The comparison of the workflow of DaVinci Resolve 12 and Filmlight's Baselight 4.4

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Abstract

Color-Grading is not only a tool that adjusts colors and makes corrections. It also is a brainchild of dramaturgy that can influence the entire mood or can be an artistic style of a movie.

Resolve and Baselight are both highly used systems that can create such distinct looks, but differ in some points such as node- or layer-based principles and its high price disparity. So which software package is better suited for a professional colorist?

Therefore, in this paper both intermediate systems will be compared in their workflow and results in order to determine their advantages and disadvantages. In addition, there will be an introduction to the basics of color grading and what a colorist has to consider besides a good intermediate system for creating good results.

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1 Introduction

Nowadays, the industry of intermediate systems is bigger than ever. Various software packages like DaVinci Resolve, Autodesk Lustre, Assimilate Scratch, Adobe Speedgrade or Filmlight's Baselight are available on the market. Therefore, it can be difficult for a professional colorist to decide which one is the most suitable software package.

Out of the various vendors, DaVinci Resolve appears to be the most widely used color correction program. Its competitor, Filmlight's Baselight is well known for its usage in many high-end post-production companies around the world as well.

Therefore, this paper gives insights in Resolve and Baselight by showing the complete workflow in both programs. Afterwards they will be compared to define their strengths and weaknesses and to explain which one appears to be the most convincing option for a colorist.

Additionally, chapter 2 of this paper introduces the basics about color correction in order to understand the technical as well as the dramaturgical aspects.

The dramaturgical aspect includes how humans perceive colors and the color theory that explains how different types of colors can make the audience feel. The technical insights concern the color spaces, recording formats and a proper working environment for the colorist.

Chapter 3 details the basics of the two software packages as well as the companies that have developed them. Since the comparison of Resolve and Baselight is based on its workflow, chapter 4 describes how a general workflow could look like in order to better understand the description of the implementation of the workflows in Resolve and Baselight in chapter 5 . Finally, the last chapter compares both systems and defines their advantages and disadvantages.

2 Basics

2.1 Vision

Besides the technical aspects, the physical and anatomical conditions of the human visual perception. needs to be considered in order to understand the basics of color grading. Humans have a comparatively good vision with exceptional color accuracy. One might argue that vision is our most important sense.

Different wavelengths of light are responsible for us seeing colors. Those wavelengths translate intodifferent colors. However, the human eye is only able to see colors at wavelengths of around 380 nm to 700 nm. Anywhere above iseither infrared or radio waves, while any wavelengthbelow isultraviolet, X-rays or Gamma rays as shown in figure 1. In fact, only a very small portion of the electromagnetic spectrum is visible to humans at all.
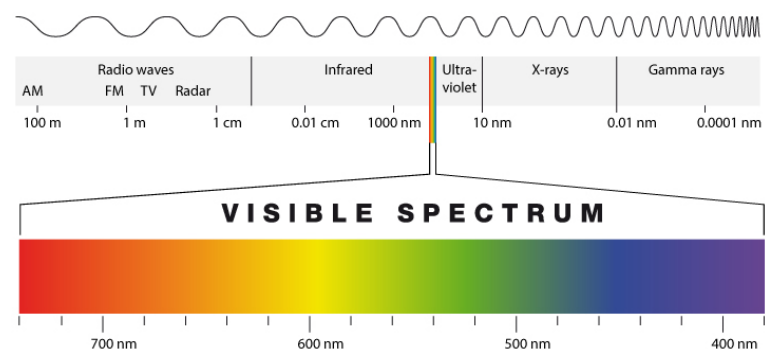

Figure 1 The visible spectrum of an human eye

The perception of colors is created by three components: a source, a modifier, and a detector.

The source can be any object that emits light such as the sun or a lightbulb.

All these different sources have color temperatures, which are measured in degrees kelvin. The lower the degrees, the redder is the light. Lava has a color temperature of 1200 K, which is the lowest of the kelvin spectrum. Light bulbs emit a warm yellow light which is about 3200 K. The color temperature of the sun has an average of 6500 K and appearsbluish. A perfect white source of light does not exist. The most pure form of light is any light source at around 6500 K.
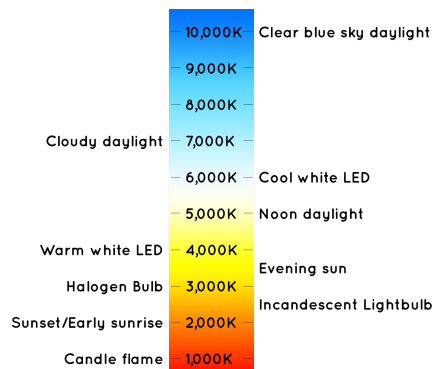
Figure 2 The color temperaturs of the kelvin spectrum (Stouch Lighting, 2016)

However, the light and its color temperature can change due to modifiers. Modifiers are objects that can absorb and reflect different wavelengths of that light to varying degrees. When the reflection of an object is very strong in certain wavelengths, we see those reflected wavelengths to be the color of that object. The spectral reflection can cause a color cast, which is extremely important for color corrections. Color casts affect the area surrounding the modifier. Basically, this means that when there is an orange-colored light near other objects that are able to reflect or absorb that light, in addition to their spectral reflectance, it can alter the perception of that color.

The last of the three components of color is the detector, which is for humans an interaction between our brain and our eyes. The eyes consist of two sensors that receive and encode the light transmitted by or reflected from the objects. These two sensors, which are located in the retina of the eyes, consist of rods and cones.

Rods do not distinguish color; they only perceive brightness. Under badly lit conditions, which are known as "scotopic vision", our eyes use rods as primary receptors. As a consequence, our eyes are not able to see color under dark conditions.

Cones are our primary receptors under a well-lighted condition which is known as "photopic vision". They are able to perceive color as well as brightness. There are three different forms of cones. They are either red, green or blue sensitive, but they all can also be achromatic which basically means that they have the ability to detect brightness, too. The information that was detected by the eyes will be converted to two channels of chrominance (red-green and blue-yellow) and one channel of luminance (achromatic). This form of perception of color is recreated in video systems.

Since our eyes have about 130 million rods, but only 7 millions cones, we are far more sensitive to luminance than to variations in saturation and hue. (Hullfish & Fowler, 2009, p. 237-242)

2.2 Color Theory

As a colorist, it is always important to consider how the perception of color can change the way we feel and think about images. The editor Steve Hullfish in his book "Color Correction for Video" divided perception into three categories: Color dynamics, cultural adaptation and viewing environment.

The color dynamics refers to the way colors can make us feel. It can excite, depress and calm us. Red color can even make our blood pressure rise, because it conveys risk taking and danger. On the other hand, blue and green inclines to calm us.

In addition to our feelings, colors can also influence our perception of depth. Cool colors such as blue appear to be further away, while warmer colors such as orange seem to be closer.

Figure 3 The appearance of warm and cold colors (Hill, 2016)

The cultural meaning of colors can also have an impact on images. The emotions corresponding to specific colors, might vary throughout different cultures. The cinematographer David Mullen already experienced those cultures differences for a shoot in Sweden, 'Directors from northern Europe feel that cold colors are pleasant and relaxing and warm colors are aggressive and disturbing. So not everyone associates sunlight with happiness and overcast with sadness." (Hullfish & Fowler, 2009, p. 246)

Another important component that influences the appearance of colors is the viewing environment. The colorist has to consider a few things when equipping a grading suite which will be discuss later on in chapter 2.4. However, it is certain that the audience will not always view the finished program under ideal conditions. (Hullfish & Fowler, 2009, p. 243-248)

2.3   Color Space

Generally speaking, a color space is a description of color, usually in mathematical terms, whereas a color gamut is the actual color or variation of color contained in that space.

In the field of video color correction sRGB, Rec. 709, DCI-P3 and Rec. 2020 are industry standards.

sRGB has basically the same gamut as Rec. 709, but it is created for CRT computer monitors.

Rec. 709 is the international standard video color space for HDTV. For broadcast it is defined in 8-bit depth whereas in postproduction 10-bit systems are common, although the source media from camera is typically a wider gamut than Rec. 709 and has therefore a higher color bit depth.
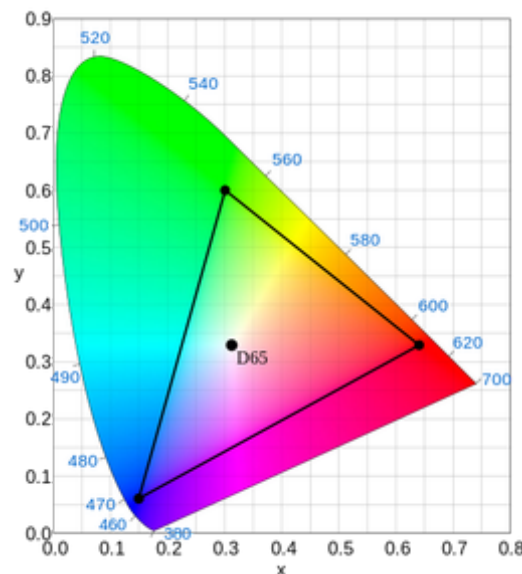

Figure 4 The Rec.709 color gamut (Yurek, 2014)

The Society of Motion Picture and Television Engineers (SMTP) introduced DCI-P3 for digital cinema projection in 2010. DCI-P3 is designed to match the full gamut of color motion picture film and is mostly used in movie theaters. Only a few

monitors are able to show the full DCI gamut. Therefore, it is not usable as a consumer standard.
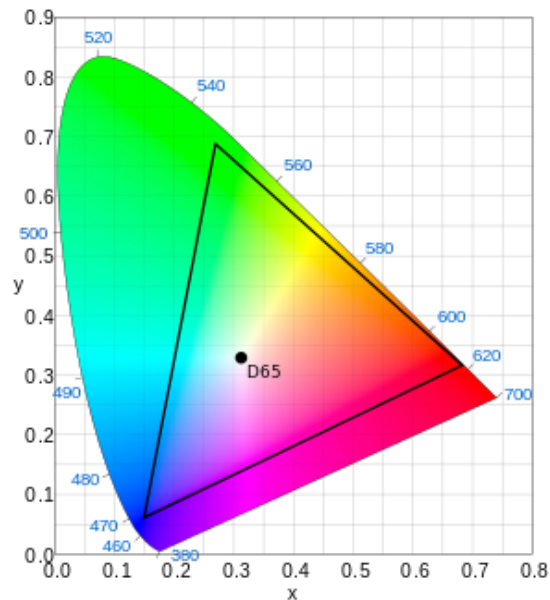

Figure 5 The DCI-P3 color gamut (My God,2014)

Rec. 2020 was introduced in 2012 and sets the standards for UHDTV. The color gamut covers a large percentage of the XYZ color space and defines 10-bit or 12-bit color depth. Unfortunately, current monitors are not able to display 100% of Rec. 2020 because they do not show the full amount of color and images might be clipping. Therefore, Rec. 2020 is not a common color space in post production yet. (Yurek, 2014)
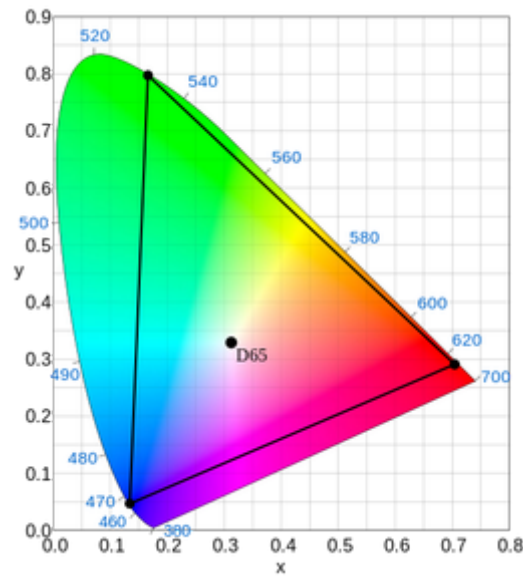
Figure 6 The Rec. 2020 color gamut (Yurek, 2014)

2.4 Working Environment

As has been mentioned previously, the environment contributes to the way how we perceive colors. Therefore, the colorist has to acquire the right workspace.

In order to cut down reflection of lights, the suite should be completely neutral gray by either painting the walls or covering them with gray curtains. If the suite is painted yellow for example, after some time the pictures would appear yellow as well because of the reflections of the wall. Our surroundings have a great impact on the perception of our eyes.

In addition, the lighting of the workspace should be daylight balanced, which translates to a color temperature of 6000-6500 K. Ideally, this light is placed behind the monitor as an indirect and dimmed light source. (Hullfish, 2012, p.7-8)

Figure 7 The recommended working environment for a colorist (Kokorosoz, 2017)

Besides a good color correction program, a proper monitor is the most essential tool. For or a professional colorist it is in fact more convenient to have more than one monitor. A second one should display the GUI of the software and a third one usually displays analyzation tools as a support for the grading process. However, one of the monitors is required as a reference monitor. This monitor has to be fully calibratable and be able to display the same color space as your software is working with. When Resolve or Baselight are working in Rec 709 for instance, the monitor has to be able to show this exact color space. (Carman & Inhofer, 2017)

Another important tool for professional colorists is the control surface. The control surface, also known as panels provides a tactile control over the parameters which the software offers. Therefore, the user is able to do the same process in one move, instead of multiple mouse clicks on the GUI. This leads to faster and more productive ways of working. (Carman & Inhofer, 2017)

2.5 Analyzation Tools

As a colorist, the eyes are the most important tool to evaluate images. However, as earlier said, the perception can be influenced easily by factors such as improper monitor calibration, the lighting, the environment and even how much sleep the colorist had the night before. Therefore, the eyes are not always very reliable. This is why all colorists use video scopes to interpret the footage correctly.

Video scopes provide valuable and real data about the video signal. Those tools help to match two different shots in their contrast and color, to create repeatable looks and fix problematic clips. (Carman, 2015)

There are three categories of scopes available. The first one is hardware based. It provides a self-contained scope solution and does not depend on any other gear

including a computer. The representation of the video signal on the monitor of the hardware unit has a much higher resolution. The downside is that it is extremely expensive.

In addition, there is the hybrid model which displays the scopes on a computer monitor instead of showing the signal directly on the unit. The setup of the hybrid scopes has the advantage that it is usually rack-mountable and quite small, but it is also expensive in comparison to the software scopes.

Software scopes are the last category of scopes and probably the most common. Every color application and editing software package has those scopes built in. The obvious positive aspect of them is that they come with the applications. However, there are a few issues with them. First of all, it is important to consider that most external scopes and hybrids offer a broader range of settings that can be controlled, while a lot of software scopes cannot be changed in their settings, because they are set to a default configuration. Furthermore, the resolution is not comparable to the hardware based scopes and their ability to display customized views is limited. Finally, it can increase the power of the computer in order to use it for the real purpose by turning off the built-in scopes and using the external scopes. (Hullfish & Fowler, 2009, p.52-55)

2.5.1   Waveform

One of the analyzing tools is the waveform monitor. It shows the tonal range from black to white, or from dark to light. The actual image is displayed from left to right. Therefore, the contrast and the exposure can be evaluated easily.
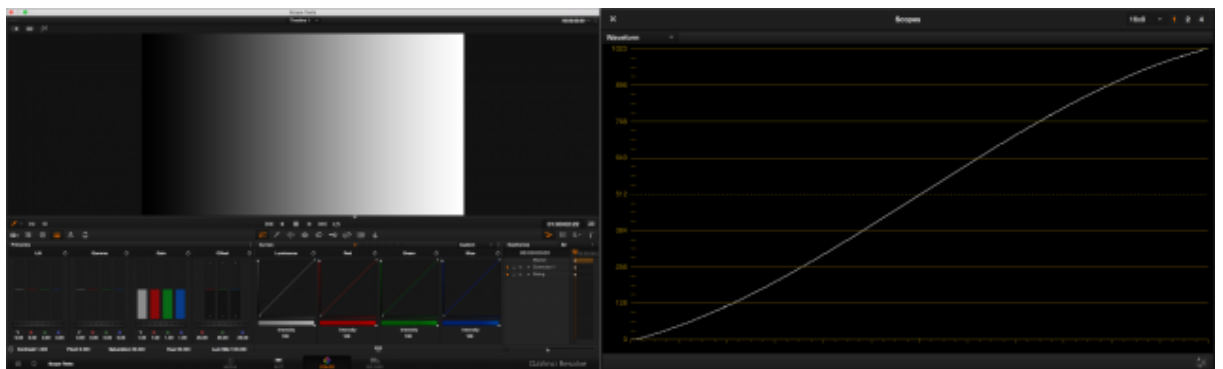

Figure 8 The range from black to white displayed in the waveform (Lackey, 2015)

As an example fig. 8 shows Resolve's waveform monitor with its 10-bit scale going from absolute black (=zero) to absolute white (=1023). Other possible scales go from zero to 100 or 700 millivolts, though there is no practical difference when working with those. (Carman, 2015)

The waveform also allows to see that the luminance and the setup levels are broadcast-safe. For PAL, the black level should not be above 0 IRE and for the white level the legal range is limited at 100 IRE. (Hullfish & Fowler, 2009, p. 56)
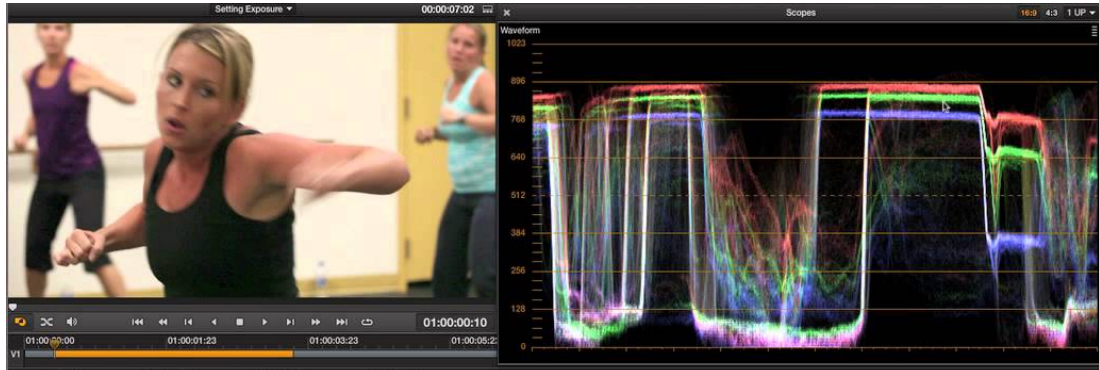

Figure 9 The waveform screen the luminance and the RGB channels (Riddle, 2012)

In some applications, the waveform monitor has also the ability to display besides the luminance mode also the RGB channels as well, which could be one way to evaluate the color balance or to set the separate colors brightness level. However, the RGB parade which will be discussed in chapter … has a similar task. (Carman, 2015)

2.5.2 Vectorscope

The vectorscope is the principal tool that is used to measure the overall saturation and hue in an image. In contrastto the waveform monitor, the vectorscope does not mimic the actual picture from left to right, but instead displays what colors are included in the shot. It helps to eliminate unwanted color casts and to keep the colors within the legal range of broadcast standards. (Hullfish & Fowler, 2009, p. 83)
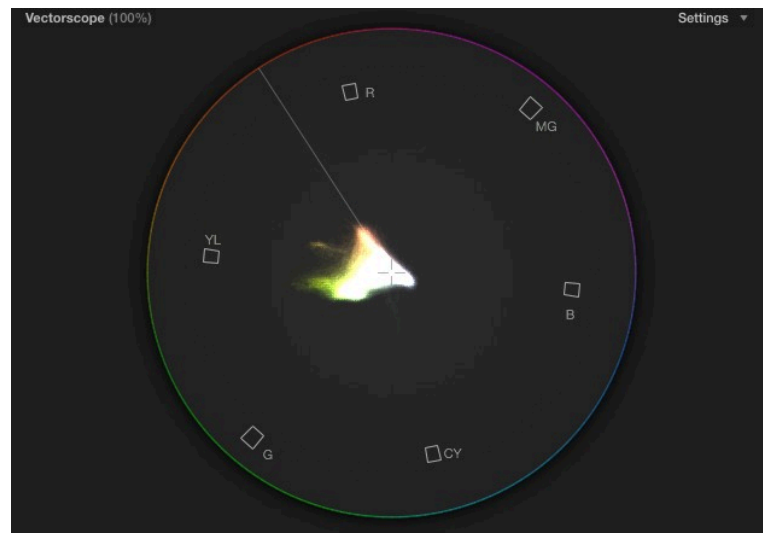
Figure 10 The vectorscope (Van Hurkman, 2013)

The angle or the circle of the vectorscope represents hue that is seen in the shot. The squares in it are the actual colors which are red, magenta, blue, cyan, green and yellow. Most vectorscopes have the option to show a line between yellow and red which represents the skin tone. However, it is not obligatory to use it, it is simply a guide. White or no color will be shown by the middle of the scope.

Figure 11 The vectorscope representing all primary and scondary colors (Carman, 2015)

In figure 11 the color bars, containing all primary and secondary colors, are used as an example to show how all the information is displayed on the scope.

Besides hue, the role of the vectorscope is also to measure saturation in a shot. Saturation is shown as the distance between the center of the scope and the outeredge. If the saturation isbe increased, the trace gets further out toward edge. Although, if it will be decreased, the color information comes into the center. (Carman, 2015)
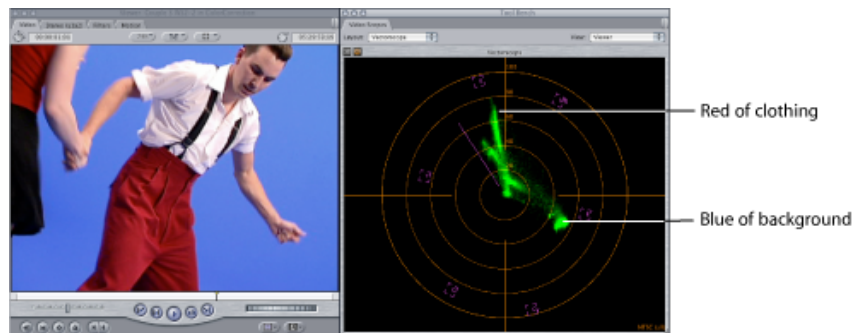
Figure 12 The vectorscope measuring the saturation (Apple, 2009)

2.5.3 RGB-Parade

The RGB parade has basically the same function as the waveform monitor. However, in opposite to the waveform monitor, it breaks the signal down into the red, green and blue channels. Generally speaking, with the RGB-Parade colorists are also able to evaluate contrast and expose, but mostly they just use it for balancing the colors.
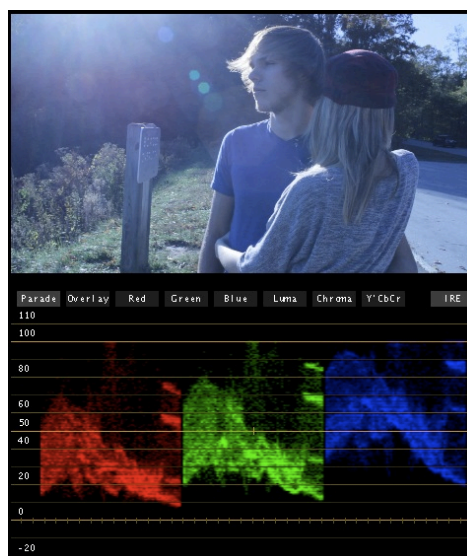

Figure 13 The RGB-Parade (Williams, 2010)

The vectorscope also display when there is a lot of blue in a shot, but in contrast to the RGB-Parade it is not able to tell for example that a blue color cast is happening in the highlights. This feature makes the RGB-Parade such a valuable tool for a lot of colorists. (Carman, 2015)

2.6 Recording Formats

Recording formats can influence the result of the color grading a lot. The decision of using a certain format usually depends on the budget, workflow and the timetable of the productions.

Raw and Log is usually used in high-end production, while Quicktime, MPX and others are great alternatives for film production, that do not have a very high budget. Semiprofessional and amateur cameras like a DSLR only offer the H.264 format, which is a strongly compressed codec. In addition to that, the codec does not leave a lot of room for a good color grading.

2.6.1 Raw and Log

Cameras like the Arri Alexa, Red Epic and the Blackmagic Designs Cinema Camera has offered new possibilities in capturing videos which is nowadays standard in the high-end production. Those recording formats are called Raw and Log. (Taboada, 2012)

Those formats create a flat profile of the footage which allows the capturing of details that would be lost when recording in Rec 709 profile. https://guerillafilmsoldier.files.wordpress.com/2016/09/the-filmmakers-handbook.pdf

Raw and Log are both designed to get the most information out of the sensor, but work in completely different ways.

Raw data has no video processing included. The format basically just captures the meta data of the video and when it will be viewed, the information has to be converted into a video file. (Ascher & Pincus, 2013)

In opposite to Raw, Log is a video. The idea of Log is that a mapped "Log" gamma curve which has to be designed for each camera pulls the most information off of the sensors. It is a special way to capture the maximum tonal range of a sensor.

Both formats create a very low contrasted and desaturated image. Therefore, Log and Raw footage has to be corrected while formats as QuickTime and MPX do not have to be necessarily graded.

2.6.2 Quicktime, MPX and others

In the semi-professional, as well as, in the amateur field recording formats such as Quicktime, MPEG-4, MPX, AVI and so on are mostly used, due to its compression and therefore its reduction of the file size. Furthermore, most semi-professional and amateur cameras do not have any other alternatives to highly compressed recording formats.

The great disadvantage is that it causes often a great loss of the video quality and therefore less possibilities in the grading process. (Cassidy, 2012)

Generally, the quality of the image is defined by its resolution, bit rate, color depth and color subsampling. The higher the resolution, bit rate, color depth and/or subsampling, the better the quality and the more possibilities a colorist has. However, with this advantage is a higher size of video files related which can cause problems if the colorist or editor does not have the proper equipment in the post production available. (The Videomode, 2015)

3 Software packages

On the market, there are various software packages like DaVinci Resolve, Autodesk Lustre, Assimilate Scratch, Adobe Speedgrade or Filmlight's Baselight available. However, in this paper I am going to focus on DaVinci Resolve and Filmlight's Baselight. Before the workflow of those to software packages will be compared, I am going to give a short summary about their development and key features.

3.1 Filmlight's Baselight

The company Filmlight was founded in 2002 in London. Filmlight first introduced Northlight which was a film scanner, followed by the color grading system Baselight and the color management system Truelight. Due to its Baselight good performance and weak competition back in 2000s, it became the most used color grading system in the high-end post-production companies around the world. Today it lost a lot of its market share, because of its competitors. Nevertheless, it still has a very high usage rate. Besides Baselight, Truelight is also a well-known product introduces by Filmlight. The software takes care of the calibration of the system and is also often used as a stand-alone in combination of other color grading systems.

Filmlight offers different versions of Baselight. It is as Plug-in for Avid, Final Cut and Nuke available. In addition, it will be sold as a hardware as either Baselight ONE, Baselight TWO or Baselight X. All these versions have the same features. What distinguishes them are the storage, GPUs and consequently their price.

3.2 DaVinci Resolve

DaVinci color correctors have been an important system since 1984. However, the digital intermediate system Resolve itself was first introduced in 2009. In some aspects Resolve was revolutionary on the market. It was and still is the first node-based system in the field of color correction. All the other software packages are layer-based. In addition, DaVinci offered Resolve for about 1.000 dollar, but still had pretty much the same feature as their 90.000 dollar system. However, DaVinci's cheap versions had the beginning some major problems, but some updates it all was fixed. The 90.000 dollar system, which was a Linux system, is barely anymore available anymore by now, due to its poor sales.

Later on Blackmagic introduced the Resolve-Free-Version. At first, the features were limited, for instance there was only one node to work with available. Today, almost all of the feature are available. Just a few are only accessible in the studio version. (Brückl, 2013)

4 General Workflow

After looking into detail of the workflows of various colorists such as Patrick Inhofer and Robbie Carman, I summed up the most important steps in the process of color correction. However, this description of a general workflow does obviously not apply to every colorist. These are merely impressions I gathered in the course of my research.

4.1 Importing

The first step in the process of a color correction is to import the data in to the software. Usually the files can be either imported as individual clips, as an entire video, as XML, AAF or EDL.

When importing an entire video, the individual clips have to be separated later on in the process, in order to grade them correctly.

XML and AAF are often used for roundtrips from or to non-linear editing systems such as Avid Media Composer, Adobe Premiere or Final Cut Pro.

4.2 Preparing the timeline

4.2.1 Simplify

When the files will be important as an XML or AAF, we receive the timeline the editor worked on before. In the process of editing the user might layers the footage to have alternative clips. For the process of color correction, those alternatives usually will not be needed. As a colorist, time is important, therefore only the necessary and visible clips should be graded. This means the editors timeline has to be cleaned up and simplified into one video track except a second one is used for a split screen or wipes.

4.2.2 Reference Video

In the process of importing the editor's timeline, it might could happen that some frames slipped a little or some effects such as flipped clip or a scale in did not import correctly. This is way a colorist should demand a reference video with the XML or AFF file. Before starting the color correction, a colorist should always compare the imported timeline with reference video.

4.3 Color Correction

The next step is the grading and correction process of the individual clips. The workflow of the color correction is separated in two steps which are called primary and secondary color correction.

4.3.1 Primary Color Correction

When talking about primary correction, the correction always effects the entire image. Before correcting and grading small details of an image, it is more important to decide what is fundamentally wrong or right with it and adjust it to set the foundation for further corrections.

Regardless of the style, look, genre, or format, the first step is always to neutralize the footage. Neutralizing an image includes the adjustment of the brightness or luminance level of the image. Then it comes the correction of the hue and saturation. Hue refers to the color red, yellow, green, cyan, blue and magenta. Saturation is the colorfulness of a picture.

The primary correction can mainly be done by the three-way-color wheels, RGB mixer and the curves. However, the curves are also often used for secondary corrections.

What always has to be considered is, that there is not one right tool for a certain job. They all have a slightly different impact on an image and there are various ways to achieve the wanted look.

4.3.1.1 Three-way-color wheels

Generally, color wheels affect the image in brightness or in color. It is separate in the wheels of lift, gamma, gain and might also offset.

The offset adjusts the entire image, while lift, gamma and gain affect a certain range more than the others.

Lift changes the dark pixel in an image the most, while gain does the opposite and has the most influence on white or bright pixels. Therefore, gamma is mostly responsible for the changes in the mid-tones.

Figure 14 The wheel controls for primary corrections (Brown, 2016)

4.3.1.2 RGB-Mixer

The RGB-Mixer has the most impact on the hue and saturation. Generally, it has a red, green and blue output.

Besides white-balancing which can be easily done with the RBG-Mixer, it can fix a broken channel. With the help of adjustment on the RGB-Mixer, it is possible to reconstruct each channel newly.

4.3.1.3 Curve tool

The curve tool has an interface of two dots on either end of a graph. The lower one on the left side is pure black and the other on on the upper right-hand corner is pure white. With the help of the curves, the RGB channels can also be modified. However, the color processing can be different in every color grading software package.

Figure 15 The curve tools (Film-Tv-Video, 2013)

4.3.2 Secondary Color Correction

Whereas primary color correction affects the entire image, secondary color correction is limited to a specific region or specific color vector of the raster. As the tools have become more nonlinear, the boundaries between what is primary and what secondary are beginning to blur.

With secondary color correction tools, a red car could basically graded into blue one. However, the main target for serious colorists for secondary color corrections are natural corrections such as skin tones, sky, water and grass. It is often used to repair the things that the colorist "broke" in the primary corrections. This can be the case, when the colorist warms up the entire image which can cause the skin tone turn too orange.

Besides fixing things, secondaries are also often used to make a subject of a shot stand out, so the viewer's attention focus on the important part of the image.

Typical ways to do secondary correction are to isolate a color vector or to use spot corrections.

4.3.2.1 Color Vector Isolation

In opposite to vignettes and spot corrections, camera movements and things crossing the foreground is no problem. The color vector isolation stays with those pixel that where corrected as long as they stay relatively the same color.

Each system has slightly different ways how to do the color vector isolation. One tool to isolate color vectors can be different curves such as the Hue vs. Hue, Hue vs Saturation, Luminance vs Saturation and so on. Another way could be the eyedropper and certain modifier keys.

4.3.2.2 Spot corrections

Spot corrections are used to solve an issue that exists in a specific area of the image. This can be done with shapes. Usually color grading applications offers standard shapes such as squares and circles. Since the usage of squares and circles is obviously limited when trying to isolate a specific portion, many file-based systems allow the user to hand-draw shapes to define these geographic areas on the screen.

With the defined shape, the user is able to correct the specific area of the picture without affecting the part outside the shape. Besides correcting the inside of the figure, it is also possible to switch the grading area from the inside to the outside. (Inhofer, 2016)
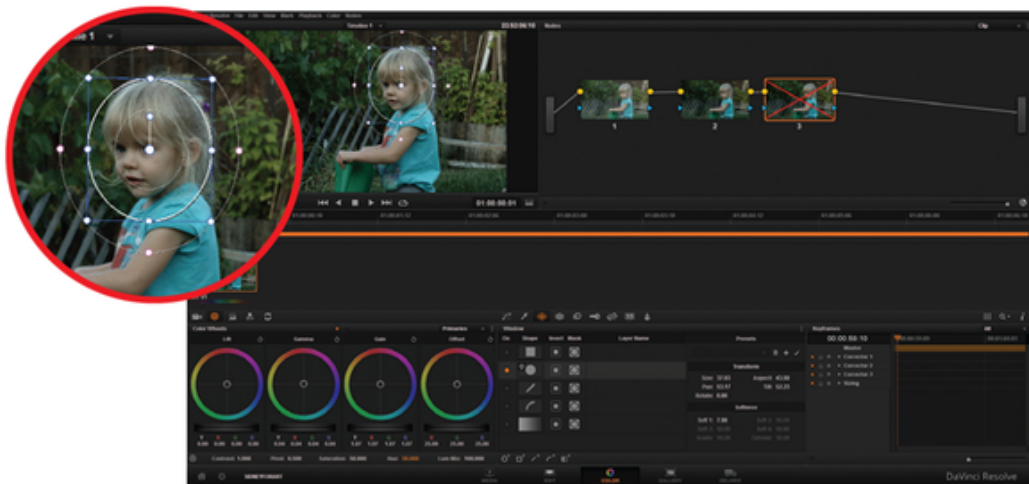
Figure 16 Spot correction by using a power window in Resolve (Gates, 2014)

The vignette is probably one of the most used spot corrections. It is basically an oval that is drawn from edge to edge and top to bottom. The vignette is mainly used to focus the viewer's attention in the middle of the screen or is a way to salvage flat areas of a shot. (Hullfish, 2012, p.159-169)
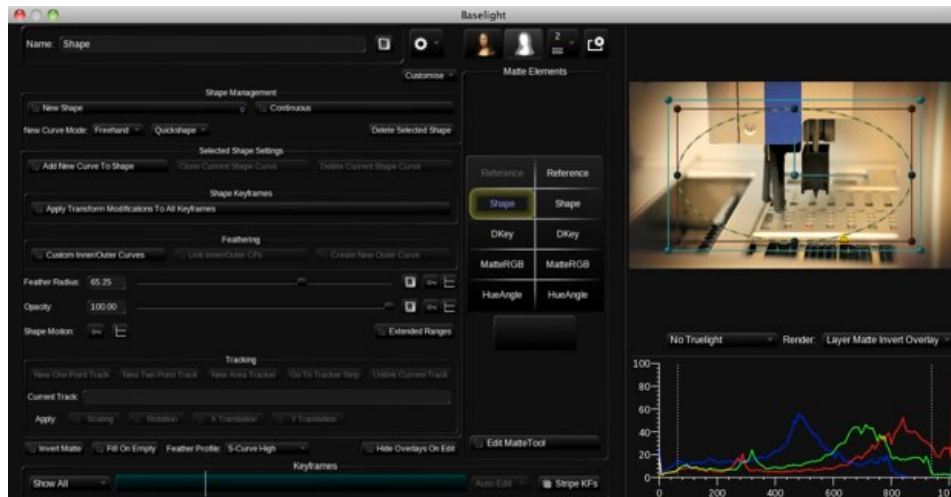
Figure 17 The vignette tool in Baselight (Simmons, 2012)

4.4 Matching Shots

After normalizing the images in the primary correction and fixing problems in the secondary, it is important that the images match each other.

The first step is the adaption of the luminance and the contrast, followed by the hue and saturations especially when it comes to the blacks and shadows in the image.

However, probably the most important part of matching the images is the skin tones. While in some videos the skin tone might appear a little red because of the sun, in others it might be a pale. Therefore, it is important to adapt it properly.

4.5 Export

After finishing the entire grading process, it comes to the step of exporting. It can be either exported as individual clips, as entire video which is basically the timeline, as XML, AFF or EDL which can be imported to the non-linear video system again.

The export settings always depend on the format the footage has or rather on the result the client demands.

4.6 Archive

As a professional colorist, it is recommended to archive finished project, in case the client requires it again after months.

Some digital intermediate systems might already have a feature to manage the storage of the project properly. (Inhofer, 2016)

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5 Comparison of the workflows

5.1 Planning

In order to achieve a fair comparison, project guidelines have to be established. On one hand these guidelines include a list of tasks and alterations to ensure reproducibility between both platforms.

Because if its high costs, Baselight 4.4 is unfortunately not available for the comparison process. Therefore, I will use Filmlights Daylight which Filmlight provides for the purpose of grading dailies. The interface of Baselight and Daylight are basically, besides some missing features. Daylight is meant to build final, renderable timelines. It is intended to do one shot at a time which is dailies work. Therefore, Filmlight has a clear disadvantage, since DaVinci's Resolve 12 is fully equipped as a color grading system. However, the disadvantage of Daylight will be considered in the hands-on approach and only the basic tasks will be done. In the comparison, the manual of Baselight that is provided by Filmlight will be included to make a fair conclusion.

On the other hand, the footage that will be used in the comparison has to be determined.

5.1.1 Footage

The footage that will be used is provided by Lynda.com as exercise files. There will be three Apple ProRes 422 clips used that have the resolution of 1920x1080 pixels and the frame rate of 23,976. The bit rate is 10 bit and a color depth of 10 bit which means there is a variation of 1024 colors for each color channel availabe. (The Videomode, 2013)

5.1.2 Tasks

As earlier said, the hands-on workflow is only limited to the very basic tasks, which mainly affects the secondary color grading and round-trip workflow to a non-linear editing software.

These are the basic tasks that are required:

- Importing the footage
- Primary correction
- Secondary correction: Spot Correction
- Secondary correction: Color Vector Isolation

- Exporting the entire timeline and one individual clip
- Archive the project

For the purpose of a reasonable comparison, the grading result should look as equal as possible.

5.2 Process

5.2.1   Protocol: Resolve 12

5.2.1.1 Importing

After starting Resolve the interface of the media page appears.

On the left side on the top, there is a browser structure where I can search for the footage. Before importing the files, I can view the files through the thumbnail or with a double click on it, the footage is displayed in the viewer.
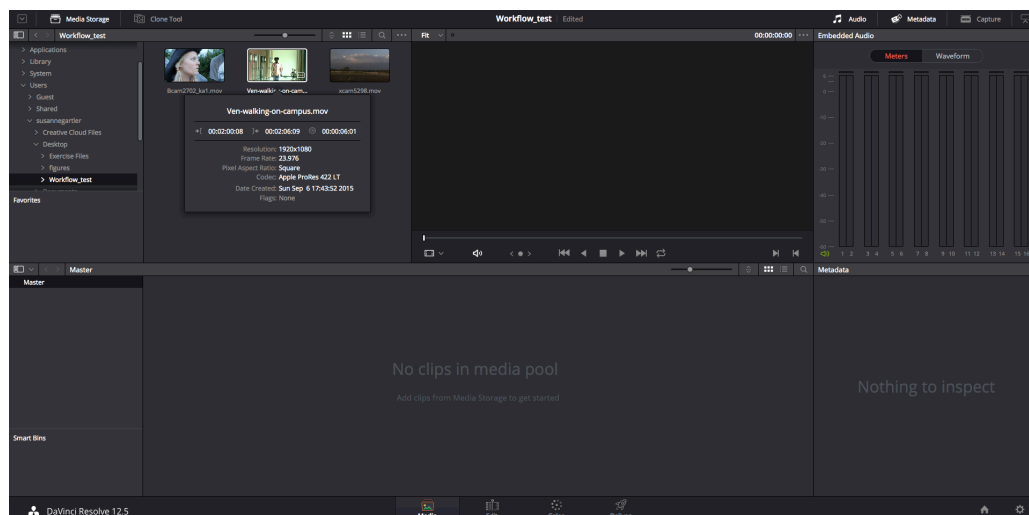
Figure 18 Importing footage in DaVinci Resolve 12

Besides the drag & drop option, the selected footage can also be importing with a right and a click on "Add to media pool". The clips can be individual or by selecting more at once as multi-insert imported.
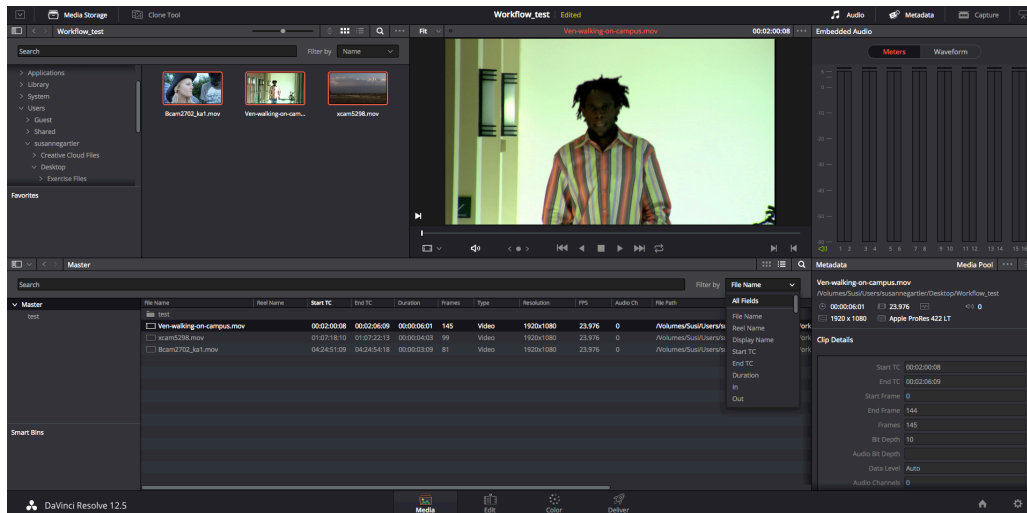
Figure 19 The media page in DaVinci Resolve 12

The media pool which is the box where the imported footage is displayed, offers different previews of the clips. It can be either shown in grid view or list view wheras the list view displayed some of the footage's metadata.

In the media pool as well as the media browser offer the function of sorting and filtering the footage by name, size, time code and so on.

Before I go to the grading interface, a timeline has to be created on the editing page. The clips can be easily placed in the timeline via drag and drop. Resolve also offers to create multiple timelines where the user can switch between them while grading.

5.2.1.2 Grading

Before grading, some setting can be made by clicking on the small wheel at the right corner on the bottom of the interface. Some important setting are located in the color management tab such as the options to make the colors broadcast safe or selecting the right color space.

As I am not using a calibrated monitor for the workflow, I select the color space sRGB for my computer monitor.
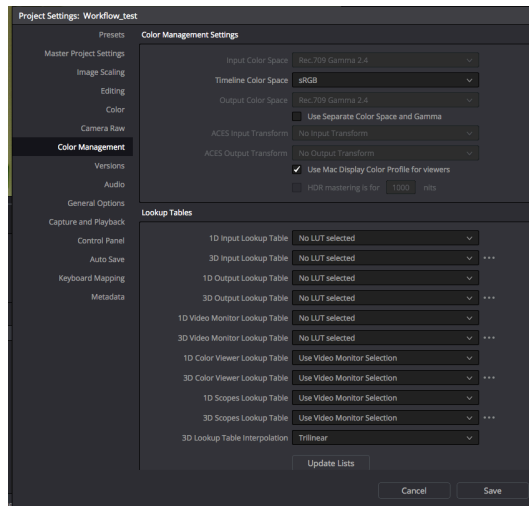
Figure 20 Project setting in DaVinci Resolve 12

The standard grading workspace includes the node tree, the viewer, a gallery where stills can be saved and the thumbnail timeline. In the bottom half of the interface are the tools for color corrections. By clicking on the various icons, there are various controls available. The primary controls tend to be on the left hand side of the interface, while the secondary tools fall on the middle part of it. On the right, there scopes and key frame options.

Certainly, all these setups can be customized or changed into a dual-screen when there is a second monitor available as well.
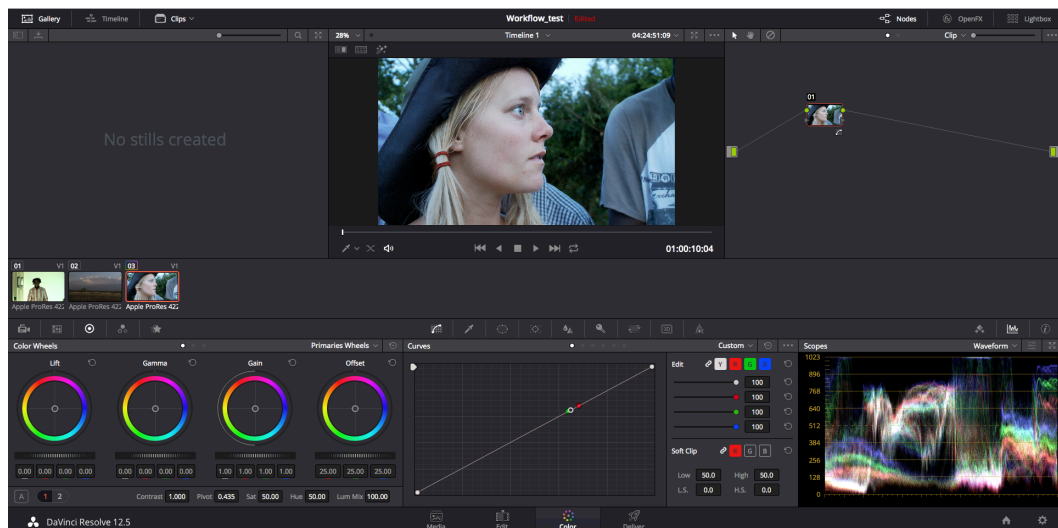
Figure 21 The grading interface in DaVinci Resolve 12

5.2.1.2.1 Primary Correction

The first clip I am grading is a guy walking down the hallway. As the RGB-Parade displays, the image is very green and the face is very dark.

Figure 22 Primary correction in DaVinci Resolve 12

Therefore, I am pushing the lift and gain controls towards magenta to balance the image. Regarding the dark face, I am going to lighten it up with the help of secondary controls later on.
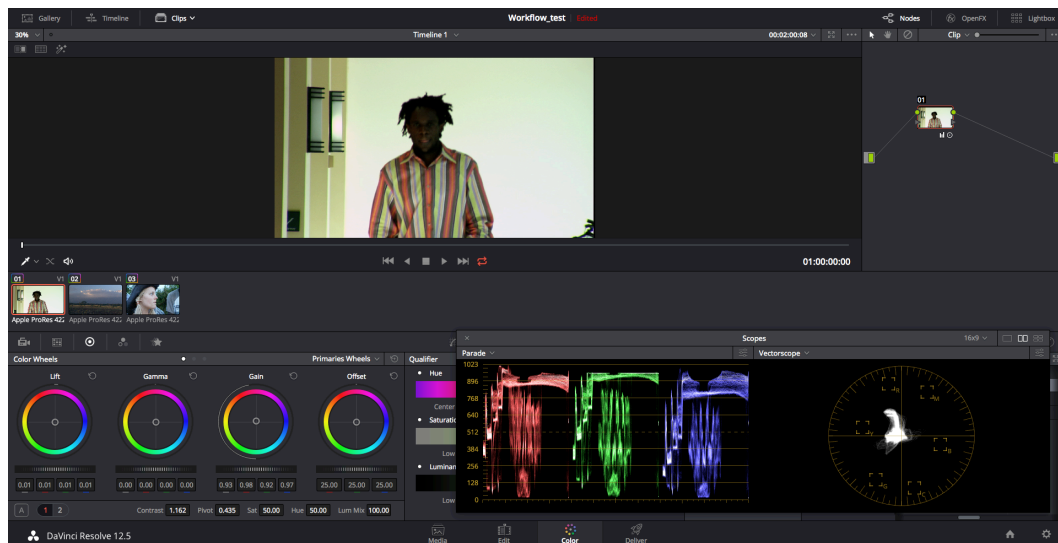
Figure 23 Primary correction in DaVicni Resolve 12

The second clip is a shot of a landscape. Unfortunately, it turned out very flat and dark.

Figure 24 Primary correction in DaVinci Resolve 12

Consequently, I pushed the gain wheel up and the lift wheel down in order to widen the tonal range. In addition, I increase the saturation of the image.

Figure 25 Primary correction in DaVinci Resolve 12

Finally, I am correcting an outdoor shot of a woman. The image is very inbalanced and has a lot of blue in it. For the correction, I use the primary bars. The bars have besides the Red, Blue and Green channel, a luminance channel.
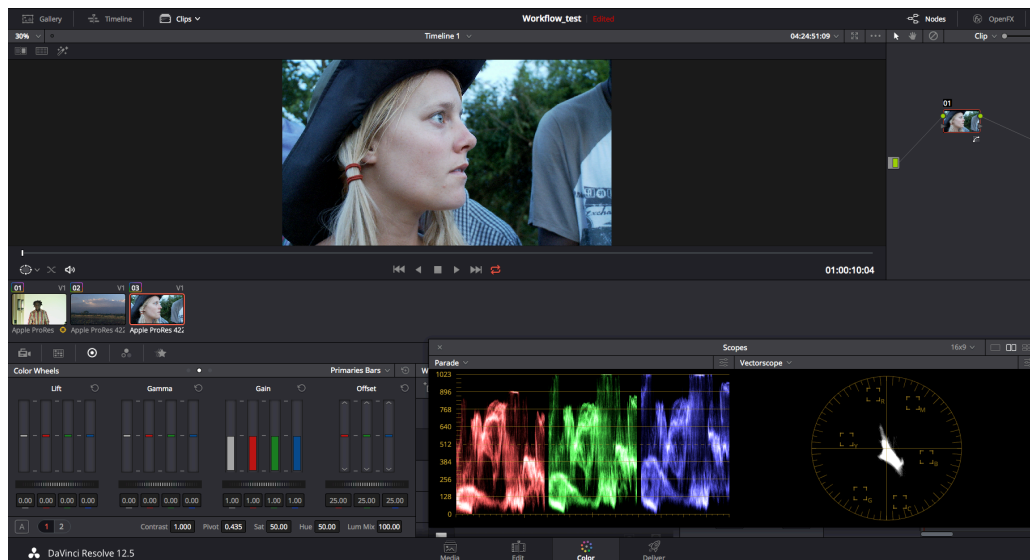
Figure 26 Primary correction in DaVinci Resolve 12

This luminance channel can adjust the shot's brithgness without influencing the saturation of the picture while other luminance control also change the saturation of the image.
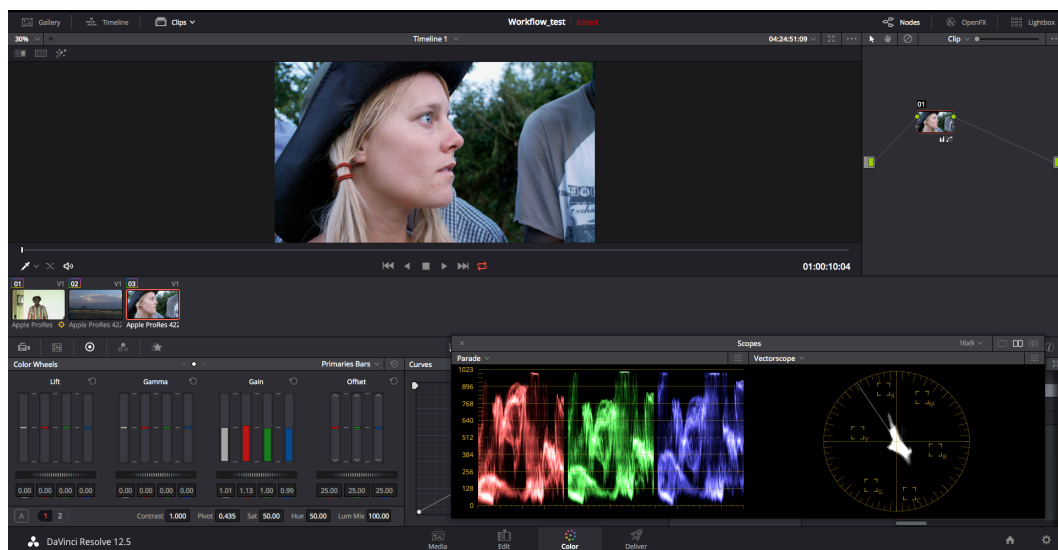
Figure 27 Primary correction in DaVinci Resolve 12

5.2.1.2.2 Secondary Correction

As I mentioned earlier, the guys face is very dark in the first shot. Since this dark spot only affects a certain area, I use the secondary correction to fix it.

The first step when doing any secondary corrections in Resolve is to add a new node to the node tree. To isolate the face, power windows are a good option in Resolve. I select the circled shape and define it to the area that has to be corrected.

Afterwards, I soften the edges of the shape so that the transition of it is not visible. My corrections include an increasement of the lift and gamma controls to brighten up the skin tone a little.
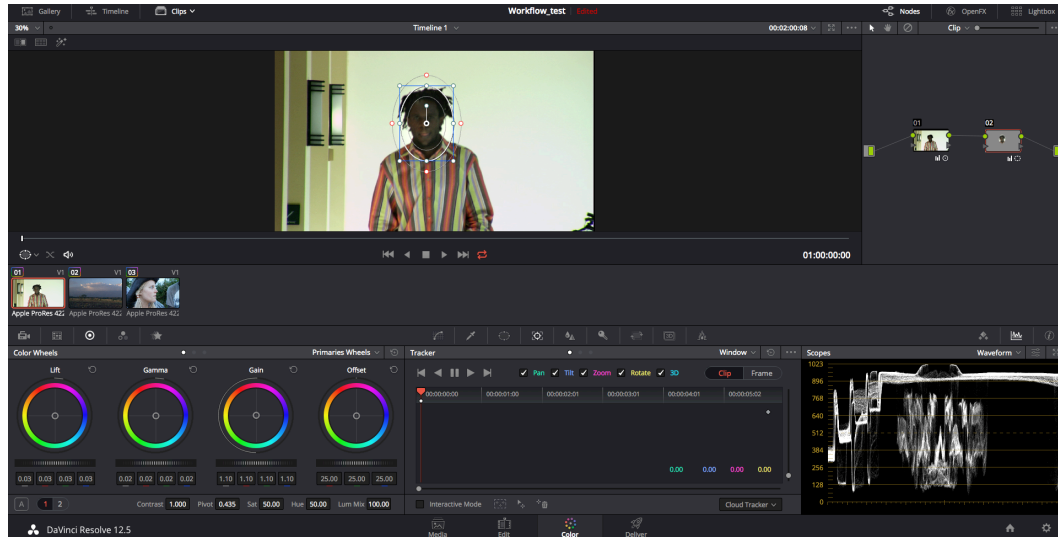
Figure 28 Secondary correction in DaVinci Resolve 12

Since the man in the clip is walking and there is also a camera movement going on, I have to track the power window to the face.
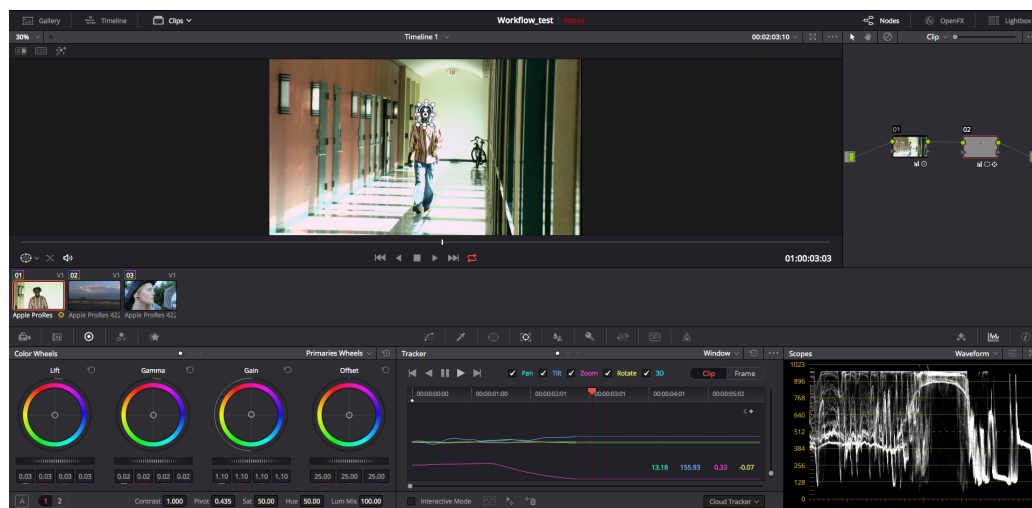
Figure 29 Secondary correction in DaVinci Resolve 12

To brighten the bottom part of the landscape a little more, I use the HSL qualifier.

After adding a new node, I click on the pipette icon. For this shot I only work with the luminance control and restrict the image to dark pixel. In the highlight mode, I can see the pixel, I am affecting. With this tool, I have created a matte and can

brighten the dark part of the image up with the help of the color wheels or primary bars.
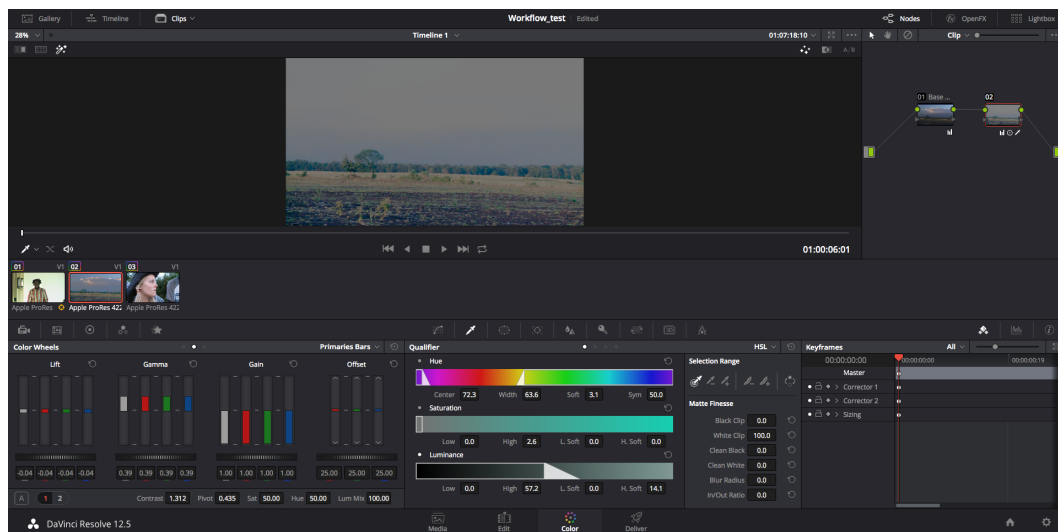
Figure 30 Secondary correction in DaVinci Resolve 12

5.2.1.3 Export and Archive

After the grading process, the video clips have to be exported properly.

On the delivery page, the user has the overview of the thumbnails and the timeline displayed again. Resolve offers multiple options for the export such as a single clip, XML, AFF and EDL. For exporting all three clips seperatly, I choose "Indivdual clips" in the setting and select additional preferences, such as resolution, format, framerate and so on, before adding it to the render queue. Furthermore, I add all the clips together as on video to the queue and click "Start Render". After the rendering is finished, I find all the clips in the location I selected in the settings.
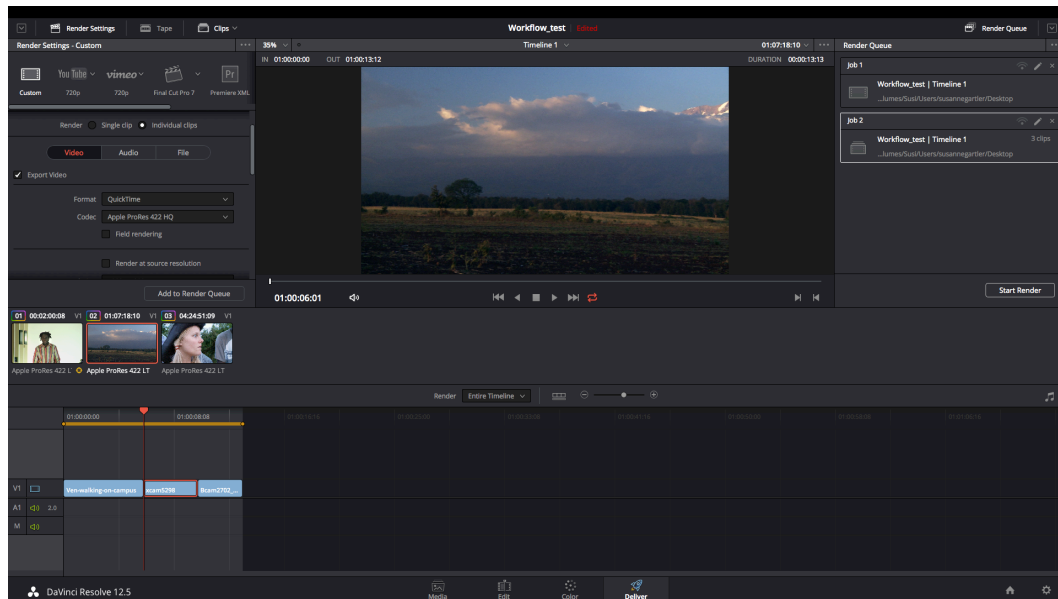
Figure 31 Exporting in DaVinci Resolve 12

To archive the project, I select 'File" and then 'Media Mangement". With this feature, I am able to archive the entire project, timelines or single clips. It has the options of coping, moving or transcoding it, while coping it is properly the safest option. On the bottom of the box of media management, the archived project size is displayed. After entering the destination and selecting to copy only the used files, I can click the start button.
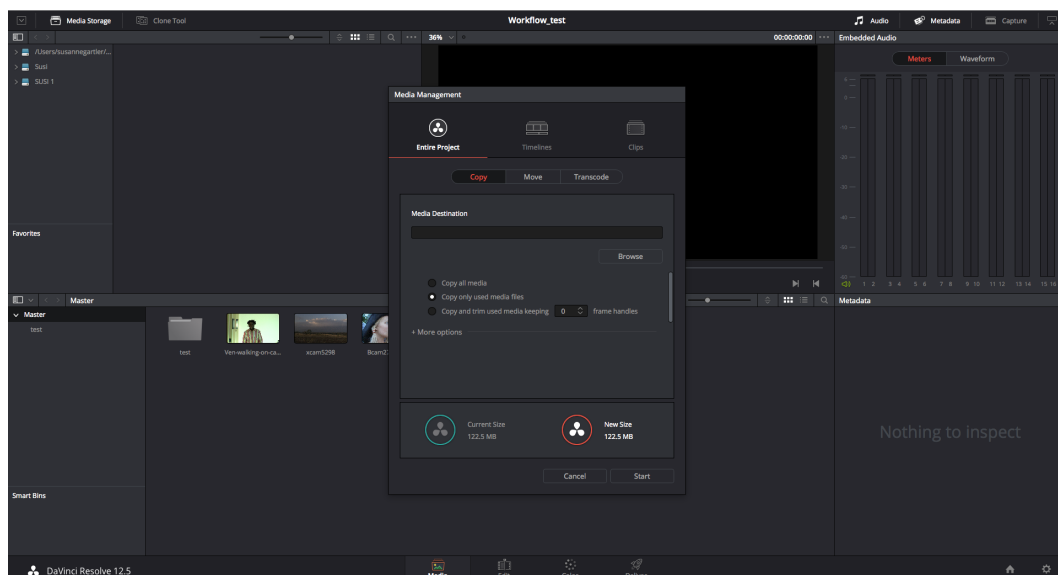
Figure 32 Archiving in DaVinci Resolve 12

5.2.2 Protocol: Daylight for Baselight 4.4

5.2.2.1 Importing

When the Daylight application first opens, the job manager appears as a window on top of the workspace. Here I can create a new „job" which is basically a new project. Typically, it would be named according to the project, but since the workflow is just a test I keep my scene in the preset folder of Daylight named "predaylight_gallery".

Within the folder I create my scene, where I select a scene name as well as the setting of the working format, the frame rate and the color space.
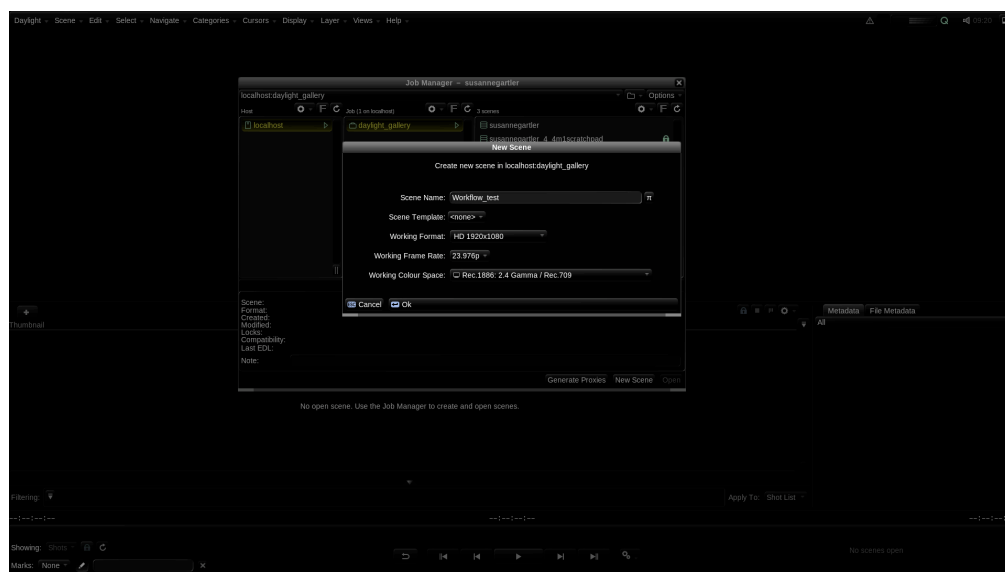
Figure 33 Creating a scene in Daylight 4.4

After I have created the scene, my footage can be imported by opening the sequence browser in the view tab. Here I navigate down to my footage and preview it before importing. When I have selected my footage, I can either import it separatelyor all of itat once by clicking the multi-insert button.
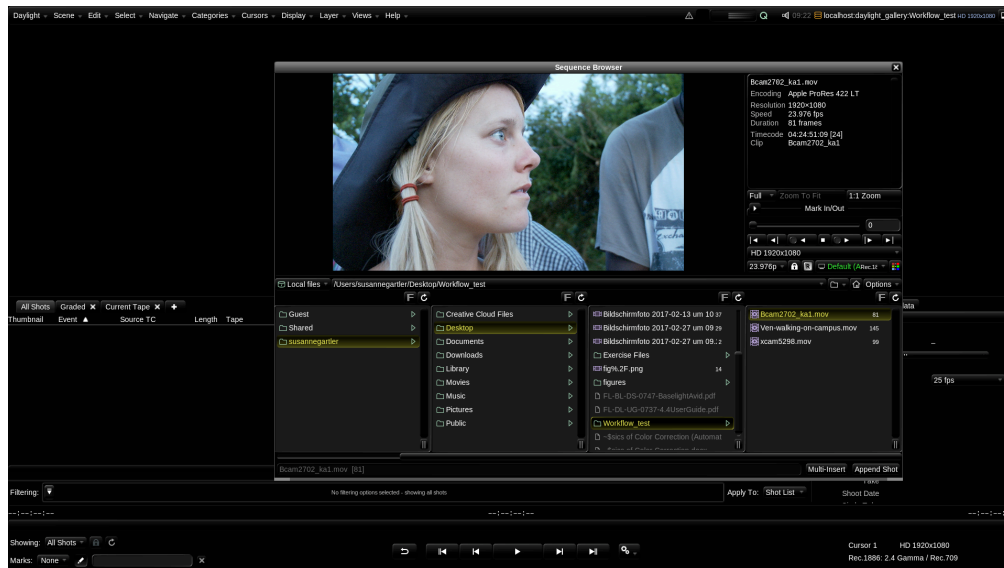
Figure 34 Importing in Daylight 4.4

Once the footage is imported, I have the possibility to see the clips' metadata in detail and to sort or filter it in the player view.
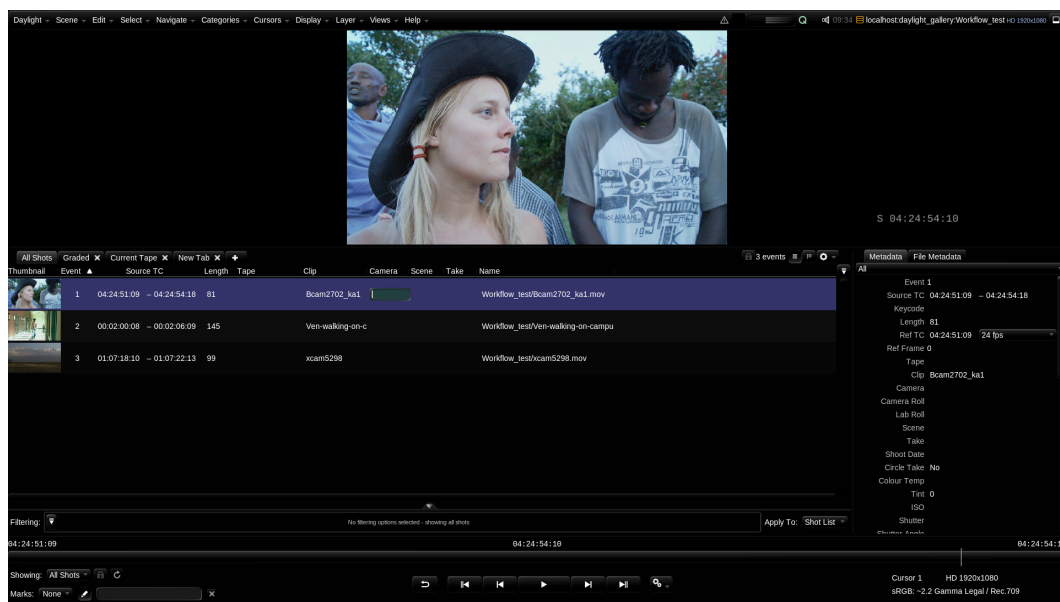
Figure 35 The player interface in Daylight 4.4

5.2.2.2 Grading

To set up the grading interface, I have to click in the tab view and select grading.

The scopes are located on the bottom left of the workspace, while on the right side is the galley, where looks and grades can be saved. The biggest window is called the parameter area. Here I can take care of settings and controls in the current

project sequence. On the right side of it is the layers view which provides a thumbnail presentation of the appearance of each layer. On the right side, there is the image display or viewer and above it are the cursor controls, where I can control what appears in the image display.

Customization can be easily done in Daylight. The windows can be hidden or dragged tothe preferred location. In addition, the adjusted workspace can be saved in Daylight.
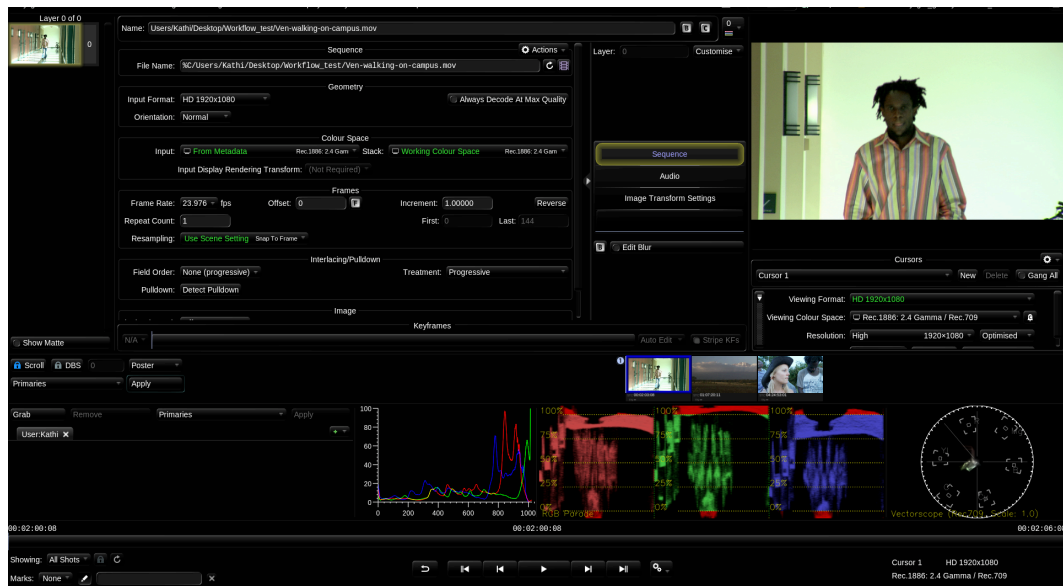
Figure 36 The grading interface in Daylight 4.4

Before grading, the right color space and the legal range have to be set which can be done by clicking on the font on the right bottom corner. As I work with a computer monitor, I choose sRGB in order to see the proper colors of my footage.
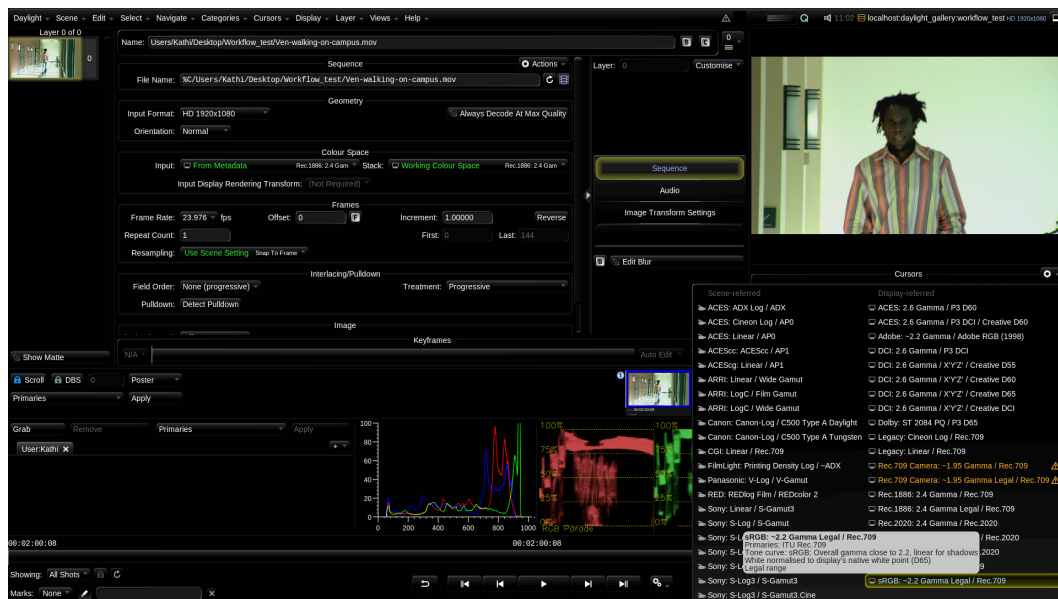
Figure 37 Project setting in Daylight 4.4

In addition, a new layer has to be added by clicking on the plus icon.
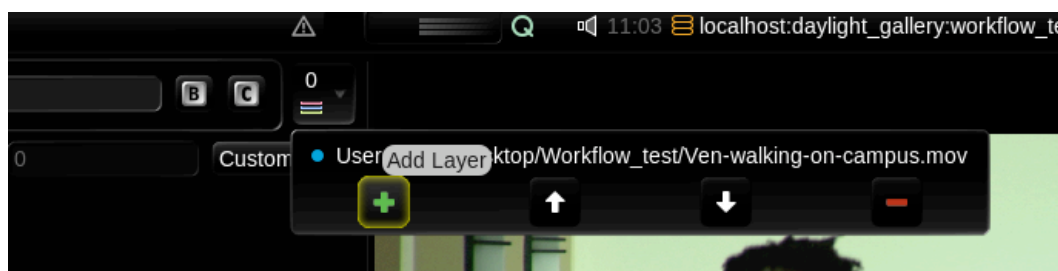
Figure 38 Adding a layer in Baselight 4.4

After adding layers, I am able to access various controls through the stack manager which are the two columns next to the image display. When the color of the fonts in the stack manager is blue, the controls in this view is affecting the output of the shot, while a white one means no impact on the image.

5.2.2.2.1 Primary Correction

As in the Resolve protocol before, the first clip shows a man walking down a hallway. To fix the greenish look of the shot, I balance the RGB-channel with color wheels which are found in the video grade controls.
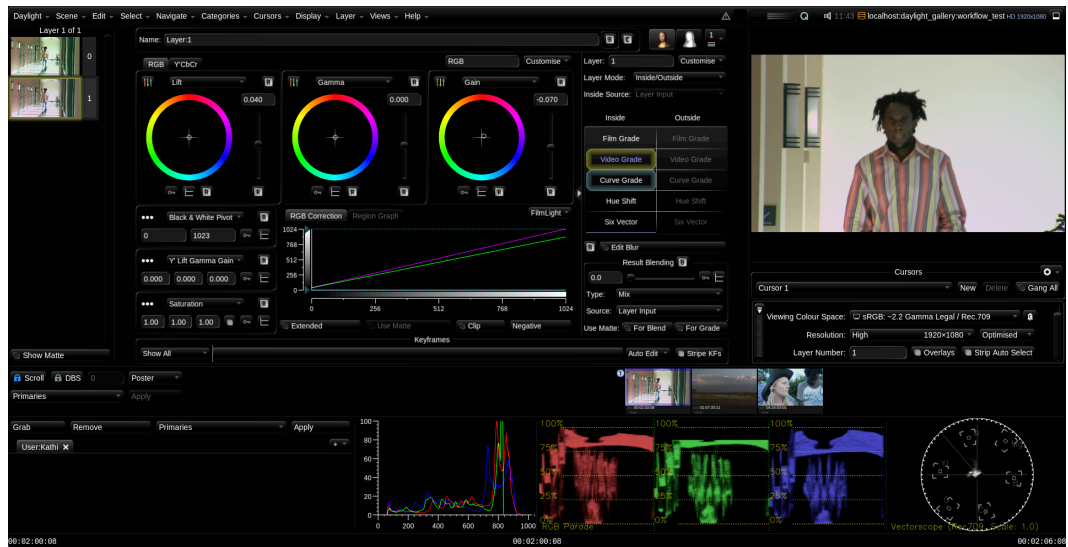
Figure 39 Primary correction in Daylight 4.4

In order to improve the landscape shot, I bring up the gain in the video grade controls and increase the saturation and the contrast which are located in the film grade controls.

Figure 40 Primary correction in Daylight 4.4

Lastly, I balance the blueish image of the woman with the wheels as well. In addition, I brighten it up a little with the help of the curve tool.
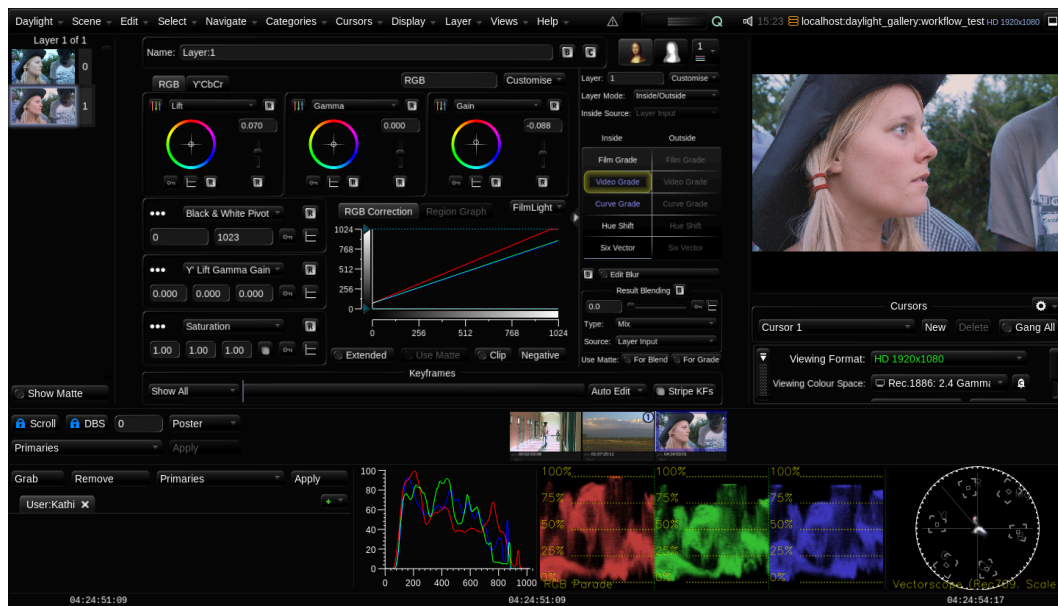
Figure 41 Primary correction in Daylight 4.4

5.2.2.2.2 Secondary Correction

For the first clip, I have to create a shape again in order to brighten up the man's face. Therefore, I press the button S on my keyboard to open the shape management window. Here, I click on the "New Shape" button to create an ellipse. Right afterwards, I click on the image where I intend to be the center of shape.

Via the CMD+O shortcut on the keyboard, the matte overlay view can be turned on which is very helpful when adjusting the feathering radius or softness of the edges.
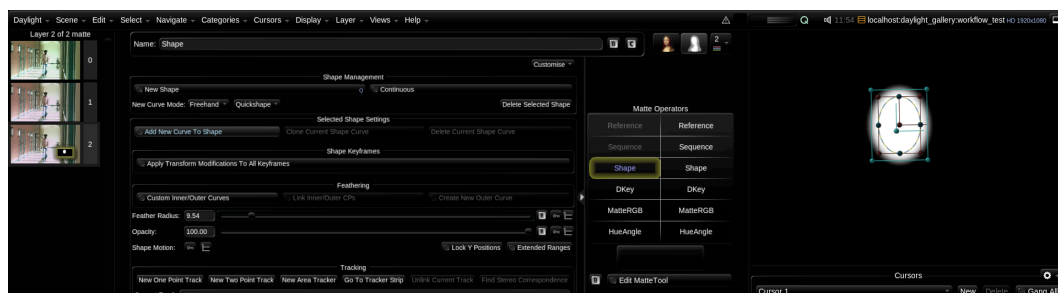
Figure 42 Secondary correction in Daylight 4.4

By pressing O, the overlay view can be turned off again.

Within the shape management window are options for tracking the shape to the man's face. I just select the area window, click "Track forwards" and the shape is connected to the face.
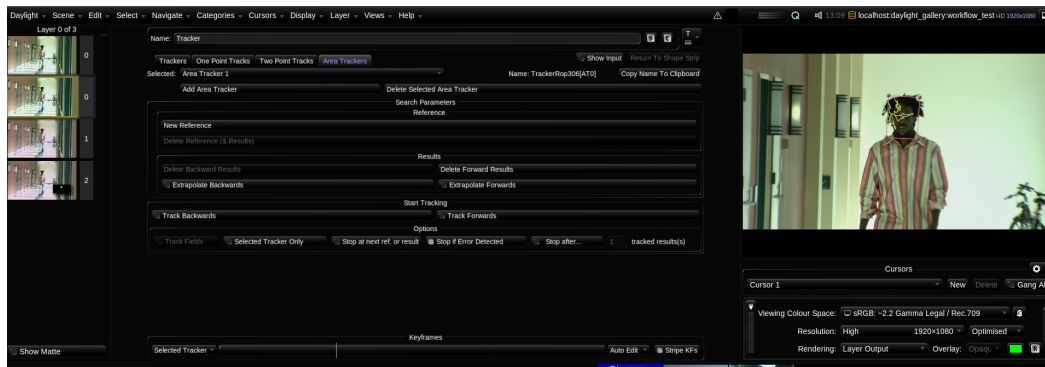
Figure 43 Secondary correction in Daylight 4.4

Finally, I brighten up the inside of the shape by going back to the grading tools with the button S or clicking on the "Monalisa" icon on the top and adjusting the exposure in the film grade tab of the stack manager.

For adding a matte to the clip, the second column labeled "Outside" is also available. Here I could also easily grade the outside of the shape .
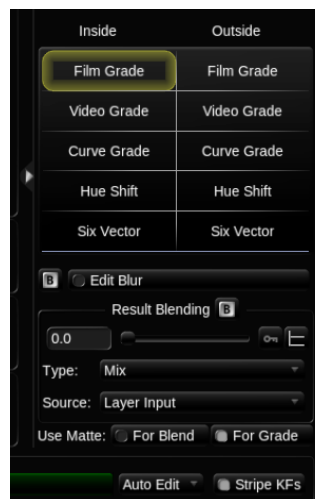

Figure 44 Stack manager in Daylight 4.4

In order to brighten up the bottom part of the landscape, I use Daylight's hue angle tool. To open the window for the feature, I press the button H. Here I can isolate various colors, but for my purposes I only need to limit the pixel of the luminance. After choosing the dark range, I press SHIFT+O in order to see the selected matte.
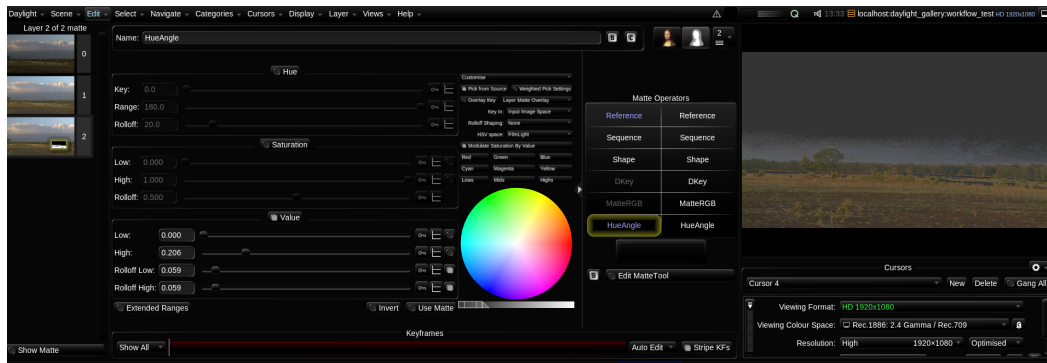
Figure 45 Secondary correction in Daylight 4.4

Back in the grading controls, the brightness can be fixed with the help of the lift, gamma and gain wheels.

5.2.2.2.3 Export and Archiv

By selecting "Render" in the tap view, the render interface opens. The left top side of the workspace is called the render view which contains settings for the output of the video. It offers various presets for Youtube, Avid and so on, or the settings can be entered manually.

The queue monitor which is next to the render view provides a list of the current render status and allows the management of prioritised renders.

For rendering my graded footage, I select the tap "Movies, video and audio" and add all necessary adjustments. In the field "Frames to Render", I select all shots and all frames. However, the filtered tabs that can be made in the player view can be selected too.

By pressing the button "submit render", the entire clip or the individual clips will be added to the queue. Here I just have to select rendering, and after it finishes, the files will be stored in the choosen folder.
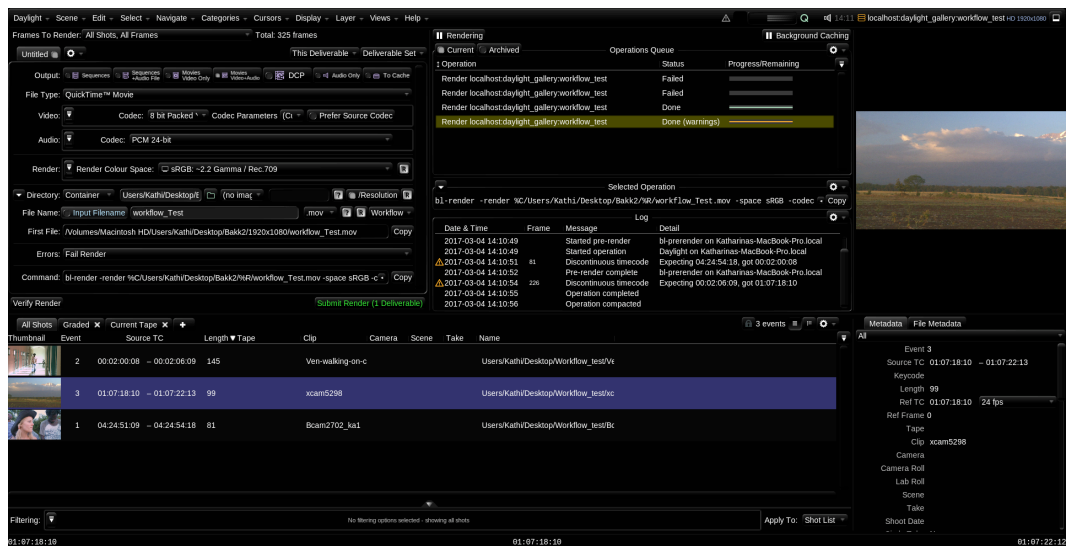
Figure 46 Export interface in Daylight 4.4

For archiving the scene, the job manager has to be opened. Afterwards, I click on the gearwheel on the top left and select "Export Scene" and the location where it will be stored can be defined. Then I select the button "Export" and Daylight creates a "blscene" file.
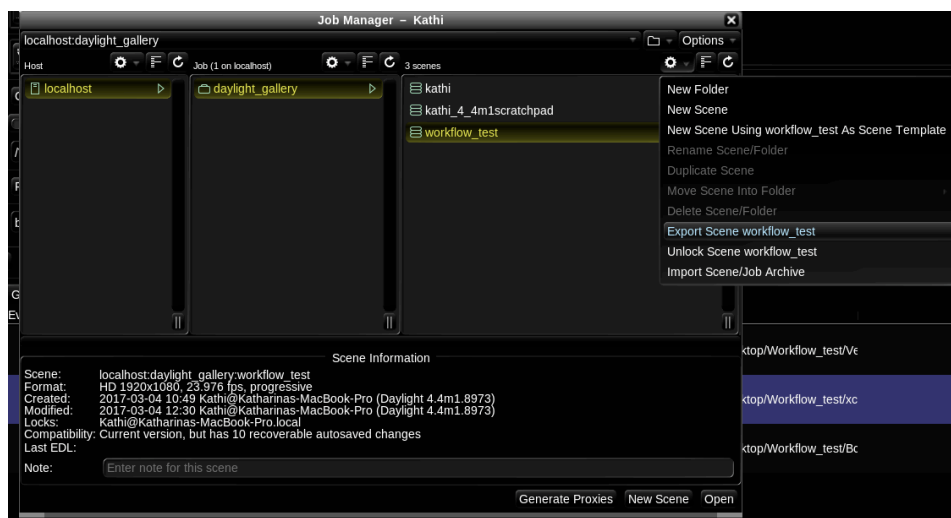

Figure 47 Archiving in Daylight 4.4

5.3 Comparison

5.3.1 Interface

Resolve and Baselight have both a very structured interface. However, it was at first difficult for me to understand the architecture of Baselight. In a lot of softwares such as non-linear editing, compositing or other color grading systems, you can either click on the second tab on the top to import the footage or the import window pops up by itself. In Baselight you have to get to the tab view in order to open the sequence browser which gives you the possibility of importing the footage. Therefore, Baselight is constructed to have a lot of windows only available by opening them in the view tab.

I personally think that the Resolve interface usage is more intuitive than Baselight's. You can find big icons on the bottom of Resolve that easily lead you to every page of the workflow easily.

On the other hand, professional colorists usually prefer their panel or keyboard shortcuts to navigate in the systems. In this regard, Baselight's arrangement is reasonable, because not every window has to be placed in actual workspace.

In addition, Baselight provides more options regarding the adjustment of the workspace. While in Baselight the dragging and resizing is possible with all the elements, Resolve only offers adjustments with limited elements.

5.3.2 Importing

As said before, the importing window is not easy to find in Baselight, while DaVinci offers an extra workspace for the import. Both systems provide good options to preview the material before importing. To import multiple clips seems easier to me in Resolve, since I can just drag the marked clips in the mediapool. In Baselight I have to select "Multi-insert" and search for my footage again.

The filtering and sorting functions work very well in both software packages . However, I found that Baselight provides more options for filtering and also going into more detail by having the possibility to add more metadata to the file.

5.3.3 Grading

Generally, there is not difference in the results of both systems. Resolve as well as Baselight provides various tools that differ only a little. Concerning the secondary tools Baselight offers more features such as various trackers.

In addition, Baselight has the advantage that the user has the possibility to grade after creating a matte both areas inside and outside whereas in Resolve you can only affect either one.

However, the usage of some tools is easier or rather more intuitive to handle in Resolve than in Baselight.

5.3.4 Exporting

Baselight, as well as Resolve provide an extra page for exporting the video clips.

Both systems provide various options for exports such as XML and AFF which can be used for round-trips to non-linear editing softwares. In addition, both offer a lot of presets that can be used for Youtube, Avid or Premiere exports and have a lot of render settings available that can be managed manually. However, Baselight has eventually more setting options such as an option to convert the clip into another color space or selecting what the system should do when it comes to errored frames within a clip.

In addition, Baselight systems support "renderless" workflows. This means that the output of the system is simply in the form of the shot's metadata which involves all image effect and grading data. When using Baselight's "BLG" file type, it is possible to deliver the grading information created in Daylight to Baselight or from Baselight to an edit suite or VFX workstation that has a Baselight plugin installed. The BLG data can be applied in real time to the source footage which provides huge time savings.

5.3.5 Node vs. Layer Based

Within the workflow, I could not recognize any differences between the node and layer-based structure. However, it seems to me that the organization of bigger projects can be handled easier with the node-based workflow. The relationship between the different nodes is clear, which is useful in obtaining a complete overview of the entire project.

Generally, for smaller projects it does not matter if nodes or layers are used, since both deliver the same results. Nevertheless, for bigger and more complex corrections the node-based structure seems to be the better option. (Hedin, 2010)

6 Conclusion

DaVinci Resolve 12 and Filmlight's Baselight 4.4 are both very powerful intermediate systems. However, DaVinci Resolve impressed with its easy and intuitive usage compared to Baselight. Baselight has a lot of its features hidden in different tabs while Resolve provides all the basic features visible on its interface.

Otherwise, Baselight seems to offer more features and in addition to that Filmlight provides forworkflow between several systems. Within Baselight's "renderless" workflow, the graded metadata can be exchanged with other Filmlight's products such as Daylight or the Baselight plugins for Avid and Nuke. This does not only save a lot of time, it also saves plenty of storage.

Nonetheless, determining the optimal software package for a colorist can not be generalized. After researching and talking with colorists about their opinions about Resolve and Baselight, they all agreed in the end in one point, which is that the choice of a system always depends on the type of project and on the personal choice of the colorist.

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