:

Input/Output
Input output color space, see *About Color Spaces* for more information.

Apply OETF
Whether to apply the Opto-Electrical Transfer Function (OETF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Apply EOTF
Whether to apply the Electro-Optical Transfer Function (EOTF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Induction
Induction value for the lighting conditions in the range [0,1]. This is typically 1.0 for average lighting and 0.8 for dim lighting.

Source White Point
Source white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Source Luminance
Luminance of the source white point illuminant in cd/m2.

Target White Point
Target white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

5.4 CLF_BartlesonAdaptation - Bartleson Chromatic Adaptation

Internal Identifier: `de.adelsbach.clf.BartlesonAdaptation`

This node provides Bartleson chromatic adaptation, given a source and target illuminant value. The node accepts RGBA data and outputs RGBA data, the alpha channel is passed through unchanged.

The following parameters are available:

Input/Output
Input output color space, see *About Color Spaces* for more information.

Apply OETF
Whether to apply the Opto-Electrical Transfer Function (OETF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Apply EOTF
Whether to apply the Electro-Optical Transfer Function (EOTF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Source White Point
Source white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Target White Point
Target white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

5.5 CLF_ZhaiLuoAdaptation - Zhai Luo Chromatic Adaptation

Internal Identifier: `de.adelsbach.clf.ZhaiLuoAdaptation`

This node provides Zhai Luo chromatic adaptation, given a source and target illuminant value. The node accepts RGBA data and outputs RGBA data, the alpha channel is passed through unchanged.

The following parameters are available:

Input/Output
Input output color space, see *About Color Spaces* for more information.

Apply OETF
Whether to apply the Opto-Electrical Transfer Function (OETF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Apply EOTF
Whether to apply the Electro-Optical Transfer Function (EOTF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Method
The adaption matrix to be used, the following options are available:

- CAT02
- CAT02 Brill
- CAT16

Source White Point
Source white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Source Adaption Degree
Degree of the source adaptation.

Target White Point
Target white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Target Adaption Degree
Degree of the target adaptation.

Baseline White Point
Baseline white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Sample White Point
Sample white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

5.6 CLF_CIE1994Adaptation - CIE 1994 Chromatic Adaptation

Internal Identifier: `de.adelsbach.clf.CIE1994Adaptation`

This node provides CIE1994 chromatic adaptation, given a source and target illuminant value. The node accepts RGBA data and outputs RGBA data, the alpha channel is passed through unchanged.

The following parameters are available:

Input/Output
Input output color space, see *About Color Spaces* for more information.

Apply OETF
Whether to apply the Opto-Electrical Transfer Function (OETF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Apply EOTF
Whether to apply the Electro-Optical Transfer Function (EOTF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Noise
Noise factor.

Luminance Factor
Luminance factor.

Source White Point
Source white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Source Luminance
Source white luminance in cd/m2.

Target White Point
Target white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Target Luminance
Target white luminance in cd/m2.

5.7 CLF_BurnhamAdaptation - Burnham Chromatic Adaptation

Internal Identifier: `de.adelsbach.clf.BurnhamAdaptation`

This node provides Burnham chromatic adaptation, given a source and target illuminant. Only the fixed CIE illuminants A, C and G are supported. The node accepts RGBA data and outputs RGBA data, the alpha channel is passed through unchanged.

The following parameters are available:

Input/Output
Input output color space, see *About Color Spaces* for more information.

Apply OETF
Whether to apply the Opto-Electrical Transfer Function (OETF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Apply EOTF
Whether to apply the Electro-Optical Transfer Function (EOTF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

From Illuminant
The source illuminant, this can be any of:

- CIE A
- CIE B
- CIE C

To Illuminant
The target illuminant, this can be any of:

- CIE A
- CIE B
- CIE C

5.8 CLF_Fairchild1990Adaptation - Fairchild1990 Chromatic Adaptation

Internal Identifier: `de.adelsbach.clf.Fairchild1990Adaptation`

This node provides Fairchild 1990 chromatic adaptation model, given a source and target illuminant and the luminance of the source illuminant. The node accepts RGBA data and outputs RGBA data, the alpha channel is passed through unchanged.

The following parameters are available:

Input/Output
Input output color space, see *About Color Spaces* for more information.

Apply OETF
Whether to apply the Opto-Electrical Transfer Function (OETF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Apply EOTF
Whether to apply the Electro-Optical Transfer Function (EOTF) of the selected color space, see *Color Space Transformation Pipeline* for more information.

Source White Point
Source white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Target White Point
Target white point illuminant. Refer to *Common White Point Selection Parameters* for parameter documentation.

Discount Illuminant
Whether to discount the illuminant in the adaptation.

Luminance
Luminance of the source whitepoint given in cd/m2.

Exponent
Exponent of the adaptation, by default this is 1/3.

CHAPTER

SIX

GLOSSARY

The following provides brief descriptions of common terms and their meaning in this manual.

Chromatic Adaptation
: A similar functionality as *white balance* in cameras. It allows transition of an image between different illuminants such as tungsten (3000K) to daylight (6000K). However by comparison to white-balancing it takes into account further color science and colorimetry related aspects.

Illuminant
: An illuminant is a mathematical description of a light source's spectral power distribution, used to define standard lighting conditions for color measurement and reproduction.

Luminosity
: Strength of a light source, generally in SI units of *Candela per Square Meter*, cd/m2.

CCT
: Correlated color temperature, is the radiated light temperature of planckian black body radiator of a given heat.

CCTF
: Color Component Transfer Function a function used to convert between non-linear color spaces.

EOTF
: Electro-Optical Transfer Function a Color Component Transfer Function (CCTF) to convert to a non-linear color space from a linear one.

OETF
: Opto-Electrical Transfer Function a Color Component Transfer Function (CCTF) to convert from a non-linear color space to a linear one.

CHAPTER

SEVEN

ACKNOWLEDGEMENTS

This product incorporates the OpenFX[1] API standard:

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[1] https://openeffects.org/