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Designing UI for color correction and grading tools for the web-based program Accurate Video

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Abstract

Color correction and grading are processes when fixing colors in recorded footage in Post-Production. The process of the two mentioned is a mix of technical adjustments and creativity. Color correction adjusts the colors between the clips/scenes so they match and look as natural or unique as possible. Grading is about the process of enhancing the look of a footage to achieve a certain style, it is of a more creative nature.

Today, color correcting and grading are performed using desktop applications. The process means that recorded material is sent to the colorist from the set where it is received and downloaded to the computer where the work is performed. When the processing is considered complete, it is sent back to the recording team. This could be considered time consuming, and this process could be improved by using Accurate Video which is a web based program. Today, there are no features for color correction and grading in Accurate Video.

The aim of this study was to design a User Interface (UI) for color correction and grading tools for Accurate Video application that meet the goals and needs of the people in this field of work, i.e. colorists. Based on literature studies including design guidelines, studies of what existing professional editing programs look like and what Accurate Video looks like, as well as interviews with colorists, a prototype was developed.

Keywords: Codemill, colorist, Post-Production, color correction, color grading, user friendly, design, user interface (UI), user experience (UX), interaction design.

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Chapter 1

Introduction

“Color is life, for a world without colors appears to us as dead. Colors are primordial ideas, children of the aboriginal colorless light and its counterpart, colorless darkness. As flame begets light, so light engenders colors. Colors are the children of light, and light is their mother. Light, that first phenomenon of the world, reveals to us the spirit and living soul of the world through colors.”

— Johannes Itten [1].

Can colors tell a story?

Colors are all around us, most of us can see them, but if you were asked ”what is color” what would you answer? How would you describe how the color cyan looks, or how maroon feels? The answers to the questions vary between people, the visual perception of colors is highly personal but for storytelling, colors are important [2].

For filmmakers, colors are an important and a very useful tool, today as well as in the beginning of the film era [3]. In the beginning, the films were black and white and before there were filters available, frame by frame was tinted by hand by colorists to enhance the image and to convey the feeling desired. A lot has happened since then. Until the 1990s, color timing was used, a process in which coloring was performed in the development of a photo-chemical process in a laboratory, done by changing the exposure time when developing the film. In the late 1990s they shifted to digital film. The colorists then worked in large Post-Production houses that cost an incredible amount of money, and those who worked at that time were treated like rock stars. At that time, late 1990s/early 2000 they started to manipulate the colors digitally in a color correction system.

People today in the media and entertainment sector use desktop programs with different tools when working with color correction and grading.

Colors in movies can be used to evoke emotions, moods or different psychological reactions [4]. For example, blue may indicate that it is cold, or red may indicate fear. However, the same colors can have different meanings depending on the situation, red can in addition to indicate danger and fear also show loving warmth. A context, different environments or characteristics can also be enhanced by a color scheme.

In any project the color must have a purpose and the colors are used to assist the story [3]. Today, as previously described, color correction and grading is performed in desktop programs, being able to do this on a web-based video platform would be a useful complement.

1.1 Problem description

Today, color correcting and grading of recorded material in Post-Production is performed using expensive standard graphics cards and desktop applications [3]. The process means that recorded material is sent to the colorist from the set (from the director / cinematic photographer / editor) where it is received and downloaded to the computer where the work is performed. When the processing is considered complete, it is sent back to the recording team. This could be considered time consuming, and this process could be improved by using Accurate Video which is web based. Accurate Video uses cloud storage, and the user does not need to download the material to work on it.

Today, there are no features for color correction and grading in Accurate Video, and due to this, the goal of this study is to develop a User Interface (UI) design proposal in order to be able to perform primary and secondary color correction and grading.

1.2 Codemill™

This master thesis was done in collaboration with Codemill [5]. Codemill was founded in 2007 and is a digital product development- and IT-Consult company that is located in Umeå, Sweden. They work with many international companies, mostly in the media and broadcast industries. The company has produced many products, one of the main products is called Accurate Video.

1.3 Accurate Video

The digital product Accurate Video, also known as AV, is a web-based video platform built for Post-Production, broadcast and media professionals [6]. Which was designed to meet challenges in the process of producing and distributing digital media. It was designed to meet challenges in the process of producing and distributing digital media. Accurate Video offers various functions, such as validation and quality control of the video content, but also features for marketing, for example the possibility to quickly create posters and promo materials. A vital part of Accurate Video is the Accurate Player, which the latter is a frame accurate HTML5 player that offers the ability to playback video in the browser regardless of frame rate.

Figure 1 shows the appearance of the Validate page in Accurate Video where validation is performed.

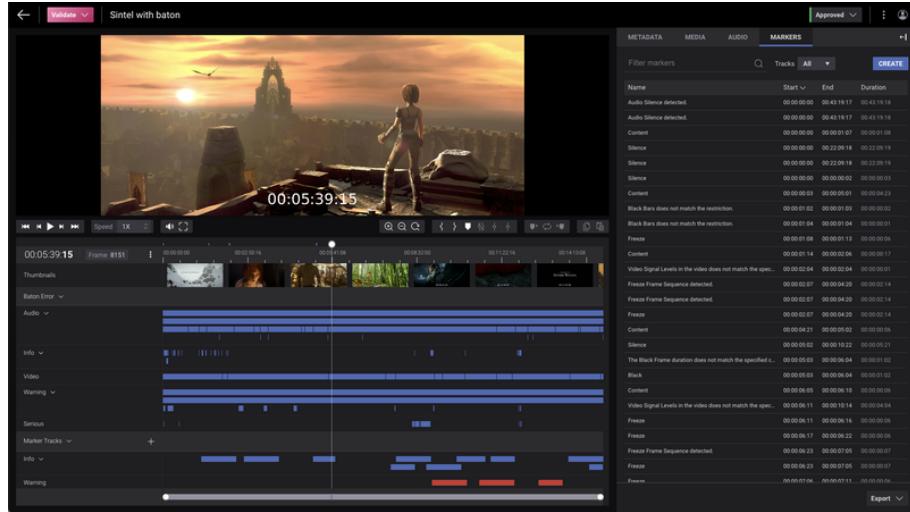


Figure 1: Screenshot of the Accurate Video program [7].

1.4 Objective

The aim of this study was to design a user interface for color correction and grading tools for the Accurate Video application that meet the goals and needs of the people in this field of work, i.e. colorists. To achieve this, research and investigation of the field of color correction and grading needed to be carried out. It would also be important to obtain knowledge about the existing available professional editing programs, and what features colorists use in them. Moreover, it was crucial to learn which of these tools they considered to be the most important to use in Post-Production. The goal was to combine this information with design theory to develop a proposal of a design prototype to be applied in Accurate Video.

Chapter 2

Theory

Theories concerning color correction and grading relevant to the study are presented. The chapter starts with descriptions of what a colorist is, description of color dimensions, the terms color correction and grading, what kind of programs colorists of today use, and design theory.

2.1 Colorist

A colorist is a technician working together with producer, director, and cinematographer [8]. The colorists of today have an incredible control over what a film looks like and what feeling it conveys by using a variation of color correctors. The colorist takes responsibility for the adjustment and design of a film's color scheme, to create a certain style or mood [9]. In bigger productions he or she is working alongside the director of the film and the cinematographer to provide that the film looks exactly as intended and according to their ideas, they are almost a part of the production [9, 10]. In smaller productions the colorist is working alone after the information has been obtained from the client, but the colorist's work is carried out in the same way as in large productions. In addition to working with the film's style or mood, colorists also work with adjusting colors so that the images get a natural look and with adjusting technical color errors. How a colorist works can be exemplified by the following: A film is recorded, and the images are greyish, or the colors do not give the feeling that is wanted in the scene. It is then the colorist's job to adjust it, through technical knowledge and artistic skills so that the colors match between the scenes and that the feeling is right in each scene [11]. The colorist is the last to put his or her hand to the film before it goes out to the audience [3]. It is the colorist who puts the imagined look on the video and reinforces and conveys the imagined feeling [10].

2.2 Description of color dimensions

Color is something we experience, color is a human feeling, it is a mind, a sensation [12]. The brain together with the eye translates light into color, light is stimulating the rods and cones of the eye, these generate a color impression [13, 14]. Even though perceived color is a complex process, involving the characteristics of light source and illuminated object as well as the human observer, it has been proved practical to describe it in three dimensions. One example is to characterize the colour by its hue, intensity (saturation) and brightness, known as “HSB” [15].

2.2.1 Hue

The hue is the actual color and defines the wavelength of the color [8]. Every color has its own wavelength. For example, a long wavelength gives red, a medium wavelength shorter than red gives green and the shortest wavelength gives blue (RGB = red, green and blue). In simple terms, hue is for the true spectrum colors generally assigned by the “color name” red, orange, yellow, green, blue, cyan, violet, magenta that is in the color wheel, hue circle. Figure 2 shows how hue represents a color depending on where it is in the color wheel as an angle about the center.

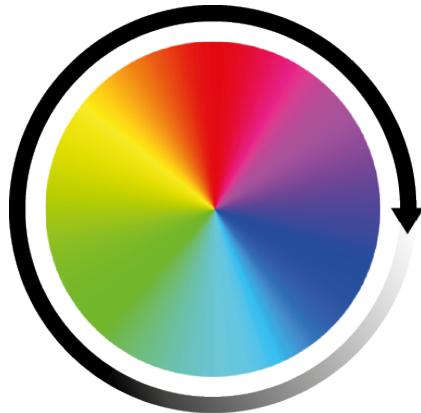


Figure 2: A color wheel that shows how the hue is represented.

2.2.2 Saturation

Saturation refers to the brilliance and intensity of a color, such as if it is extremely vibrant or if it is a faded “toned” paler color [8]. The less saturated it is, a desaturated image, the closer it is to gray, a monochrome image. Decreased saturation will reduce the vivacity and make the image “muddy”. Making the image paler and paler will make the colors disappear, resulting in a black and white image where only the monochrome luma component will be left. If increasing saturation it will increase the colors in an image and make the image “pop”. In other words, to make your color “pop” or to make it “muddy” (the other end of the spectrum), you use

saturation. In the outer edge of the color wheel the saturation is 100%, and in the center there is 0% saturation, this is shown in figure 3.

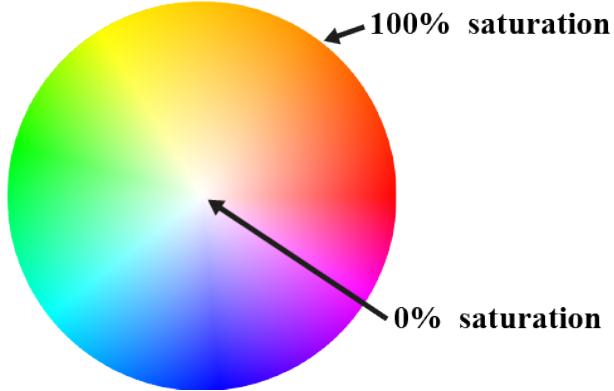


Figure 3: A color wheel that shows how the saturation is represented.

2.2.3 Brightness

Referring to the level of light in the color, the lightness or darkness of a color, is called the brightness [15]. It indicates the quantity of light reflected, from white that is full brightness to black that is no brightness. Depending on how dark or light the brightness is, a viewer can get different emotions when looking at an image. If the image has a high brightness, it can give the feeling of joy and energy, however with a low brightness the feeling can be gloomy and sad. Figure 4 shows an example of a scale with brightness, in this case the color red, where most brightness is on the right and least brightness is on the left.



Figure 4: How the brightness is represented on the color red.

2.3 Color space

To describe a color digitally, each shade of color needs a unique digital representation [8]. A defined range of colors in a color model is called color space. Color model is the model that describes colors with numbers, to be able to be computerized. For example, RGB is the color model and sRGB is one type of defined color space. Color spaces are often presented in the CIE "horseshoe" that represents all colors that a human observer can perceive [10]. Larger color space indicates

more reproducible colors. Different cameras got different color spaces, for example Rec709 and Sony, meaning different capability of capturing different colors. Figure 5 is an image of the color model with two different color spaces (the triangles).

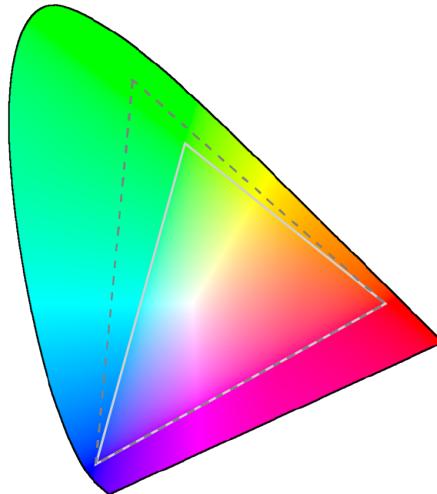


Figure 5: The “horseshoe” with two different color spaces.

2.4 Color correction and grading

Color correction and grading is what a colorist is doing on set and in the Post-Production on film and video [8]. This is done with software, a computer and a control panel together with a mouse. Color correction and grading are used to archive the filmmakers vision of the production [3, 10]. The process of the two mentioned is a mix of technical adjustments and creativity. Apart from the fact that these tools not only make images visually appealing but can also change them to influence the mood and message of the film.

Color correction attributes to a process that is of a technical nature, in an image to change clear qualitative errors and make footage appear as clean and real and naturalistic as possible [8]. The goal is to create visual consistency throughout scenes [8, 10]. The adjustments are on black and white levels, white balance, exposure and contrast.

Grading is about the process of enhancing the look of a footage to achieve a certain style, it is of a more creative concern [8, 10]. This is a process when the footage is colored in new, sometimes unnatural ways, to add emotions and a certain atmosphere [15]. The adjustments are done to transform the footage to the final look. When the actual process is to be described regarding the work with a shot, a color correction is an individual adjustment, while grading is a number of adjustments that gives a desired overall look to it [8]. But the result of a finished film or a video is actually a combination of these two, it is not one “versus” the other, it is about

the combination of them [15]. Whether you are working on a movie or video, on a cable TV series to be broadcast or something on the web it has to be graded [8]. The basic reason you grade projects is that you want it to look as good as possible. There are two different processes of color correction and grading, they are primary and secondary [10, 16]. Primary works with the whole picture, the wholeness, the process of setting the contrast, color balance and the overall tone. Secondary works with part of the image, a specific area.

2.5 LUT

Using LUT (Lookup Table) profiles is a way to adjust colors during the process of pre-production, production and post-production [3]. It is a kind of non destructive filter and it can be added and removed without destroying the original material/recording. The LUT profiles are used to create/recreate a specific mood or effects in a clip or the whole film.

3D LUT is a three-dimensional (3D) lookup table. This offers more sophisticated color transformation, which can be used for something like desaturation.

Shooting is often done in RAW (RAW image files are not processed and must be edited before use). It gives a high quality, but flat image that needs to be fixed.

If a 3D LUT filter is applied, the image becomes brighter and depending on which filter is applied, it sets the desired tone. The mood of the movie can be determined by applying these 3D LUT filters. Such filters can also be created by the colorist himself.

2.6 Software

On the market there are different systems for color correction and grading [3]. A number of years ago, the software was expensive, but a lot has happened since then. Today, they are not as complicated as before, and thus considerably cheaper.

Color correction and grading programs on the market today are, for example, DaVinci Resolve, Baselite, Nucoda and Adobe Premiere, where the first two mentioned are the most common. Figure 6 and 7 shows screenshots of what the DaVinci and Premiere programs look like where color correction and grading is performed.

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Figure 6: Screenshot of DaVinci Resolve [17].

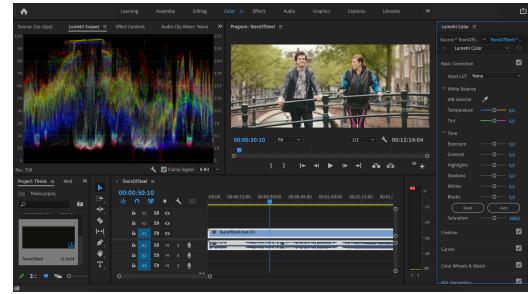


Figure 7: Screenshot of Adobe Premiere [18].

2.7 Post-Production

Post-Production is the final steps in production after material has been recorded on set, for example TV programs, films or commercials [3, 8, 19, 20]. Many different professional categories participate in Post-Production; editors, sound engineers, colorists and more. In this step, the editing is performed, the material in RAW is cut, music and sound effects are added, and it is in this step that the work with color correction and grading is performed by colorists.

2.8 Design theory

All manufactured pieces are designed [21]. Design is about how things work, how we handle them, and about the interaction between people and technology.

2.8.1 Principles of design

When talking of good design, two of the most important attributes are, according to the professor and UX designer Don Norman, understanding and discoverability [21].

Understanding: How am I supposed to use this product, this detail? The things I see, what do they mean? The different controls and settings, what do they mean?

Discoverability: When looking at this product, this detail, is it even possible to understand how and what to do? This discoverability depends on six basic principles of design; affordance, signifiers, constraints, mappings, feedback and conceptual model [21, 22].

Affordance - is the relationship between an object's character traits and how the object could be used. It gives the agent the possibility to interact with something. If an object is designed correctly, the user understands how to use it just by looking at it.

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Signifiers - they tell us how to use the design, for example with graphic illustrations or words. They communicate how things should be done.

Constraints - adding constraints guides activities and eases explanation. For example, in a menu where choices are not selectable, they are toned down.

Mappings - is about being able to know and map actions compared to how they work in reality. In order not to confuse a user, the user should be able to understand the pattern, for example on a stove, the knobs should be placed so the user understands which plate it is turning on.

Feedback - is the visible response/confirmation a user receives after an interaction. For example, after submitting a form, the answer is received "The form is received" or in an application, it is indicated by another color that you have changed the tab.

Conceptual model - is the mental, abstract model that brings true understanding how a work/task should be done. The effects of what we do are predicted by good conceptual models.

2.8.2 User friendly

The term user-friendly may seem self-explanatory, however, there are many aspects to consider when deciding whether something is user-friendly. In summary, it can be explained as when the interface is easy to use and not difficult to learn or understand. The goal is to provide a good user experience with a user-friendly product. Several common attributes found in user-friendly interfaces are as follows [23]:

- **Clean** - when it is a well-organized interface, it makes it easy to find different options and tools.
- **Reliable** - a product that is not reliable is not user-friendly, as it will cause unnecessary frustration for the user. It should be reliable and not crash or bug.
- **Simple** - when it is straightforward, gives quick access to common commands and features, i.e. is not too complex.
- **Intuitive** - means that the interface does not get the user confused, lost or guessing. The explanation of how to use it should also be minimal. The interface must be meaningful and make sense to the average user.

2.8.3 Design Guidelines

Design guidelines are an important link between assessment and principle. To provide a positive user experience, also called UX, there are design guidelines that are sets of recommendations on how to apply design principles [24]. Such guidelines are used by designers to determine how to adopt principles such as consistency, efficiency, intuitiveness and learnability. This so they can create convincing designs as well as to meet and exceed the user's needs. Design Guidelines are rules of thumb

aiming to avoid creating frustration for the user. Design guidelines exist thanks to common sense and the fact that cognitive psychologists have provided the basis through results from studies [24]. Guidelines for design are divided into several groups, some are:

- **Text** - labels, font, tone.
- **Style** - colors, brand logos.
- **User interface components** - buttons, menus.
- **Layout** - list or grid structure.
- **Design patterns** - forms.

How the design guidelines are applied also depends on the design platform, on the user context and the type of interaction the user will have with it.

2.8.4 Usability heuristics for user interface design

There are 10 general principles of interaction design that have been stated by Jakob Nielsen, which are [25]:

Visibility of system status

The user should always be able to tell through the design what is going on.

Match between system and the real world

The design of the system should speak the user's language, with words, phrases, concepts and icons that are familiar to the user.

User control and freedom

When an action is made by mistake, the user needs a clear exit to leave and/or undo the unwanted action.

Consistency and standards

The user should not have to think and ask if different actions, situations or words mean the same thing.

Error prevention

The aim is to prevent problems from occurring through the design rather than using good error messages.

Recognition rather than recall

Make the elements/objects, actions and options visible to the user to minimize the memory load. The user should not have to remember the information in the interface from one part to another.

Flexibility and efficiency of use

Accelerators such as shortcuts, which are hidden from novice users, can often speed up the interaction for the expert user so that the design of the system can satisfy and cater both experienced and inexperienced users. Grant the user to customize frequent actions.

Aesthetic and minimalist design

Information which is irrelevant or rarely needed should not be contained in the interfaces.

Help users recognize, diagnose, and recover from errors

Error messages should indicate the exact problem and suggest a solution and it should also be expressed in plain language without error codes.

Help and documentation

The optimum is if the system can be used without any further explanation, but it may be necessary to provide help and documentation to the user to gain an understanding of how to complete their tasks. All such information should be easy to search for, focused on the user's task, and be kept concise. The specific steps that need to be performed should also be listed.

Chapter 3

Method

The thesis was carried out at Codemill in the spring of 2021. The work was divided into five phases; research, interview, transcription, analysis and development of the prototype. The resulting prototype was based on interviews, design theory and previously established appearance of existing software and Accurate Video. An overview of the different method steps used is shown in figure 8.

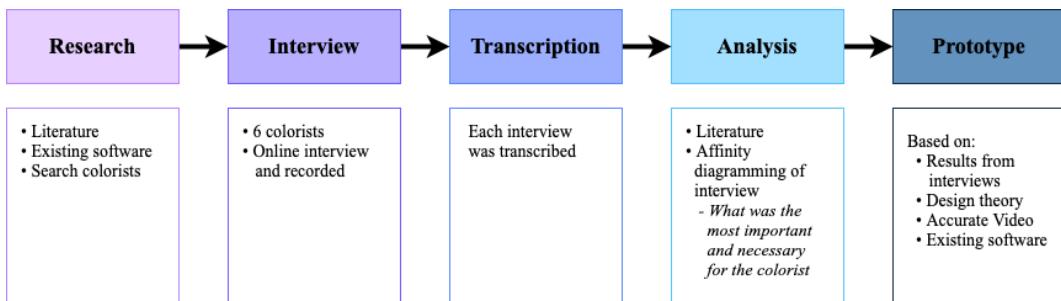


Figure 8: An overview of the method, and the different steps, used in this thesis.

3.1 Research

In order to gain knowledge in color correction and grading, literature research and research on existing software and their source criticism have been carried out.

3.1.1 Literature research

To build an understanding and knowledge within the subject, a literature study was conducted. The literature study aimed to obtain information and data to be able to conduct interviews with colorists and to design a prototype for Accurate Video. Most of the articles were found through searches on Google Scholar and in the

Umeå University library database, but web searches were also performed as the area has not been the subject of so many reports.

Some of the search terms used to find relevant information were "color correction", "color correction and grading", "color grading", "colorist", "Post-Production", "color correction and grading tools", "user friendly", "discoverability", "understanding", "design theory". The search terms have also been combined together to increase the search area. Books and manuals in interaction design and color correction have also been consulted, as well as literature dealing with method selection for interviews.

3.1.2 Research of existing software

To build an understanding of what Accurate Video and existing color correction and grading programs look like and are structured, these were examined. The programs examined were Accurate Video, Nucoda Film Master, DaVinci Resolve, Baselight and Adobe Premiere. They were examined by watching various YouTube videos, looking at images on the UI and reading about them. The keywords to find information were "color correction and grading", "tutorial" "how to use *name of the program and/or tool*". After obtaining the required knowledge, navigation in the mentioned programs could be started to gain a broader knowledge and understanding of the subject.

3.1.3 Source criticism

When data is collected directly from people/ groups of people, it is called primary data [26]. The researcher goes without detours to the primary source of information. Secondary data is information that is already available, collected and presented in previous studies. The use of secondary data as reference material is very common, however, only one source should never be relied on, several should be balanced against each other. These must also be assessed for how independent they are of each other.

In this study, both primary and secondary data have been used.

Data have been collected via interviews, which means that primary data has been collected [26]. As a researcher, the quality of the material collected should be critically questioned, whether the right people have been interviewed and whether the information obtained is valid, ie. true [26]. In cases where the information obtained comes from persons who are involved in the phenomenon, these can be assessed as informants with greater confidence [26].

The respondents in this study can be considered credible as they in their profession as colorists work daily with color correction and grading with currently available programs. Well aware that the secondary data used may have been angled. But since the same data has been found in several articles, books, in existing software and found in the answers from the interviews, they can be considered credible.

3.2 Interviews

To get input on how the prototype should be designed, knowledge of the user's needs and their working methods was needed. To access this, interviews were conducted with a number of respondents. This section describes how this was done and how the personal integrity of the respondents is protected.

3.2.1 Choice of method

For this thesis, a qualitative study with an inductive approach was chosen [27]. The emphasis in qualitative study is the words and not quantification of collected data and the inductive approach is used when the emphasis is on generating theories. In qualitative research, a theory is obtained after a study has been performed, compared with quantitative research where the starting point is to start from a theory. However, there are disadvantages to this type of research. For example, can it be difficult to generalize in qualitative research as interviews and observations take place in a small group of individuals. Since the idea of this study was to investigate what tools colorists use and how they use them in their daily work, it was necessary that the study has the participants' perspective as a starting point, to thus gain an understanding of their choices. This means that a qualitative study is best suited as this type of study aims to gain insights into the respondents' opinions, behaviors, and values.

3.2.2 User interview

In a research study, the researcher wishes to be able to map the issues selected in the project. This qualitative research study was performed through personal semi-structured interviews.

In qualitative studies, there are two key types of interview structures; semi-structured interview and unstructured interview [27].

In unstructured interviews, the researcher uses supporting words and fewer questions because the idea is that the participants should be allowed to speak freely based on the main question posed by the researcher. In the semi-structured interview, on the other hand, straightforward and simple questions are asked with a script as a basis and the conversation is focused on the specific topic that is relevant in the study [27]. The interview format is suitable if the study is specific. There is great freedom among the participants in answering the questions and the emphasis is on the interviewee's own perceptions. The person interviewing can also deviate from the structure of the script by changing the order of the questions and by following unexpected threads that appear.

This study has a specific question in that it asks what colorists use in existing professional color correction and grading editing programs and what they think about them. This makes a semi-structured interview suitable for this study.

3.2.3 Participants

To get answers to the questions, the interviews were conducted in a group of people with a colorist as their title. Colorists can work with film, series, TV-shows, documentaries, music videos and advertising. In the qualitative approach, there are several different criteria regarding the choice of respondents, which is governed by the type of information that is intended to be obtained [26]. The selection criterion used is the criterion within the group called information. This criterion requires that the researcher must know how good the information from the respondents is, in this case, the assessment was made that they have great knowledge in the subject as they work daily with just color correction and grading with currently available programs.

To get in touch with people with colorists as a title, a search was made via the web and on LinkedIn with the keyword "colorist". People found were contacted either via email or LinkedIn for a request for participation in an interview. A total of six people were interviewed, both men and women. Their experience in the field varied from 4 years up to 40 years. The majority (5 out of 6 people) had worked more than 10 years as colorists.

3.2.4 Conducting the interview

As mentioned above, a semi-structured interview was used as an interview form. Interviews were held online via the program Zoom with an interview guide as a basis (Appendix A & B) and all interviews were recorded [28]. The length of the interviews was one hour, with the exception of one, which lasted for one hour and 20 minutes. Before the start of the interview, all participants were given the opportunity to answer whether it was okay to record the meeting or not. It was okay in all cases. An interview guide was used to keep the focus during the interview and to give the respondents the same basis to answer the questions from. In some cases, questions that already had been answered in a previous reasoning were excluded and in cases where it was deemed necessary, additional questions could be asked such as "*could you explain this further*" or "*did you say this before*".

The interview guide was divided into four parts where the first part was an introduction about who I am, where I study and how the work with the thesis project should proceed. The second part, introductory questions, was to get a background picture of the respondent and so that the interview would feel personal and not like an interrogation. It was made clear at the beginning of the interview that no answers would be perceived as right or wrong but that they should be based on their experience and perception of the technology they use. The third part, general questions about color correction and grading, were the basis for this thesis. The interview ended in part four, final questions, where the respondents were able to add thoughts or aspects that were not requested during the interview.

3.2.5 Research ethics

In this study and interviews, the basic individual protection requirement has been applied according to the four principles; the information requirement, the consent requirement, the confidentiality requirement and the utilization requirement [29, 30].

The information requirement - information must be provided to the participants about their task in the project, information must be given that participation is voluntary and that whenever they want, the interview can be interrupted. Also inform that the purpose of the information provided by the respondents is only for use in the research. This requirement was met by providing information to the respondents before the interview was started.

The consent requirement - those who participate in an interview have the right to decide for themselves about their participation. The requirement was met by placing the request via email and LinkedIn, where the respondents themselves decided whether they wanted to participate or not.

Confidentiality requirement - this requirement deals with the fact that the respondents and what they say during the interviews should not end up with unauthorized persons. The requirement was met by informing before the interview started that the material would only be used for research and would not be handed over to third parties.

The utilization requirement - the requirement means that the information obtained via the interviews will only be used in the research. The requirement was met by informing about this at the start of the interview.

3.3 Data analysis

Alan Cooper et al. [31] describes how important it is to determine what the product is supposed to do before designing how the product will do it. Below is a description of how the analysis steps were performed.

3.3.1 Data management

The work with data management can be divided into three steps; data collection, analysis of data and interpretation of data [32]. The first step, *data collection*, was in this case performed through literature studies combined with recorded qualitative interviews (described above). In order to be able to enter the second stage, the obtained recorded material needs to be handled so that conclusions can be drawn later. This was done by transcribing the recorded interview from video to text. The transcription was done using the online audio and video transcription software Sonix [33]. The Sonix website makes a transcription into text, however, it may be required that the material needs to be corrected slightly manually at a first listening / reading of text, this if words or sentences are pronounced carelessly, then the program does not seem to "understand" which word or words were intended. This

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is to ensure that the written material exactly corresponds to what is said in the interview.

The second step, *analysis of data*, involves reading through the obtained material and picking out quotes and sections of interest [32]. In the analysis of data obtained from the conducted interviews, Affinity diagramming was used as an aid [34]. This is a method developed by the Japanese Jiro Kawakita in 1960 [35, 36]. It is a tool to organize data and ideas, and is often used for organizing notes from interviews. In this study, the method entailed that each selected point taken from the recorded and transcribed material was written down on sticky notes that were placed on an empty wall. One individual color per interviewee was used. After reviewing all the interviews, the notes with similar answers were placed next to each other and in this way clusters were formed. When a cluster was considered clear, an overall sticker note was set up with names of the theme of the cluster.

In the third step, *interpretation of data*, the obtained themes can be used to obtain insights from the obtained data material [32]. In this study, the interpretation of data was primarily focusing on themes dealing with what colorists do in the image they edit, and on what functions/tools in existing programs the colorists consider most important for performing their work.

Affinity diagramming is useful for making interpretations and helps to coordinate information, without making it subject to perceptions such as the researcher may have [35, 36].

Figures 9 and 10 below show an example of Affinity diagramming with sticky notes. The first, figure 9, shows the set up for a specific respondent from the interview before clustering was started. The second, figure 10, gives an overview of how all respondents' answers are clustered together in different areas.

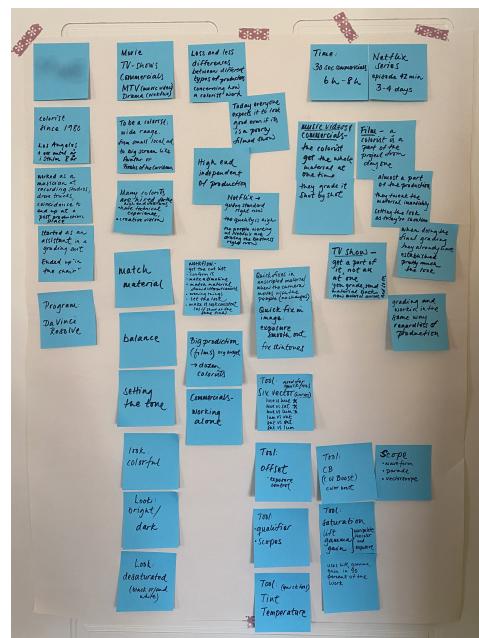


Figure 9: An Affinity diagram for a specific respondent, the name of the respondent has been blurred out.

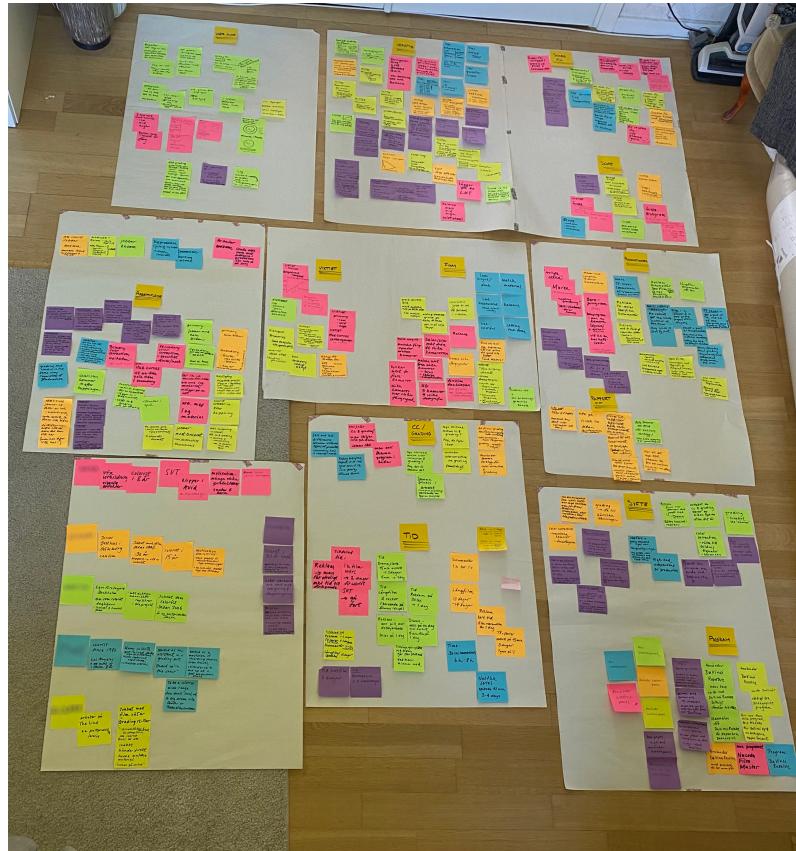


Figure 10: Overview of the clusters from the Affinity diagram, for all respondents.

3.3.2 Reliability of data

It is of great importance to review and evaluate the quality of studies performed, to illuminate and reason about how reliable and true the results obtained are. The most common criteria are reliability, validity and generalization [30]. According to Stukát, the reasoning regarding these should be in the method part with reasoning about the weakness in each part.

Reliability - describes how reliable the results are in the study and whether the test results could be repeated regardless of who performed them. The results obtained should be the same, if the investigation is repeated several times [27, 30].

In this study, one person performed the interviews, which does not fall within the scope of being able to control repetition regardless of who performs it. However, it can be considered that the reliability is relatively high because the respondents have received the same questions through the use of the interview guide and that the answers obtained have been approximately the same from all of the respondents.

Validity - is a concept that is more complicated and more difficult to interpret. It deals with the question whether what has been examined actually is that was intended to be investigated [30]. To have obtained results that have a relevance and whether its results and conclusions are consistent with what was intended to be investigated [27, 30].

The questions in the interview guide were based on the assignment received from Codemill and all the questions were within the work area for colorists and how they use the tools for color correction and grading in the programs they have available. With that as a background, it can be considered that the results obtained have a relatively high validity, that what was intended to be examined actually was examined. One weakness of interviews may be that respondents do not want to admit their weaknesses, or they might respond according to what they think the interviewer wants to hear [30]. This could be a possible source of error in this study, however, the questions have deliberately tried to be formulated so that they are not leading questions. Thus, it can be considered that the source of error has been reduced.

Generalizability - is about the reasoning to whom does the result obtained apply, can it be generalized [30]? Or does it only apply to the examined group?

One thing that affects the generalizability is that the surveyed group was small and may mean that the selection is not representative. In this thesis, six colorists were interviewed about what tools this profession uses in available color correction and grading programs. As most of them stated the same type of answer, the answers can be considered credible. This means that the answers obtained can be generalized for the profession of colorists - the generalizability is high.

3.4 Prototype

A prototype is a working model, a trial version of an end model, to be able to test the intended design ideas before launch [37, 38].

Prototypes are needed to check that the intended design concept works, and to verify that people can really use them. To present the design, two different prototypes were built, one low-fidelity and one high-fidelity.

3.4.1 Prototyping

In this thesis, the final outcome was to present a prototype for color correction and grading tools in the web based Accurate Video program. This was achieved by combining the information retrieved from literature, information from existing software, design guidelines together with the data obtained from the interviews.

The work to develop a prototype was carried out with pen and paper and in the programs Sketch and Abstract. Sketch is a program specifically created for digital design for apps and websites [39]. Abstract is a library of components and version control [40].

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The UI in the prototype, i.e. the choice of colors, placement of specific objects and font would follow what it looks like in Accurate Video as far as possible. If there were already designed building blocks, like buttons, these would be used to get a coherence between the parts in Accurate Video. In cases where such did not exist, new ones were designed for this prototype.

Low-Fidelity prototype

The Low-Fidelity prototype is also called LoFi prototype. It was outlined during the brainstorming part, where ideas were visualized with the help of pen and paper by drawing sketches.

High-Fidelity prototype

The High-Fidelity prototype is also called HiFi prototype. Ideas from the LoFi prototype were evaluated by creating a HiFi prototype. From these sketches a more detailed prototype was created in Sketch. This prototype was then presented to Codemill.

Chapter 4

Results

The results chapter consists of the sections *Insight from research*, *Interviews* and *Prototype*. Insights from research provided a basis for the study. The interviews were conducted to gain an understanding of what a colorist is, what they do in their daily work and what they change in a picture with the help of color correction and grading and with what tools they perform this work. The outcome of the answers, that is, what usually needs to be changed in an image, what they think are the most important tools, and their needs together with design theory, resulted in a prototype proposal for Accurate Video.

4.1 Insights from research

Literature studies on the subject color correction and grading provided fundamental insights on the subject, this together with the study of the software that colorists use today laid the foundation for how the interview questions should be phrased. Through the literature studies, knowledge was obtained where colorists work and, in this way, the right contact area could be found to investigate whether they could participate in an interview. The examination of the existing software provided an insight and understanding of what the colorists talked about during the interviews, and to be able to ask follow-up questions during ongoing interviews. Literature studies in the subject of design theory and Accurate Video were also carried out. This research provided guidelines that were considered during the execution of the prototype.

4.2 Interviews

The study was based on interviews with six colorists. This part presents collected data from the interviews conducted, after clustering was performed with the method Affinity diagramming, described in section 3.3.1. Answers received from the respondents were clustered together in different areas, see figure 10 above. However, the theory that colorists describe in general terms about what a colorist is, is not reported here, this is found in section 2.1. Nor is the theory the colorists described about color space, this is described in section 2.3. The same applies the theory that colorists describe regarding the concepts of color correction and grading, this is described in section 2.4. The topic *Interview participants* describe background facts about the interviewees. The topic *Workflow* describes the general workflow of the colorists. The topic *Color correction and grading conditions* describes the relationship between color correction and grading and their standard. The topic *Time required during project* describes the time colorists have to complete different types of productions. The topic *Data analysis of interviews* presents the data that the colorists gave in the interviews regarding what they do in an image and what tools and needs they have to adjust images. The topic *Additional information obtained from Affinity diagramming* presents additional information that emerged from the clustering of the interviews.

4.2.1 Interview participants

In this section, collected data from conducted interviews with regard to background facts about each colorist are presented. Each person who participated in the interviews is presented separately. All respondents who participated are reported anonymously.

Participant 1

Participant 1 was a person with education in VFX (visual effects) who ended up in the colorist profession by a coincidence 8 years ago. The person then joined a media company that conducts television operations in Gothenburg and still works there today. This colorist works in the Nucoda Film Master program, and the reason for this is that the employer provides this program. The colorist considered that there were no shortcomings in the program and its tools. The person works alone but would like to get in earlier in the process. The types of programs that this colorist has worked with are animal and nature programs, entertainment, children's- reality- and community programs. What motivates to work as a colorist is the variety of productions, and what drives the person the most are nature and children's programs, because these contain more color and creativity compared to a community program.

Participant 2

Participant 2 has worked with film for almost 25 years. From the beginning with editing and then composting, which are processes that take place after color correction and grading. This entails putting the final touches to the film, for instance by adding special effects and removing unwanted objects. For the last 12-13 years, the person has worked exclusively as a colorist with color correction and grading. Today, this colorist works at a Post-Production service in Stockholm and uses the program DaVinci Resolve, and the reason is that this person believes that the program is very educational and that it is Apple based. The colorist meant that there were no shortcomings in the program and its tools. Under the current circumstances, ongoing pandemic Covid - 19, the person is working alone. In the past, the work was often carried out in teams where the director, photographer and producer were in the same room at the same time as the colorist and provided input when the job was performed. The productions the person has worked with are commercials, TV series, feature films, and documentaries. What motivates and drives in the role as a colorist is that changes take place quickly and immediately, that there is creativity in shaping the image according to history and that, as the colorist said, to be able to put the finishing touches on the work.

Participant 3

Participant 3 was a person who has worked as a colorist since 2006, which makes about 15 years. This person works daily as a colorist and runs his own Post-Production company located in Stockholm. The work is done in the program DaVinci Resolve, and the colorist described that it was because this is cheap and works on Mac. The person also said that the manual for the program is "super good and educational". The colorist said that there were no shortcomings in the program and its tools. The person performs the work alone. The various productions that the person has worked with are commercials, documentaries, feature films, series, short films, drama and music videos, where some have been shown in cinemas. According to this colorist, it does not matter what type of production or what type of images they work with, because it is about Post-Production, the work is similar. The motivation for working as a colorist is that this colorist thinks it is fun as it is both technical and creative, to work with very talented people, such as directors and in good projects. He/she appreciates that the process is very varied and gives the opportunity for him/her to constantly be able to learn new things.

Participant 4

Participant 4 has been working with film since 1990, first as an editor then with VFX (visual effects). For the past 15 years, he/she has been working as a colorist in the Post-Production in Gothenburg that he runs together with his colleague. As it is their own company, they take care of everything themselves and in most cases the colorist works alone, but in some cases, depending on the type and size of the production, the photographer and director are involved. The work is done in the program DaVinci Resolve, because the colorist considered that this program is the most affordable for what you get and that it works well. The person describes that

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there are no shortcomings in the program and is very sophisticated. The productions the person has often worked with were feature films and TV series but also documentaries. What gives motivation in the job as a colorist is that each new project is different and a challenge. It gives satisfaction that a colorist adds something to the film.

Participant 5

Participant 5 has worked as a colorist since 1980, making about 40 years in the business. The career began when that person was a musician and was working at a recording studio in Los Angeles, California. It was a coincidence that the person ended up at one of the biggest Post-Production places at the time in Los Angeles and Hollywood and got a job there, starting just driving a delivery truck at the same time as studying to become a recording engineer. Then started as an assistant in a grading suit. At that time, the professional title colorist did not yet exist, it was not really a job at all, but one of the bosses persuaded this person to learn grading. The boss was pointing this person in the right direction and said, “that’s going to be a really important position in Hollywood and everywhere”. Finally, the person ended up “in the chair” and has worked as a colorist in Southern California the whole time, with the exception spending 9 years in Stockholm from 2008 to 2017, also working as a colorist. The person works today at a Post-Production place in Los Angeles, and whether the colorist works alone or in a team, depends on the type of production in question. In large productions with a large budget, a dozen colorists work and in smaller ones, this person works alone. The colorist meant that many colorists are hired because they have the technical experience, and they have a creative vision. This colorist performs his/hers work in the DaVinci Resolve program, and he saw no problems with the program. The productions this person worked with are movies, TV shows, commercials, music videos (MTV) and drama (Netflix and other streaming services). This colorist said that in music videos and commercials the colorist gets the whole material at once. He/she continued to say that in films the colorist is a part of the project from day one, the colorist is almost a part of the production, and they tweak the material immediately on the set and are setting the look as they are shooting. Concerning TV shows the colorists get a part of it, not all at one time, they grade it and send the material back, new material arrives and so on.

Participant 6

Participant 6 was a freelance videographer, photographer, film editor and colorist based in Umeå and has worked with this for almost 4 years. Now during the pandemic Covid -19, the person works mostly with editing and color correction and grading, compared to before when this person also filmed, which is not the case due to the current situation. In smaller productions, however, this person performs most things, namely filming, editing and color correction and grading, this as in small productions there is often a lack of competent colorist. This gives the opportunity to connect to what this person is already doing as a photographer. This colorist is driven by the same reason why working with film and photography and that is that

this person loves the visual medium and visual aesthetics. To work with the eyes, and said that "what I see with the eyes I understand". The various productions the person has worked with are corporate films, promotional videos, music videos and short films. This colorist works alone during his projects. In the work with company films, no information is exchanged during the work, the material is obtained and the colorist works with it and is not shown to the customer until it is ready, and after that it is handed over. When it comes to music videos the client is involved in the process and provides input. In the case of short films, the director and producer provide a lot of input to the colorist throughout the process. The work takes place in Adobe Premiere, because in addition to the work as a colorist, he/she uses this program as a producer and director. This colorist means that the negative with this program is that it is unstable.

4.2.2 Workflow

All respondents answered with similar words regarding their workflow. They described that the workflow is to obtain the footage from the client's editor together with a cut list. They described that the cut list contains time codes where the clips are located, that is in point and out point on each clip, this to get clips in the right order. The colorist imports the material into the software, the interviewees said that it is called conform, which means that the material is placed correctly in their timeline, then color correction and grading is performed. The final result is shown to the client and when this is approved, the export is performed, and the material is sent back to the client.

4.2.3 Color correction and grading conditions

When asked in the interviews if there were different conditions and problems encountered in different types of productions, the respondents answered that there are smaller and smaller differences between different types of productions regarding how a colorist performs their work. However, what also emerged during the interviews was that the standard and requirements for the work that the colorists are expected to do have been raised over time. As one colorist put it, "Today everyone expects it to look good even if it's a poorly filmed show. Netflix is the golden standard right now and the quality is high and the people on Netflix are driving the business right now".

During the interviews the colorists explained that there is no difference between different types of productions concerning how a colorist works on the image with color correction and grading, and that the requirement for the result is independent of the type of production. They further described that what they do technically in the picture is the same regardless of whether it is a commercial of 30 seconds or a documentary or a feature film. They also described that when it comes to the way they work with the material, there is no difference between color correction and grading.

4.2.4 Time required during projects

When asked how much time the colorists had at their disposal to carry out their work, one respondent began with "it is a bone of contention, it is never enough" and continues that it depends on the type of production in question and the pressure they are under.

However, consistent responses were obtained from participants 2-5 as follows, for a commercial of 15-30 seconds, they have 1-2 days to do the work. In the case of series and an episode of 42-60 minutes, the time required in the span is 3 - 7 days per episode. As one respondent said, "we have to step on the gas". For a documentary, the time varies between 1 to 8 weeks depending on the type of production. Participant 2 mentioned that, when it comes to documentaries, when there is a long period of time during the project, other projects can usually be worked on in between. When it comes to feature films in Sweden, 10-15 days are stated, depending on the length of the film. Unlike high-end productions in the USA where several colorists work on the same film and it takes so much more time, up to 12,700 man-hours can be invested per film.

For participant 6 who worked with corporate film and short film, it takes 2-3 days for a corporate film and 7 days for a short film.

Participant 1 who worked on, as the person put it, a "TV factory", everything must go fast, on a 1 hour of film material, color correction and grading must be done in 2 days.

To get a comparison of the time used for two different types of productions, the following calculation was done: In a commercial of 15 seconds, the colorists described that they have 2 days to do the work compared to a series episode of 45 minutes where they only have 4 days. As a result, in advertising, they have more time to work with the material.

Advertising: in 1 second of material, they have 32 minutes to work on it.

A series episode: on 1 second of material, they have 0,71 seconds to work on it.

4.2.5 Data analysis of interviews

This section presents compiled data from the interviews where the colorists described what they needed to change and adjust in the images, what tools they used and considered important to perform the work.

What a colorist performs in an image material

As described earlier, the participants expressed that the work with color correction and grading does not really differ, that everything happens at the same time and flows together. They meant that it is the same process in the work with color correction and grading and is performed in the same program regardless of project. They described that technically color correction is about fixing the image regarding neutralizing and correcting colors, while grading it is about adding something, the stylistic color that is applied. When asked what needs to be adjusted in the pictures in the received material , the asked colorists answered almost the same things. Con-

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sistent, all participants said that they "fixed the look" in the image to get the natural or unique look. They described that they need to match the material between different clips, that is, match color spaces in materials from different cameras, sometimes shot by different photographers, to get an overall look and an acceptable overall tone. This must be done because the material is often recorded with different camera types that have different color space. They further explained that the material may come from different recording times and locations and may be recorded at different times during the same day and yet it should look as if it was recorded at the same time for the same scene. The colorist then needs to match the material so that it looks coherent and feels balanced even though in one clip it can be sunlight, and in the next cloudy. The same scene can be recorded during one and the same day from early morning to late evening or a cloudy movie day should feel sunny. In all cases, the material must be matched, balanced, the levels set correctly, evened out and given a consistent appearance or beautified. This is so that we as viewers get the intended impression, give us a certain feeling, and the viewers should not notice if there have been differences in the material. Furthermore, the colorists described that in the pictures they also need to adjust the contrast, temperature, balance colors (hue) and overall tone. They said that they should be able to make the picture, for example, saturated / desaturated, brighter / darker, make it colorful, change the black so that, for example, it becomes greener or the light a little blue and adjust the black and white point and get the luminance right. They explained that color correction and grading are not performed the same throughout the film, the colorist does this shot by shot.

Tools used and needs

The colorists said that what they manipulate in an image is done with a number of the tools found in the programs they use. The colorists pointed out that there are many more tools in programs than those they use frequently. On the interview question concerning which tools they use most frequently and which they consider most important for their work, they answered almost unanimously. In most cases, six out of six respondents answered the same, and these tools are listed below, see Table 1. Along with each tool, the colorists' own description of what they are / are used for is included. The colorists' descriptions of the tools were also consistent.

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Table 1: Results of which tools colorists consider most important for performing color correction and grading, and how they describe the tools.

Tools and needs	The colorist's description
LUT (Lookup Table)	<p>It is a kind of filter that is applied, gives an appearance immediately and gives different effects on the image. Not used to fix the look. Is non destructive.</p>
Lift, Gamma, Gain, Offset	<p>Used to set the image, set levels, provide contrast, balance, and matching. Fix black and white points in the image.</p> <p><i>Lift</i> - controls dark tones, the darkest part of the image. <i>Gamma</i> - controls mid-range tones. <i>Gain</i> - controls the brightness of the image. <i>Offset</i> - adjusts and balances, works with the entire range in the image, affects everything.</p> <p>With these, light / dark (exposure) and colors can be changed in the specific areas they affect.</p>
Hue	This tool changes the color of the image. Can be used both for the primary (the whole picture) but also for the secondaries, (in a specific area).
Saturation	Is used to turn the image more or less saturated. What strength the colors have. With this, you can, for example, get the image black and white in a simple way.
Contrast	Is used to distinguish between dark and light areas in the image. With the right contrast for the image, the desired richness of detail is obtained.
Shadows	Affects shadows in the image.
Highlights	Affects highlights in the image.
Temperature	Affects the temperature in the image, adjusting the white balance, it ranges from cold blue tones to warm yellow-orange tones. Is a complement to other tools for balancing the image.

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Tools and needs	The colorist's description
Tint	Adjusting the white balance, shift the whites towards green or magenta. It is a complement to other tools for balancing the image.
Curves • Custom • Hue vs Hue • Hue vs Sat	<p>Under Curves there are several tools the colorists use. The three tools described by the colorist to be the most important were:</p> <p><i>Custom</i> - it is used to be able to control RGBY (red, green, blue, luminance), either together or separately. To get different kinds of contrasts.</p> <p><i>Hue vs Hue</i> - used to control colors in the image. Either it is the wholeness or just a specific color.</p> <p><i>Hue vs Sat</i> - used to control the saturation of the image. Either the whole image or for a specific color that needs to be stronger or weaker.</p>
Qualifier - keyer	A specific color range is pinpointed using a picker, which means that an area is isolated, and then changes can then be applied to it. The qualifier tool has hue, saturation, and luminance, along with denoise and blur.
Window & Tracker	<p><i>Window</i> - A part of the image is selected / highlighted, and color correction and grading are then performed in the specific area.</p> <p><i>Tracker</i> - is used to follow, track, the object on which the window is on, in the moving image. For example, if a car gets a window around it to change color, then when the car rolls away in the clips, the window should follow the car and not be left where the car stood in the beginning.</p>
Scopes • Parade • Vectorscope • Waveform	<p>The tool provides technical security. It is used to see how the image changes / reacts / behaves during adjustments, with respect to colors and light. Helps during the work.</p> <p><i>Parade</i> - see if the image is well exposed.</p> <p><i>Vectorscope</i> - to stay within limits and see in which direction the colors are.</p> <p><i>Waveform</i> - control the light.</p>

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Tools and needs	The colorist's description
Node tree	Keeps track of various adjustments made. The colorist decides for himself whether he or she wants to make all adjustments of tools on one node or divide into different nodes. For example node 1 for adjustment with lift / gamma / gain, node 2 for curves, node 3 for windows or all adjustments at the same node.
Split screen	Used when it is desired to place pictures next to each other, used to for example see the difference between different clips / cameras.
Viewing videos	To be able to perform color correction and grading, it is important to be able to see the image clearly and distinctly for the clip.

The colorists describe that the tools in the programs are used to set the look. They also explain that they can be used both separately and in combination with each other, and both in primary and secondary. However, it can be learned from the interviews that the work with color correction and grading is that the tools in the programs they work in are usually used in a combination to get the desired result.

An example given by the respondents was to combine keyers, windows and change color with one of the tools. This combination was explained by one of the respondents according to the following example:

In one picture there are red roses and a red car. The goal is to change the color of only the roses, from red to yellow. First, the specific color, in this case red, is pinpointed with Qualifier, the keyer. If they now start to change the red color after they pinpointed red, the color of both the roses and the car will change. To only change the roses, they need to put on a window to mark out the roses and explain that only they are to be affected. When it is marked with both the pinpointing and the window, the color is changed with for example hue vs hue.

4.2.6 Additional information obtained from Affinity diagramming

During interviews when the colorists described the workflow, it emerged that 5 out of 6 in their work use a control panel, together with a mouse as a complement. However, the main work is done with the help of the control panel and it streamlines their work. They said that is really needed when working with larger productions. The colorist who did not work with a control panel at the time of the interview expressed a desire to acquire such. It was also described that in addition to the larger control panels used at their worktable, there are smaller types of control panels to bring if the work is performed out of office.

The last question in the interview guide was whether the interviewees had any questions to ask back to the person who conducted the interview. The question asked by the participants was "what is the purpose of this interview and what exactly are you going to do?". In response, the idea behind this thesis was briefly explained, together with a short description of Accurate Video, emphasizing that it is a web-based solution. One of the colorists then replied that one thing that is important to keep in mind when the material is to be included in the program and then worked on, is that it should not be compressed. The compression takes place in the dark parts of the image. If the material is compressed, it becomes blurred and noisy, which reduces the quality of the work.

4.3 Prototype

This section presents sketches of the LoFi prototype which resulted in and were translated into a HiFi prototype. The following elements were considered when designing the prototype:

- Information obtained through literature studies
 - on color correction and grading
 - on design theory
- The appearance of existing editing software
- The results from the interviews (described in section 4.2)
- The appearance of the Accurate Video program

4.3.1 LoFi prototype

There were two versions of sketches of the overlay from the early stages in the prototyping. These two were done by pen and paper. The first version represents the overlay with the appearance of the wholeness on what the page for color correction and grading should look like. This version is shown in figure 11. The location of the

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Video Image box and the File info / Node tree / History box follow the appearance of Accurate Video. The boxes for Tool 1, Tool 2 and toolbar are new for Accurate Video. In discussion with the supervisor at Codemill, it emerged that the placing of the toolbar did not follow the Accurate Videos standard. Therefore, in the second version, the toolbar and its contents have been moved and a new wholeness was created, shown in figure 12. Figure 13 shows an overview of the appearance of the tabs and tools.

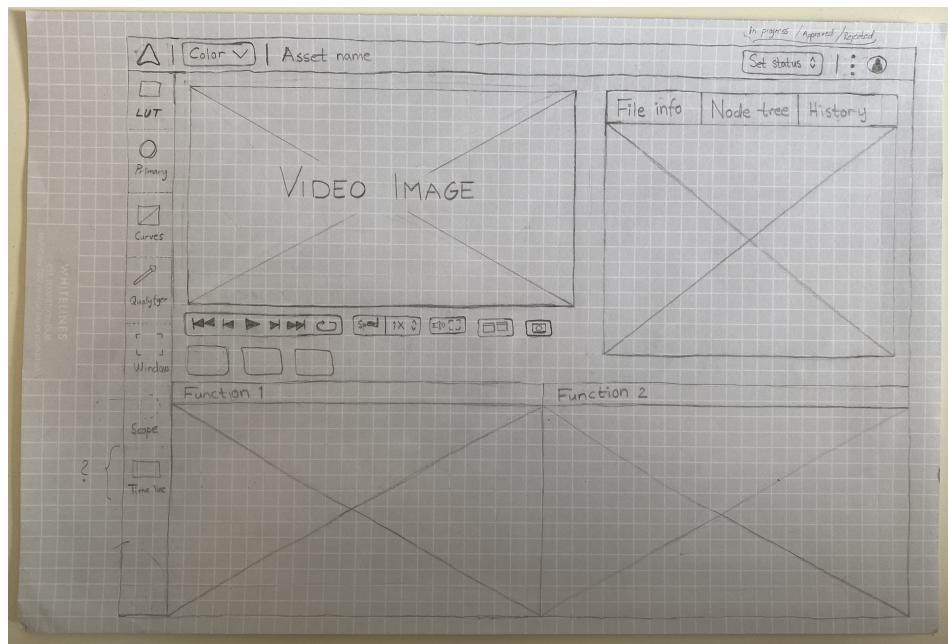


Figure 11: LoFi prototype version 1.

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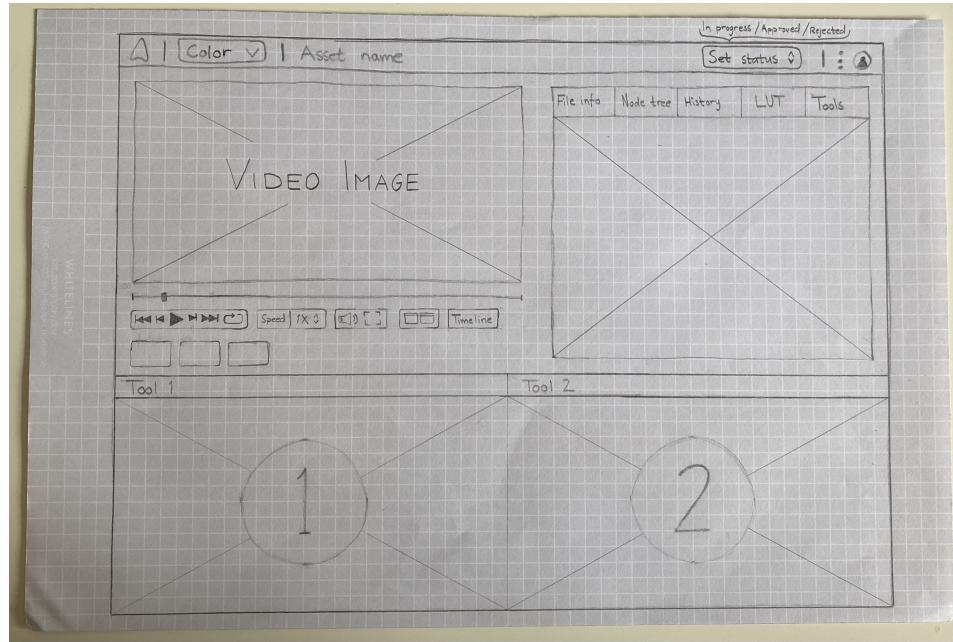


Figure 12: LoFi prototype version 2.



Figure 13: LoFi prototype on tabs and tools.

4.3.2 HiFi prototype

The HiFi prototype is the proposal for a UI on color correction and grading for Accurate Video, based on the LoFi prototype, which was developed based on results obtained in this work. The work with the HiFi prototype has been performed in the

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program Sketch, which was mentioned in the method section above.

All images of the prototype with its functions are shown and described in Appendix C. The basic functions for color correction and grading in the prototype are described below. With some examples of the working surface of the prototype produced.

The page in Accurate Video where color correction and grading are intended to be performed is called Color. The page Color shows the current clip. On this page there are five different tabs that the user can navigate between and five different tools to use. The user can decide where the tool should be placed. One and the same tool can be either placed in place 1 or 2. The various tabs and tools available are:

- **File info** - this is where the user can see information about the current clip.
- **Node tree** - this is where the user can see what adjustments to the tools have been made. The user can choose to perform adjustment on different nodes. In this way, the user can easily show himself, and maybe the customer, what has been done and there be able to turn off the node with various adjustments to see the difference if desired. It is non-destructive in the picture.

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- **History** - here the user can see a list of the various adjustments that have been made. In this way you can easily see what has been done and also be able to throw it if desired to remove an adjustment.
- **LUT** - here the user can select a LUT in the library and place it on the clip. It is non-destructive in the picture.
- **Tools** - there are five different tools the user can choose from to be able to adjust the clip with.
 - The **Primaries** tool, which has two different views, *Wheels* and *Basic*.
 - The **Curves** tool which has three different views, *Custom*, *Hue vs Hue* and *Hue vs Sat*.
 - The **HLS Qualifier** tools that has one view.
 - The **Window** tools that has one view.
 - The **Scopes** tool, which has three different views, *Parade*, *Vectorscope* and *Waveform*.

Figure 14, below, shows what it looks like for the user when they click on the Color page where the work is performed. Here's what it looks like by default. Here is the clearly visible image on the clip they are working with at the top left, below the image there are various functions for displaying the clip. At the top right is a box with tabs for File info, Node tree, History, LUT and Tools. At the bottom there are two places, the placeholders 1 and 2, where the user is free to place the tools they want to expose to be able to perform their work.

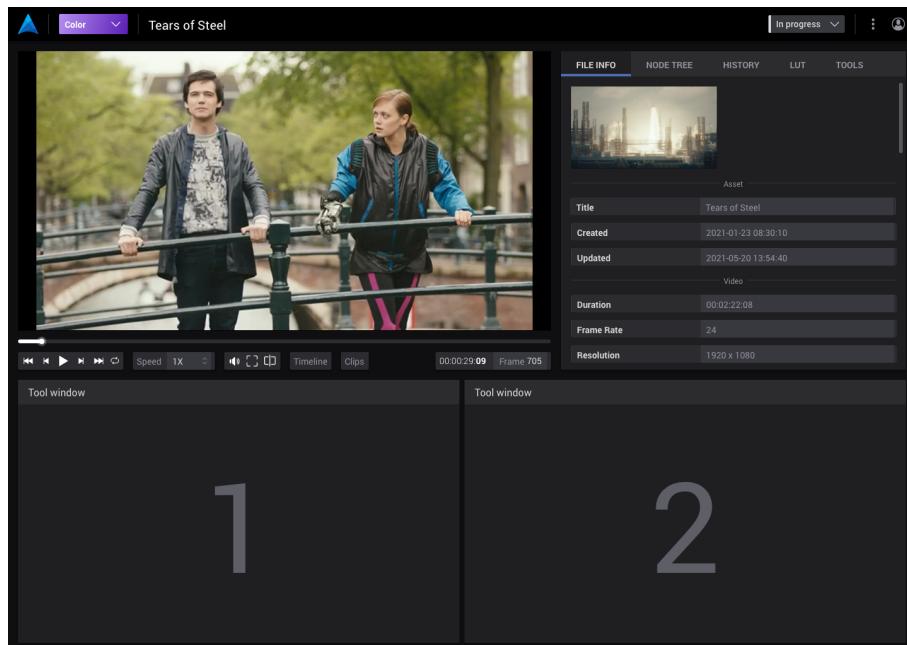


Figure 14: Appearance on the Color page when the File info tab is visible, and no tool is selected.

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Figure 15 shows the different functions for displaying the clip. Where “A” is the playback of the clip, it shows the time and frame on which the image is in the clip. Here the user can drag to select the time he wants for the image to be displayed in the clip. Where “B” are buttons to choose to go backwards or forwards in the clip, start or stop the clip or be able to put the clip in a loop. The double arrow is used to step 10 frames, front and rear, and the single arrow is used to step 1 frame. Where “C” is used to be able to choose the speed at which the clip is to be displayed. Where ”D” has three different functions, the first is for the user to be able to choose to turn the sound on or off. The second is for choosing to show the clip in full screen and the third is for being able to split the screen between different clips and thus be able to show different clips at the same time. Where ”E” is to be able to display the timeline, and ”F” to display thumbnails of the various clips that have been uploaded and there to be able to click to adjust that clip.

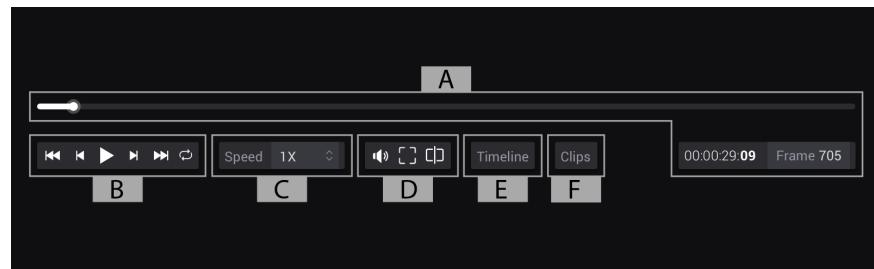


Figure 15: The different functions for displaying the clip.

Figure 16 shows the appearance on the Color page. At the top right is the box with the tab Tools visible. In place 1, the user has chosen to add the Scope tool and to display the Parade view. In place 2, the user has chosen to add the tool Primaries and to display the Wheels view.

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Figure 16: An example of what the *Color* page can look like when two different tools have been selected.

In figure 17, the user has chosen to make adjustments on Lift, Gain and Offset. The user can choose to either do a complete reset by clicking on the icon in the upper right of the header in the tool. Or a reset can be done individually in those in which adjustment has been made.



Figure 17: An example of what it looks like when the user has made an adjustment in the *Primaries* tool, in the *Wheels* view.

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Being able to navigate between different views in one tool can be done in two ways. Either by clicking on the "rings" in the middle of the header or bring up the menu by clicking on the name of the view. Figure 18 shows an example of what it might look like when the user has accessed the menu when it is in the Wheels view in the Primaries tool to be able to navigate to the Basic view.



Figure 18: An example of what it might look like when the user has opened a menu for navigation.

Chapter 5

Discussion

In this chapter, the work before the creation of the prototype, the design proposal for the prototype, and color correction and grading in Accurate Video will be discussed. The purpose of this work was to investigate and gain an understanding of the field of color correction and grading, and the people who work in this field. As well as examine which tools the colorists used and considered most important to carry out their daily work in the programs they used, find out what their needs were. Based on the information obtained, be able to design a prototype proposal to be able to apply in Accurate Video.

5.1 The work leading to the creation of the prototype

The interviews were conducted with people who have a colorist as their title. As a thorough research in the area was carried out before the work with the interviews started, a good basis was obtained for the formulation of the interview guide. It also meant a better understanding of what they would talk about, and thus be able to adequately follow their reasoning.

Getting in touch with colorists was relatively easy. During searches on LinkedIn and via the web with the keyword "colorist", a number of names came up and after checking that they worked with Post-Production, a request was sent out if they wanted to participate in the study. 5 persons answered that they were happy to participate in the interviews. The participant 6 that I came in contact with was via suggestions from Codemill. According to the supervisor at Codemill, it was positive that so many answered, however, he said that I needed to think about not bringing in too many to interview since processing interview material is very time consuming. In this case, there was a time limit, and therefore the study was limited to these six interviews. It can be mentioned that more people responded to the request and were positive to participate after the said number of participants was determined.

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Without having to select the people to be interviewed and not having to consider which industries they worked for, the outcome was positive in that the interviewed colorist worked in a wide range from small ads to big screen movies, where the majority worked with advertising, TV series and programs, documentaries, drama, and film. Why it can be considered positive is because none of them were niched in a particular type of assignment and this makes it more likely that the greatest possible width in the answers was obtained.

The research included examining existing software and their tools, which also provided a very good basis for conducting the interviews, because when they described how they worked I could not only understand what they were talking about, I could also have the program up in my own computer and thus be able to follow their reasoning. The positive thing was that two of the participants turned their camera to show their control panel and their screens with software, so I could even more clearly understand what they meant, which was appreciated when we were not sitting in the same room but met via video call.

What struck me during the interviews was that all colorists conveyed the feeling of being happy in their profession, and that it seemed to be a fun profession. This explains why they remained in the professional role for a relatively long time, in two of the cases for a very long time. The fact that they have worked in the area for a long time means that it can be considered that they have solid professional experience, and this gives credibility to the answers received.

During interviews, information was obtained in the colorists' own words, including what colorists are as a profession, what color correction and grading are, they described / explained for example about color space as this is a big part of their work when it comes to matching materials from cameras with different color spaces. Most of this information correlated well with what had been found in the preceding review of the literature.

One scope of this thesis was to investigate which of the tools used for color correction and grading was considered by the colorist to be the most important to use in Post-Production. Even though different types of software were used by them, they answered almost unanimously in the interviews regarding which tools they considered the most important. It is debatable that there are apparently relatively many tools they consider most important, around 20. To remember is that in the programs they use there are significantly more tools they did not mention. The tools they considered the most important were taken into account when the prototype for Accurate Video was created.

Thanks to the similarity between the answers obtained from all the interviewees, it can be considered that they are reliable and that what was said was a very good basis for carrying out the design of the prototype. Conducted interviews provided an insight into the role of people in this field of work, and in this way were able to achieve a prototype that suited both the professional group colorists and Accurate Video.

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In the interviews it emerged that depending on the purpose of the footage, the time frame of the work of colorists can vary. However, in summary, they usually work under time pressure. One of the colorists stated about time, "it is never enough". This aspect needed to be taken into account when designing the prototype. It must be easy to understand, and that the colorists must be able to easily navigate the software, especially under time pressure.

When thinking of "conducting an interview", I have so far usually thought that you meet the people in question. Due to the ongoing pandemic, Covid -19, this could not be done, but it had also fallen on its unreasonableness to go over to the USA to conduct one of the interviews. The people interviewed were spread across Sweden and one was in the USA. Conducting interviews via Zoom was therefore a perfect fit. A disadvantage was not being able to see their hands-on on the control panel, and in what exactly they did in the image and UI. If we had been sitting in the same room, I might have been able to gain a broader understanding of the details. However, I do not think that it affected the outcome of the interviews. The interviews went well. Although my previous experience in conducting interviews is on a junior level, I believe the outcome from this study became very valuable. Conducting the interviews has also offered me a great experience and a confidence in performing this type of studies in the future. All participants were nice and wanted to share their experience in the profession. In five of the six interviews, the interview went well according to the interview guide, in the sixth case, a challenge arose in smoothly inserting the questions along the interview. The person in question was very talkative and very proud of his work. This meant that this interview was 20 minutes longer than the others, so that most of the questions in the questionnaire would be completed.

When it came to transcribing recorded material, the Sonix tool was a great help. An advantage was that in the program both the text and the video were shown at the same time and that the words that were said in the video were marked in the text to easily keep up. But unfortunately, the text did not always turn out to be exactly what was said, and correction of the text needed to be done. So more time than expected was spent transcribing, even though a computer program was used. This was a lesson that even if a transcription program is used, it takes time, but without the program, it would have taken even more time. For future interviews and transcription, this time aspect is something for me to keep in mind when planning a project.

Affinity diagramming was a completely new method for me that my supervisor at Codemill suggested should be used because he uses this method when organizing notes from interviews. I experienced this method as useful, and by using it I was able to break the interviews into pieces of information, and then cluster the obtained information into themes. This method gave me an overview of the material obtained. Instead of reading the transcript and based on the mass of text, making continuous notes, and trying to extract information about the common denominators from the respondents, this method with sticky notes was of great help. Through these sticky notes with information, I was able to get a good understanding of the context, see parts that stood out without making it the subject of perceptions that I

as a researcher may have.

5.2 The prototype

What emerged during this thesis was the colorists' needs and goals, namely the tools they say they need to be able to adjust the images with regard to color correction and grading, and that consideration should be given to the design theories and that the UI on the prototype should follow the appearance in Accurate Video as long as possible.

The tools added to the prototype are those the colorists described in section 4.2.5. This because all six interviewees identified these tools as the ones they need to be able to carry out their work. With regard to design theory, this can be considered to have been taken into account in the proposed prototype. Both the current user interface that follows the design theories already described in this document, and the already determined design in Accurate Video. For example, the choice of colors, placement of specific objects, fonts, and designed building blocks, such as buttons. The existing UI / UX has previously been checked in Accurate Video. The established names used in existing software that the colorists already use and are familiar with, have been used in the prototype. That is why the prototype has the resulting appearance.

The work on the prototype was initiated by a brainstorming session. As the literature research had provided a solid foundation, this process was quick and easy. When working with the prototype, existing programs on the market were first studied. This was helpful in understanding the structure colorists were used to. This, combined with looking at the appearance of the existing layout in Accurate Video, made the work on version 1 of the LoFi prototype relatively fast. Since the sketch was drawn by hand with paper and pencil, after discussion with the supervisor at Codemill, adjustment to version 2 could be done quickly. The LoFi prototype facilitated the construction of the HiFi prototype, as it presented a clear vision of the structure and appearance of the prototype.

Throughout the period of the creation of the prototype, close contact was maintained with the supervisor at Codemill, who provided feedback on the outcome and encouraged me to constantly think during the process about why I made the choices I made. This feedback was invaluable not only during the design process but throughout the work on the thesis.

On the question “Is there any shortcoming in the tools you use today?” all colorists replied that they did not see any shortcomings or ambiguities in the tools they use. This meant that no inputs with respect to improvements needed to be considered when creating the prototype.

From the interviews, it is clear that colorists today use a control panel to a greater extent than using a mouse. The development of the user interface in the prototype was not affected by this fact, but this is something that needs to be investigated more with regard to programming.

5.3 Color correction and grading in Accurate Video

One thing that could facilitate a colorist's work when it comes to communicating with the client is that they in Accurate Video can be in the program at the same time, without having to be in the same place. This avoids having to send the material between each other, as the material is cloud stored and does not need to be downloaded. This is time saving. The client can see the material that the colorist works with, and in this way be able to quickly give feedback on the work performed. One thing to keep in mind is that the colorist should be able to decide if the customer should only be able to see the material and not be able to change it. This is a thought that has struck me during the project, but it has not been investigated in this project and has therefore not been taken into account in the creation of the prototype.

Another aspect is that in large productions, colorists often work on the set together with directors and photographers, and there directly on the set, the first look of the material is often put. Therefore, I think that the proposed application in Accurate Video, with the tools that colorists consider most important, would fit well as a complement to the software currently on the market.

Chapter 6

Conclusion

The goal of this thesis was to design a user interface for color correction and grading tools for the Accurate Video application that meet the goals and needs of the people in this field of work, i.e. colorists.

To succeed in this, research was conducted with respect to literature studies and studies on what existing professional editing programs look like. Based on this knowledge, qualitative interviews were conducted with people who had a colorist as their professional title. They all had solid knowledge in the field, and they all worked in a wide range of productions. The aim of these interviews was to crystallize what they use in these programs and what tools they considered most important to use in Post-Production. The information obtained from the colorists together with facts from literature studies provided a framework for developing a prototype.

One conclusion that can be drawn is that the proposed prototype suits the target group that will use it, because the answers they provided to the questions were used as the basis of the prototype. Answers regarding what they use in the programs and which tools they considered to be most important, were consistent and the participants responded similarly. These answers formed the basis of the prototype.

Another conclusion is that based on the participants describing that there were no shortcomings in the tools and user interface they use, it meant that any improvements did not need to be taken into account when creating the prototype. It could also be concluded that the same tool is used regardless of the type of assignment and production, so the prototype did not need to be niched in any direction.

A final conclusion can be drawn that the information obtained from the interviewed colorists is credible because it is consistent with the information obtained from the literature studies.

6.1 Future work

Due to the time constraint for this thesis, testing of the prototype has not been performed. It would be valuable if colorists could answer if there are ambiguities in it, or if something needs to be changed. This is something that needs to be checked in the future. Participant 1 stated that he/she can participate as a test person if the prototype is to be tested in the future, and was very interested in the work and the outcome of it.

Since colorists in their work with color correction and grading use a control panel, and only have a mouse as a complement, in the future, it needs to be investigated how it could be solved so that Accurate Video becomes compatible with a control panel.

Another thing that needs to be addressed is to see how to resolve that a video should not be compressed but should be in original format when placed in the cloud storage. This is when the work with color correction and grading is to be performed in Accurate Video.

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Appendix A

Interview guide (Swedish)

Intro

Jag heter Frida Andersson och är en student som läser sista året på Civilingenjörsprogrammet Interaktion & Design. Vill börja med att säga tack att du tagit dig tid att delta i denna intervju!

Denna undersökning ingår i mitt examensarbete som genomförs på Umeå Universitet med företaget Codemill. Studien går ut på att undersöka hur colorister arbetar i sitt vardagliga arbetsliv i de program som finns att tillgå, och genom den informationen få en djupare förståelse för att kunna ta fram ett förslag till en applikation för color correction och grading.

Ditt deltagande i intervjun är frivilligt och du har rätt att avbryta intervjun om du önskar när som helst. All personlig information som samlas in i undersökningen behandlas anonymt, kommer inte kunna kopplas till dig och informationen kommer inte spridas vidare till tredje part.

Vill bara verifiera att det är okej att spela in det här? Eftersom det skulle vara användbart för mig att kunna gå tillbaka och lyssna, men även för att kunna transkribera. Är det okej med dig?

Vill också att du ska veta att det finns ingen dålig information du kan dela med dig av och att alla insikter jag får genom denna intervju kommer att vara av värde. Du har ingen press på dig som deltagare i det här, jag är intresserad av vad du har att berätta, lämna inte ute någon info.

Mål (endast för mig, påminnelse under intervjun)

Vill komma fram till vilka verktygen är som de använder i programmen för att veta hur jag ska designa en prototyp.

- *Få en grund av vad en colorist är*
- *Hur jobbar en colorist?*

APPENDIX A. INTERVIEW GUIDE (SWEDISH)

- *Vilka verktyg använder dom i programmen?*
- *Vilka eventuella problem har ni i verktygen ni använder idag?*
 - *Vad är det dom vill uppnå?*
- *Kontrollera om det är någon skillnad att arbeta med film, reklam eller serie?*

Inledande frågor

- Innan vi drar igång, berätta gärna lite om vem du är, så vem är du?
 - Vad motiverar dig till att jobba som colorist?
- Hur länge har du jobbat inom det här området med color correction och grading?
- Vad är en colorist? Kan du berätta om ditt jobb som en colorist, vad gör du? Vad innebär den titeln?
- Vilken typ av projekt / produktioner brukar du generellt arbetat med?
- Om man jobbar med olika sorters produktioner, typ film, serie eller reklam, är det olika förutsättningar? Är det olika typer av problem man stöter på?
 - Så du menar att det inte är någon skillnad hur man jobbar i det olika?
 - Så du menar att det är skillnad hur man arbetar, vad är största skillnaden?
- Arbetar du ensam eller i team?
 - Vilka andra typer av roller samarbetar du med?

Generella frågor om color correction & grading

- Kan du beskriva arbetsflödet under ett projekt med color correction & grading? Vad är en typisk uppgift?
 - Hur mycket tid spenderar man på en typisk uppgift? När förväntas det att man ska leverera resultatet på det man gjort?
 - Var i processen använder du color correction och var använder du grading?
 - När är det du kommer in i processen?

APPENDIX A. INTERVIEW GUIDE (SWEDISH)

- Om du skulle behöva göra snabba fix och justeringar, vad i bilden är det som är vanligast man måste ändra då?
 - Vilka verktyg är det då du använder för att fixa till dom?
- Vilket typ av program använder du och varför är det just det programmet?
- Hur skiljer sig arbetet mellan color correction & grading?
 - Är det samma program du använder under color correction och vid grading?
- Vilka verktyg i programmen använder du?
- Är något verktyg i programmen som du tycker är bättre och viktigare än andra som jag bör ta hänsyn till?
- Finns det någon brist i verktygen som du använder idag?
- Vilket är det vanligaste problemen du stöter på när du jobbar i programmen?
 - Vad är det ni vill uppnå i arbetet med att lösa dom?
- Om det finns snabba fix:
 - Om man går tillbaka till dom snabba fixen, kan man generalisera vilka dom är?
 - Är det inte så att ni brukar använda er av justeringar av brightness, contrast och saturation? Är det något som är viktigt eller inte?

Slutliga frågor

- Har du något mer du har att önska lägga till, som är bra för mig att veta som jag inte har frågat om?
- Har du någon fråga till mig?

*Tack ännu en gång för att du har tagit dig tid att delta och svara på mina frågor.
[Lämnar inspelningen igång]*

Följer upp med:

Kändes frågorna relevanta eller har du något mer att tillägga?

Om du senare skulle komma på något som du vill tillägga är det bara att kontakta mig antingen via LinkedIn eller mail. Kontaktuppgifterna har du redan eller vill du ha dom igen?

Om jag skulle komma på en följdfråga, är det då okej att jag hör av mig?

Appendix B

Interview guide (English)

Intro

My name is Frida Andersson and I am a student studying the final year of the Master of Science (MSc) program Interaction & Design. I want to start by saying thank you for taking the time to participate in this interview!

This research is part of my master thesis that is carried out at Umeå University with the company Codemill. The study aims to examine how colorists work in their daily working lives in the programs that are available, and through that information gain a deeper understanding to be able to develop a proposal for an application for color correction and grading.

Your participation in the interview is voluntary and you have the right to cancel the interview if you wish at any time. All personal information collected in the survey will be treated anonymously, it will not be linked to you and the information will not be passed on to third parties.

I just want to verify that it's okay to record this? This is because it would be useful for me to be able to go back and listen, but also to be able to transcribe. Is that okay with you?

Also want you to know that there is no bad information you can share and that all the insights I get through this interview will be of value. You have no pressure on you as a participant in this, I am interested in what you have to say, do not leave any info.

Goal (only for me, reminder during interview)

Want to find out what tools they use in the programs to know how to design a prototype.

- *Get a foundation of what a colorist is*
- *How does a colorist work?*

APPENDIX B. INTERVIEW GUIDE (ENGLISH)

- *What tools do they use in the programs?*
- *What possible problems do you have in the tools you use today?*
 - *What do they want to achieve?*
- *Check if there is a difference between working with film, advertising or series?*

Introductory questions

- Before we get started, feel free to tell a little about who you are, so who are you?
 - What motivates you to work as a colorist?
- How long have you been working in this area of color correction and grading?
- What is a colorist? Can you tell me about your job as a colorist, what do you do? What does that title mean?
- What type of projects / productions do you usually work with in general?
- If you work with different types of productions, such as film, series or advertising, are there different conditions? Are there different types of problems you meet?
 - So you mean there is no difference how you work in the areas mentioned?
 - So you mean there is a difference in how you work, what is the biggest difference?
- Do you work alone or in a team?
 - What other types of roles do you collaborate with?

General questions about color correction & grading

- Can you describe the workflow during a project with color correction & grading? What is a typical task?
 - How much time do you spend on a typical task? When is it expected that you will deliver the result on what you have done?

APPENDIX B. INTERVIEW GUIDE (ENGLISH)

- Where in the process do you use color correction and where do you use grading?
- When do you get into the process?
- If you need to make quick fixes and adjustments, what in the image is the most common thing you have to change then?
 - What tools do you use to fix them?
- What type of program do you use and why is it that particular program?
- How does the work differ between color correction & grading?
 - Is it the same program you use during color correction and grading?
- What tools in the programs do you use?
- Are there any tools in the programs that you think are better and more important than others that I should consider?
- Is there a shortcoming in the tools you use today?
- What are the most common problems you encounter when working in the programs?
 - What do you want to achieve in the work of solving them?
- If there are quick fixes:
 - If we go back to the quick fixes, can you generalize who they are?
 - Is it not the case that you usually use adjustments of brightness, contrast and saturation? Is it something that is important or not?
- If you had to decide what really needs to be included in order to do your job, what are the ones you need to include?
- Do you usually use scopes?
 - Which of them do you use most often?

Final questions

- Do you have anything else you would like to add that is good for me to know that I have not asked about?
- Do you have a question for me?

APPENDIX B. INTERVIEW GUIDE (ENGLISH)

Thanks again for taking the time to attend and answer my questions.

[Leaves the recording running]

Follow up with:

Did the questions feel relevant or do you have something more to add?

If you later come up with something you want to add, just contact me either via LinkedIn or email. Do you already have the contact information or do you want it again?

If I were to come up with a follow-up question, would it be okay for me to contact you?

Appendix C

High-Fidelity prototype

This appendix presents all the images of the outcome of what the HiFi prototype looks like. The prototype is based on data from interviews, design guidelines, literature studies and the appearance of Accurate Video.

First, pictures are shown of what the tabs look like, figure 19 to 25. Then it is shown what the tools look like and what their adjustments can look like, figure 26 to 76. Then pictures are shown of what it looks like when the user has clicked on the tool name and a menu is shown, figure 77 to 111. Finally, under the Color page where the user works, figure 112 to 171, examples are shown of how the tools could be in the program, to get an understanding of the appearance of the program.

The tabs

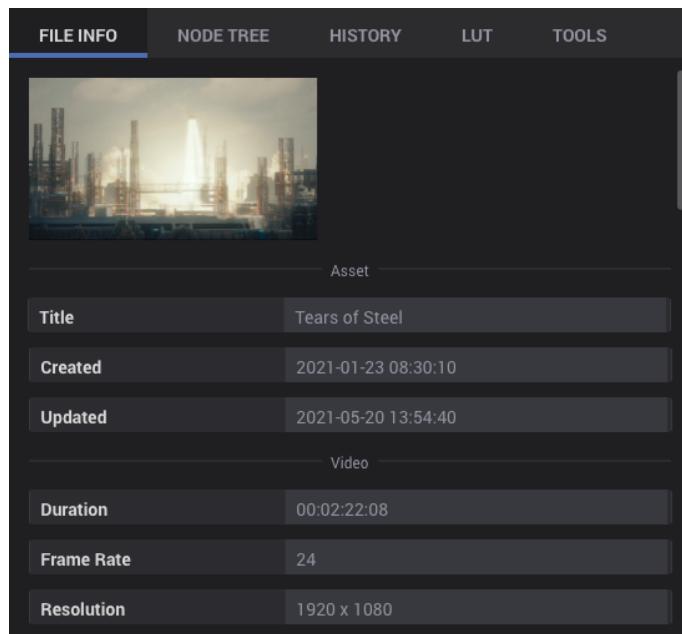


Figure 19: Appearance of the *File info* tab. Which shows the information of the clip in which the user adjusts.

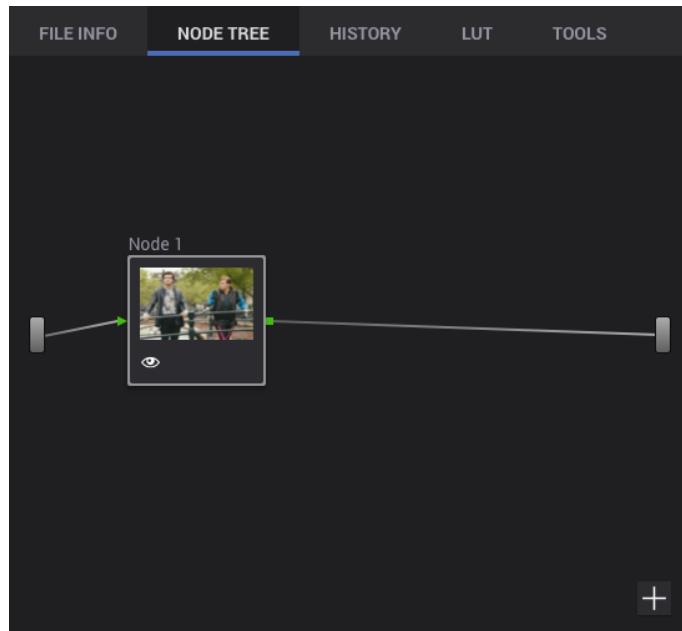


Figure 20: The appearance of the *Node tree* tab. Here the user has not made any adjustment, the image shows what it looks like from the beginning when the user opens the program with a new clip. Using the plus at the bottom right, the user can make an additional node.

APPENDIX C. HIGH-FIDELITY PROTOTYPE



Figure 21: The appearance of the *Node tree* tab after adjustment has been made. The user can see which of the tools has been used on each node using the icon on the tool. With the "eye" icon, the user can turn that node on or off, to make it visible or not. Here it also can be seen which of the nodes is active, i.e. in which node the user makes adjustments in. The user can click between the nodes to select which one should be active.

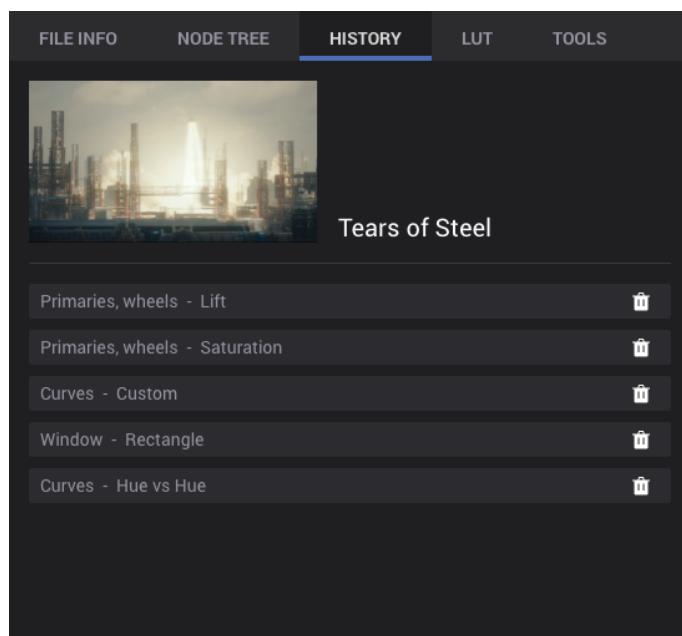


Figure 22: The appearance of the *History* tab. There, in a list, the user can see what has been done and can also throw / remove an adjustment, if desired.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

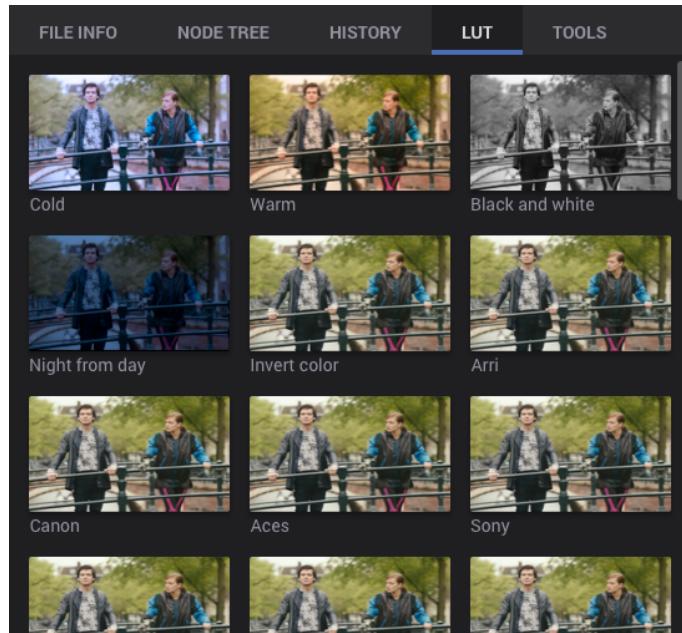


Figure 23: The appearance of the *LUT* tab. This contains thumbnails where the user can click on desired LUT to add on the clip. If the user does not know which one is suitable, the user can first hover over a specific LUT to see its effect in the clip and then it can be selected by clicking on that LUT.

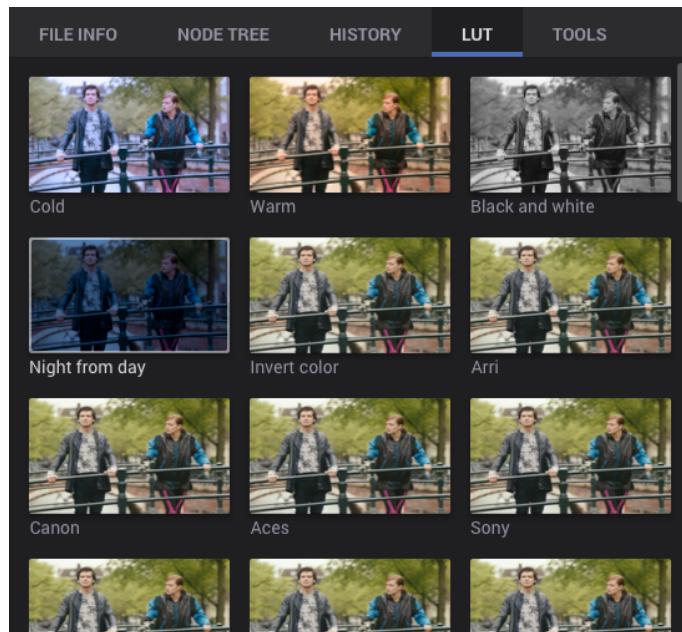


Figure 24: The appearance of when a specific LUT is selected, here it is the LUT *Night from day*. The user can click on another LUT to select it instead, or click on the one selected to delete it and return to the original without a LUT.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

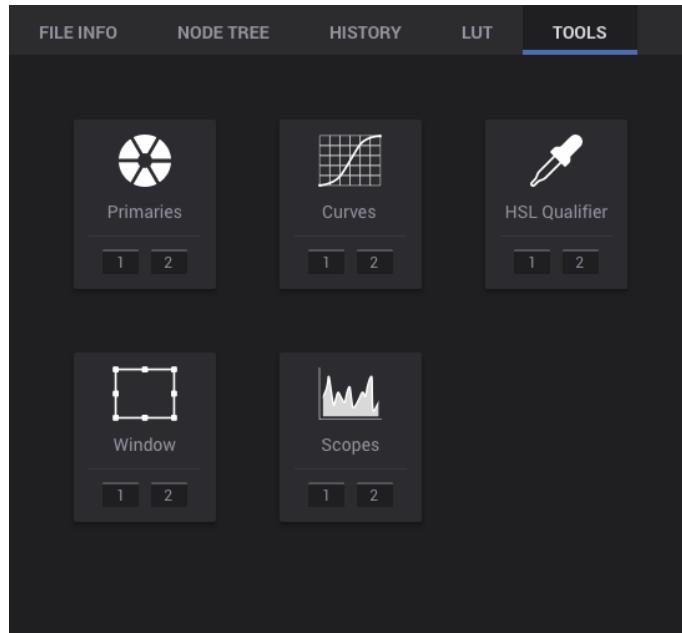


Figure 25: The appearance of the tab *Tools*. These are the ones that the user can choose from to make adjustments in the image. It then shows an icon and the name of the tool, but also icons to be able to choose whether the tool should be opened in tool window 1 or 2.

The tools

The *Primaries* tool has two different views; Wheels and Basic, figure 28 to 31. The *Curves* tool has three different views; Custom, Hue vs Hue and Hue vs Sat, figure 32 to 59. The tools *HSL Qualifier* and *Window* have one view each, figure 60 to 65 and 66 to 72 respectively. The *Scopes* tool has three different views; Parade, Vectorscope and Waveform, figure 73 to 76.

As described in the figure text above, figure 25, the user can decide whether the tool should be opened and placed in 1 or 2.

In the upper right corner in the header of each tool, except for scopes, there is an icon that is there for the user to be able to reset all of what has been done. In the tool Scopes in the upper right corner in the header, there is an icon that is there for the user to be able to expand the tool window to see all three views at the same time. When the user has the extended view open, there is another icon in the upper right corner to be able to leave the extended view.

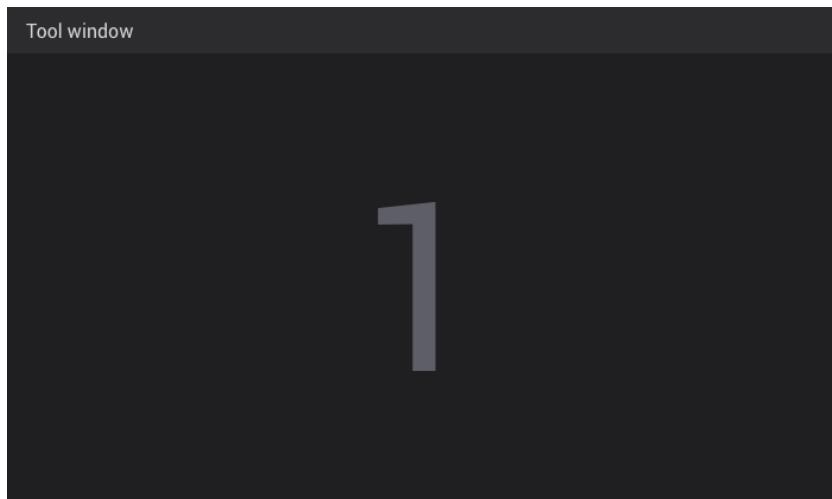


Figure 26: Placeholder 1 where the user can place a tool.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

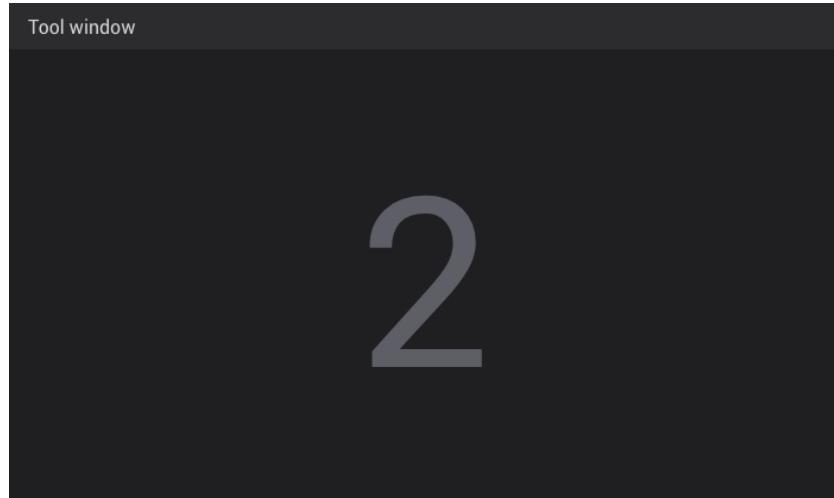


Figure 27: Placeholder 2 where the user can place a tool.

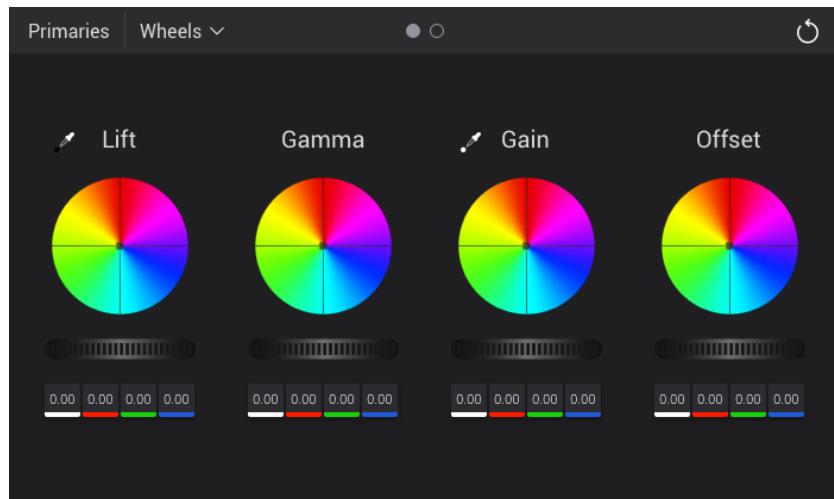


Figure 28: The appearance of the tool *Primaries*, with the view *Wheels*; lift, gamma, gain and offset. The image shows when no adjustments have been made. The wheel (circle) is to adjust the colors and the horizontal wheel adjusts the exposure. There, the user can change both color and intensity in light / dark on each wheel. There are also pickers to be able to select what is the white in the image and what is the black in the image so that the image changes after it. The boxes at the bottom are for the user to see how the wheel adjustments are affected (Luminance, Red, Green, Blue).

APPENDIX C. HIGH-FIDELITY PROTOTYPE

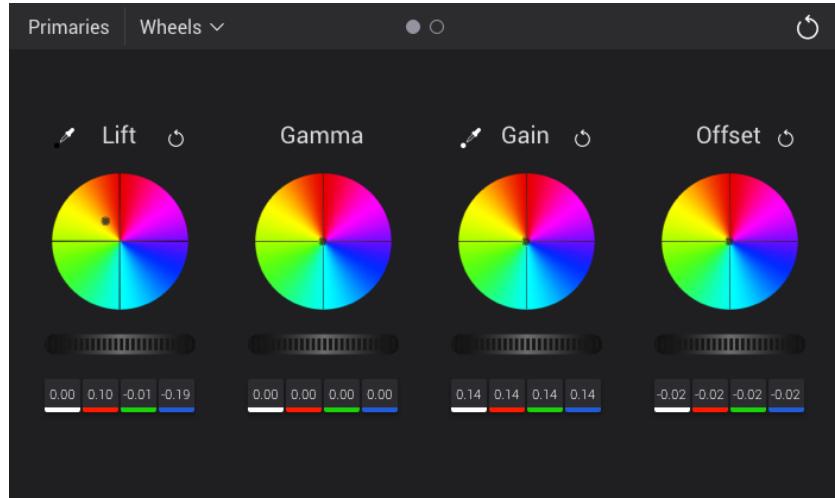


Figure 29: Appearance of Wheels when the user has made adjustments.

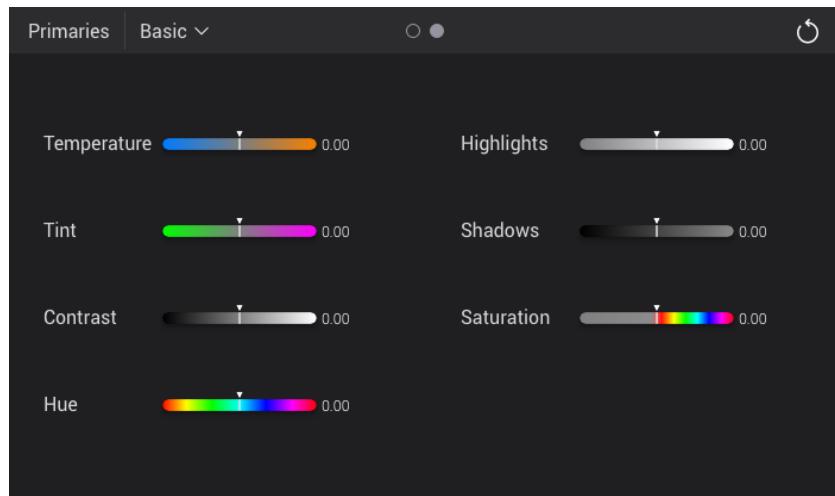


Figure 30: Appearance of the *Primaries* tool, with the Basic view. The image shows when no adjustments have been made. Here the user can choose to drag the different ones from right to left and vice versa to get the desired look.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

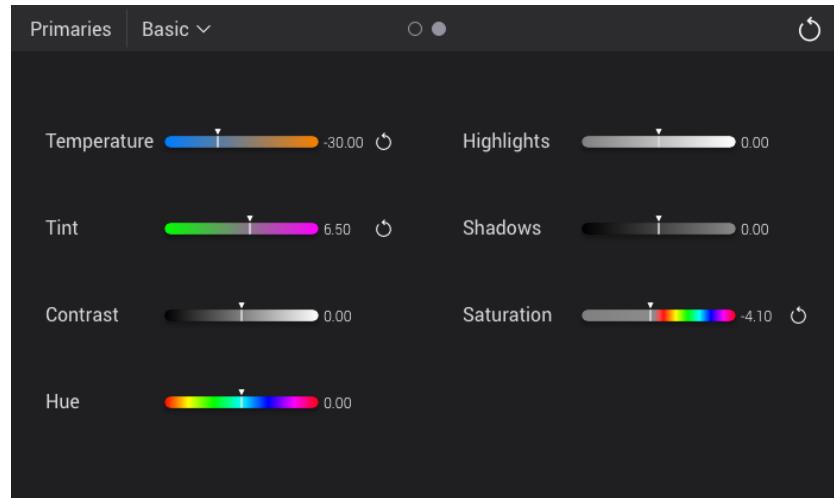


Figure 31: The appearance of Basic when the user has made adjustments.

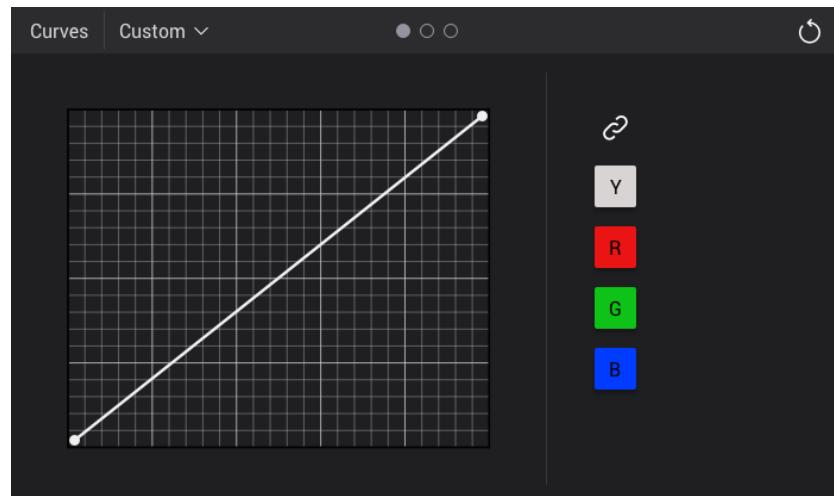


Figure 32: The appearance of the *Curves* tool, in the Custom view. The image shows when the view is opened and no adjustments have been made. Here, everyone is linked to each other, namely Luminance (Y), Red (R), Green (G) and Blue (B).

APPENDIX C. HIGH-FIDELITY PROTOTYPE

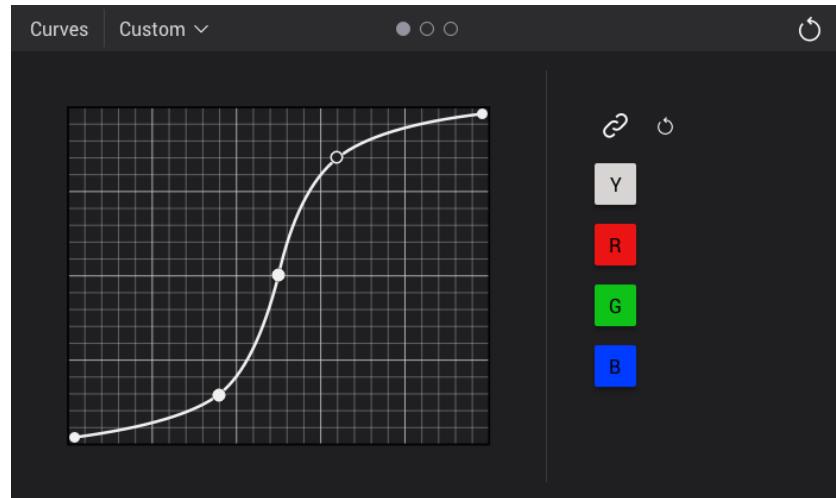


Figure 33: The appearance of Custom when the user has made adjustments, when they are linked to each other (Luminance, Red, Green and Blue).

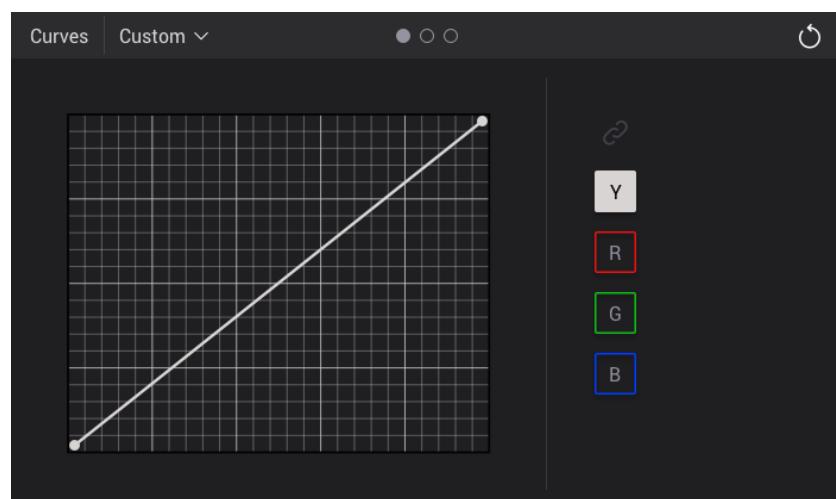


Figure 34: The appearance of Custom when the user has broken the link and only has Luminans active to be able to adjust it.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

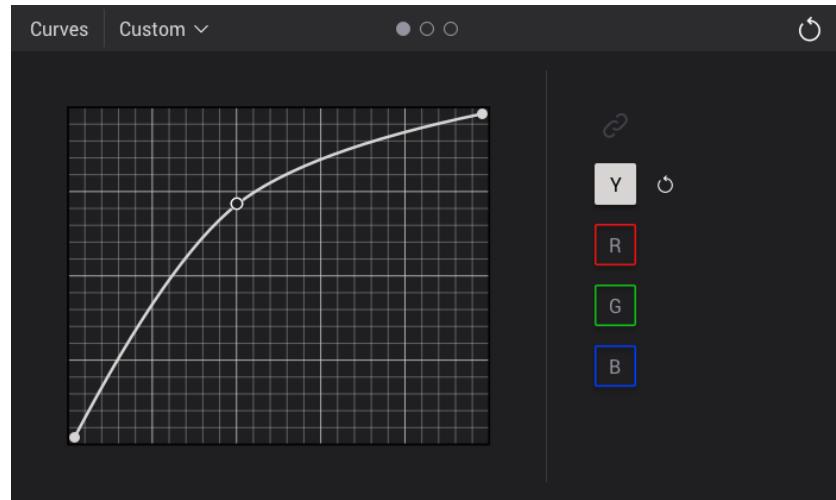


Figure 35: The appearance of Custom when the user only has Luminance active and made adjustments in it.

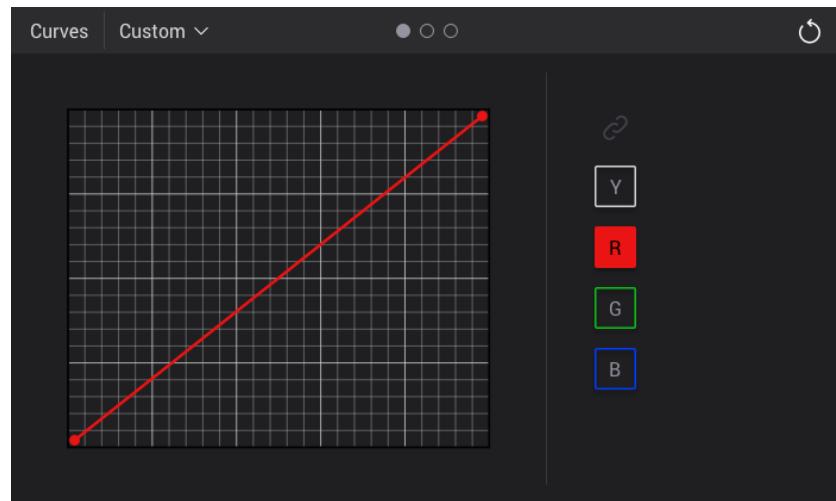


Figure 36: The appearance of Custom when the user has broken the link and only has Red active to be able to adjust it.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

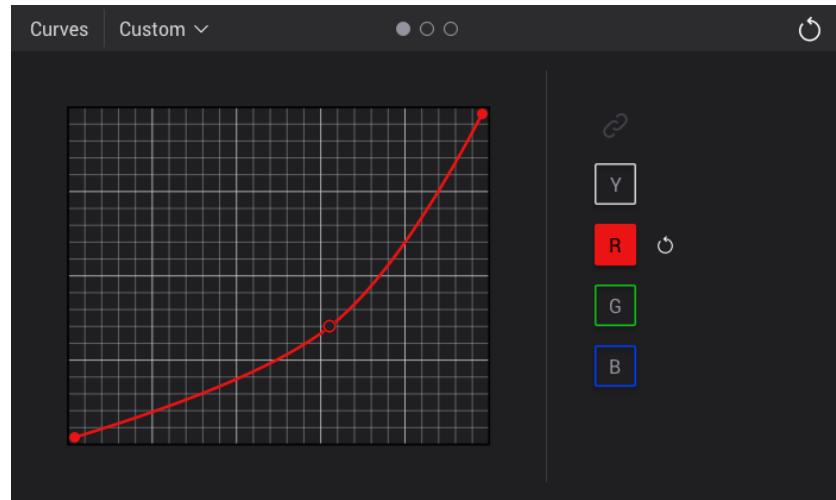


Figure 37: The appearance of Custom when the user only has Red active and made adjustments in it.

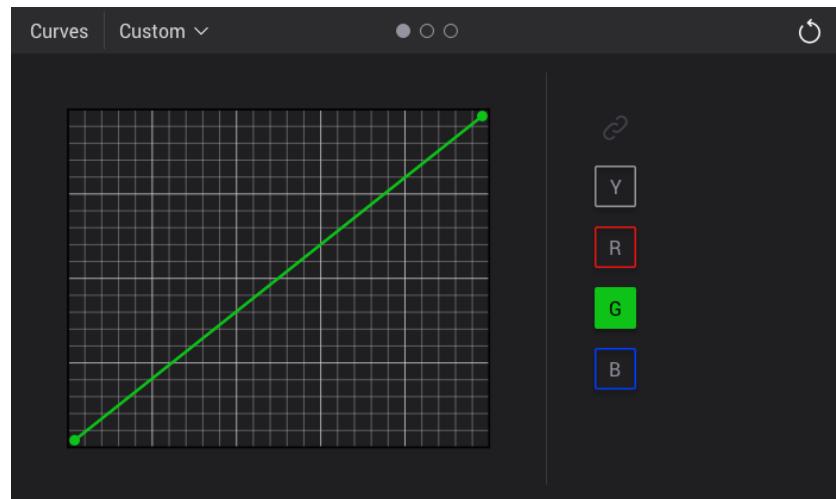


Figure 38: The appearance of Custom when the user has broken the link and only has Green active to be able to adjust it.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

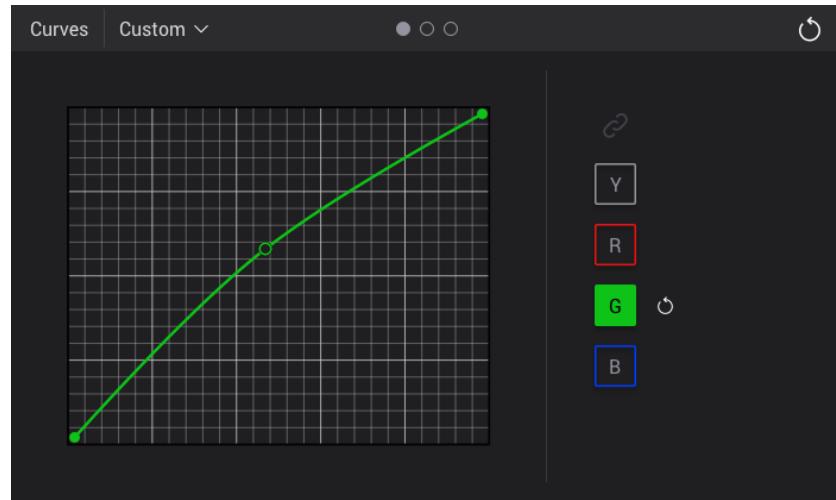


Figure 39: The appearance of Custom when the user only has Green active and made adjustments in it.

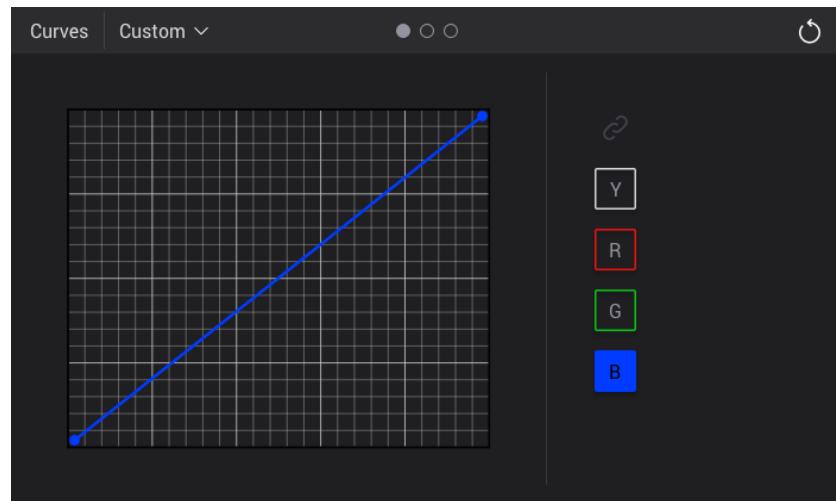


Figure 40: The appearance of Custom when the user has broken the link and only has Blue active to be able to adjust it.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

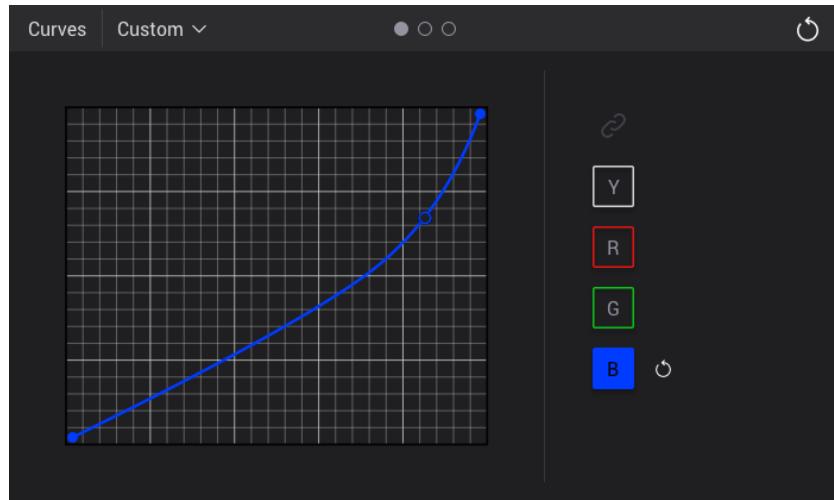


Figure 41: The appearance of Custom when the user only has Blue active and made adjustments in it.

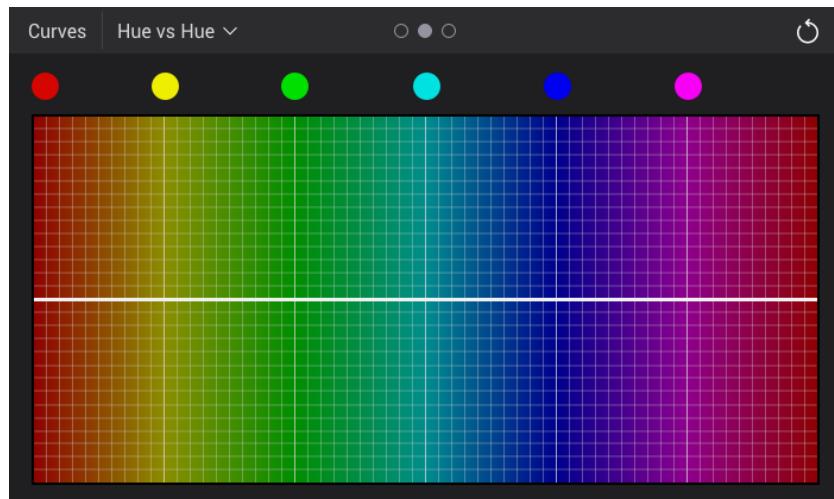


Figure 42: The appearance of the *Curves* tool, in the *Hue vs Hue* view. The image shows when the view is opened and no adjustments are made. Here the user can choose to click on a point on the line to adjust or choose to click on any of the color circles to adjust that color. In this view, the user adjusts a specific color to another color, for example, if the user wants to adjust green, the user clicks on that color and then drags that point to change the green color to another.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

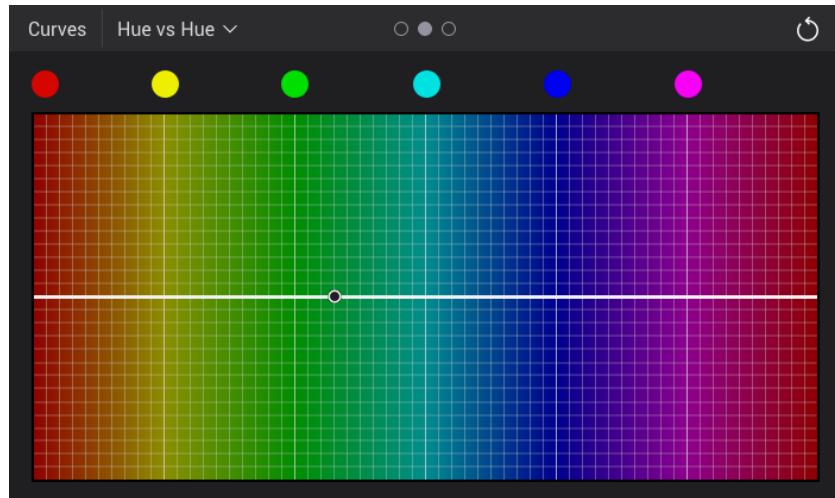


Figure 43: The appearance of Hue vs Hue, when the user has marked a point on the line to be able to make an adjustment.

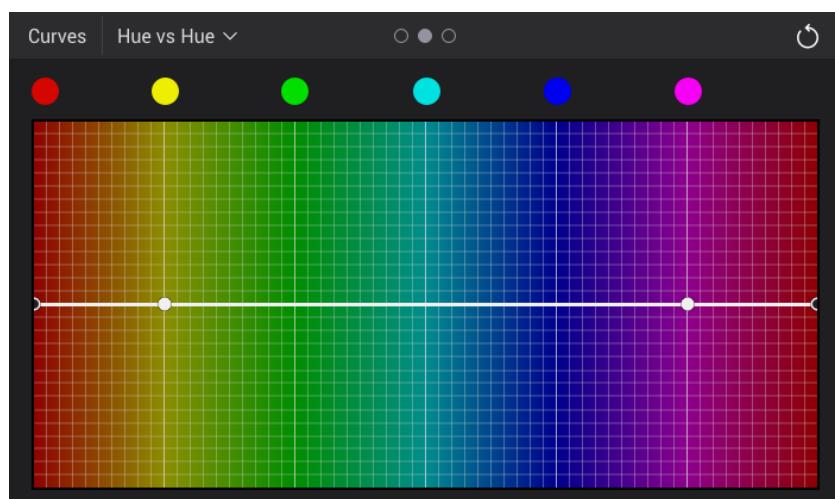


Figure 44: The appearance of Hue vs Hue, when the user has highlighted red by clicking on the red color circle to make an adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

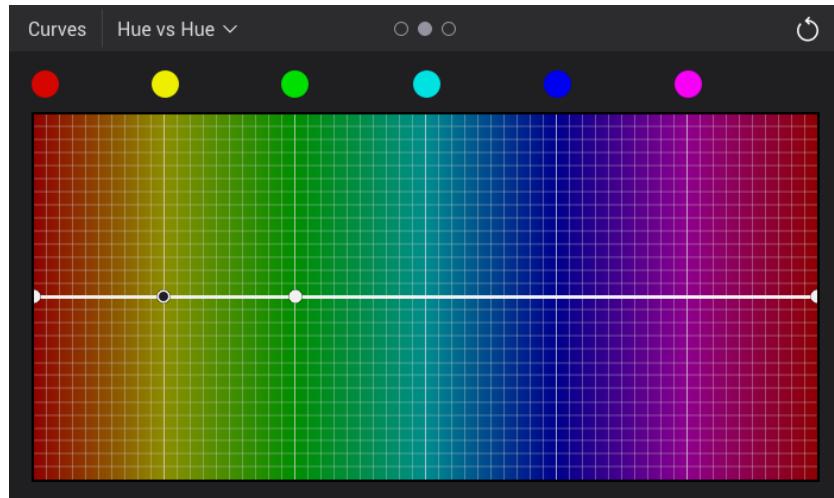


Figure 45: The appearance of Hue vs Hue, when the user has highlighted yellow by clicking on the yellow color circle to make an adjustment.

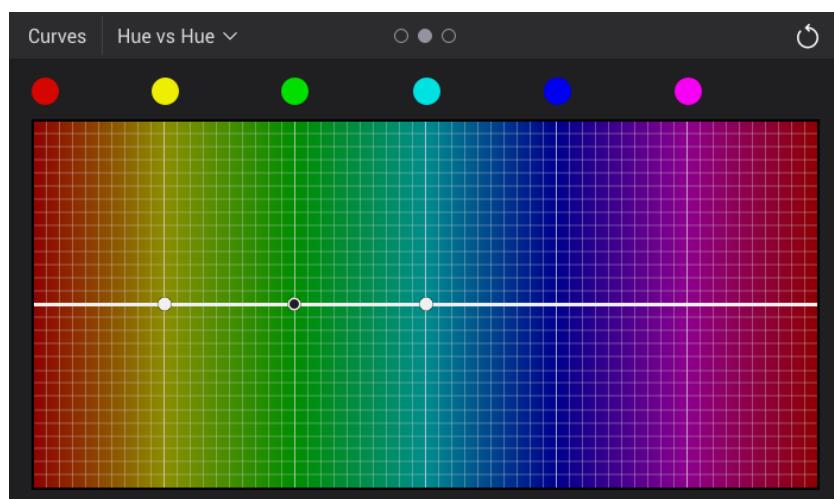


Figure 46: The appearance of Hue vs Hue, when the user has highlighted green by clicking on the green color circle to make an adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

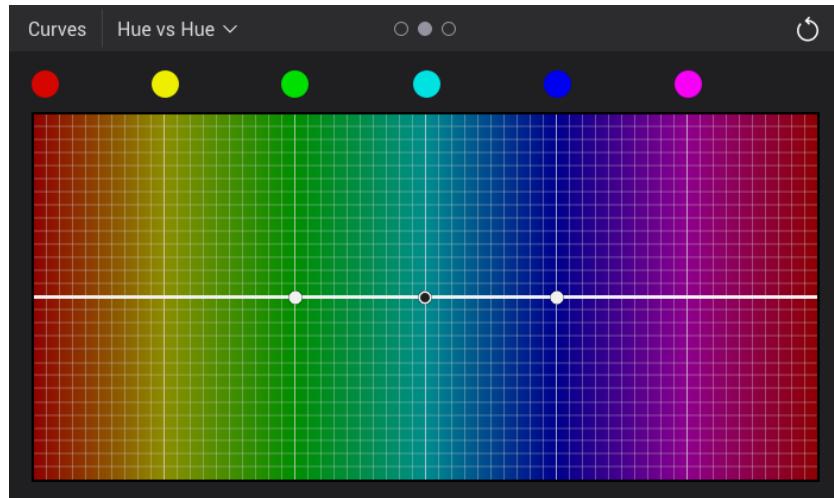


Figure 47: The appearance of Hue vs. Hue, when the user has selected cyan by clicking on that cyan color circle to make an adjustment.

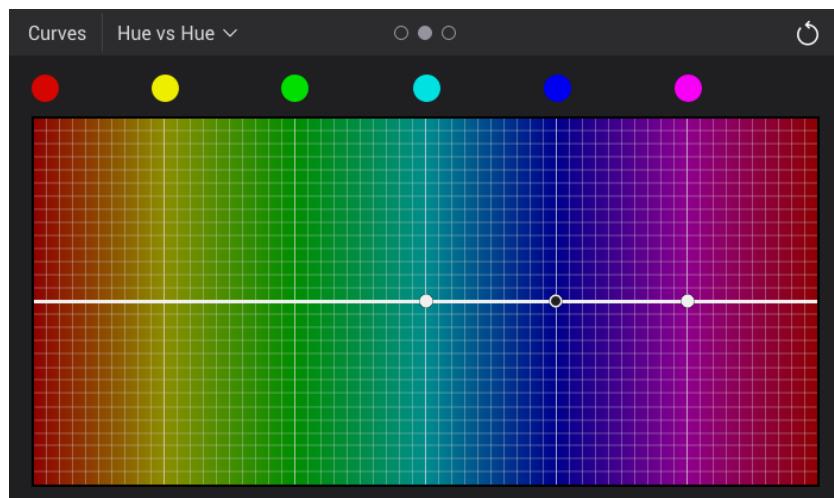


Figure 48: The appearance of Hue vs Hue, when the user has highlighted blue by clicking on the blue color circle to be able to make an adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

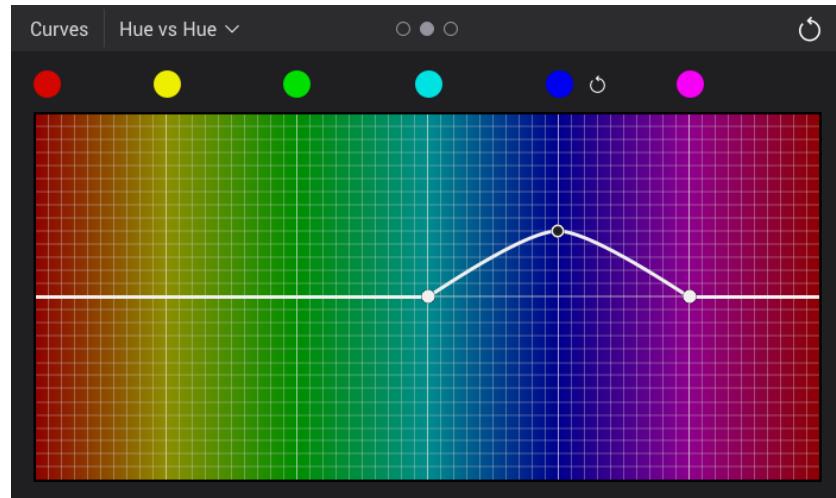


Figure 49: The appearance of Hue vs Hue, when the user has highlighted blue by clicking on the blue color circle and making an adjustment.

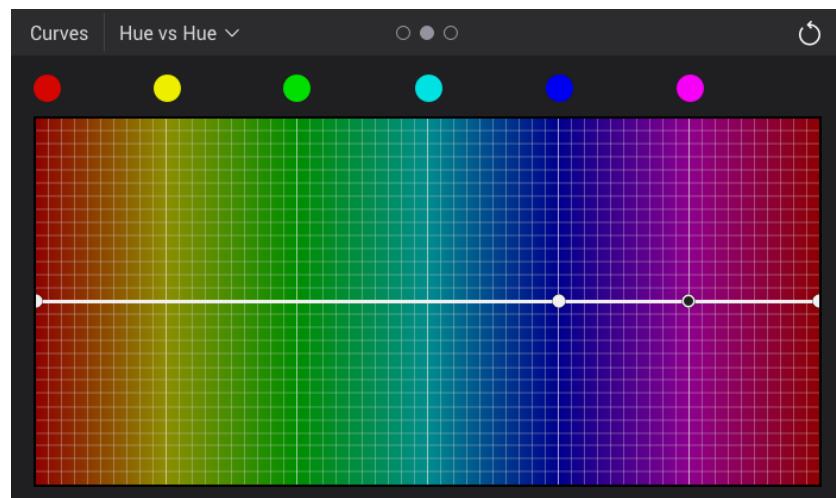


Figure 50: The appearance of Hue vs Hue, when the user has selected magenta by clicking on the magenta color circle to make an adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

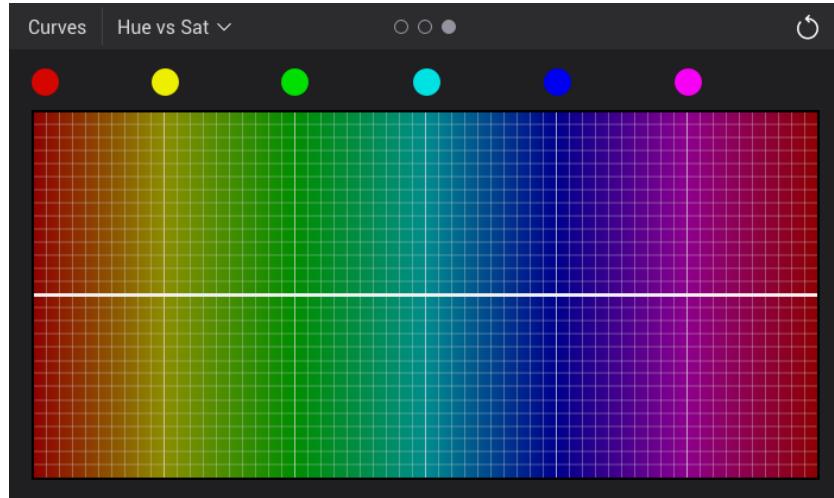


Figure 51: The appearance of the tool *Curves*, Hue vs Sat. The image shows when the view is opened and no adjustments are made. Here the user can choose to click on a point on the line to adjust or choose to click on any of the color circles to adjust that color. In this view, the user adjusts a specific color so that it is more or less saturated, for example, if the user wants to adjust blue, the user clicks on that color and then drags that point to change the blue color to more or less saturated.

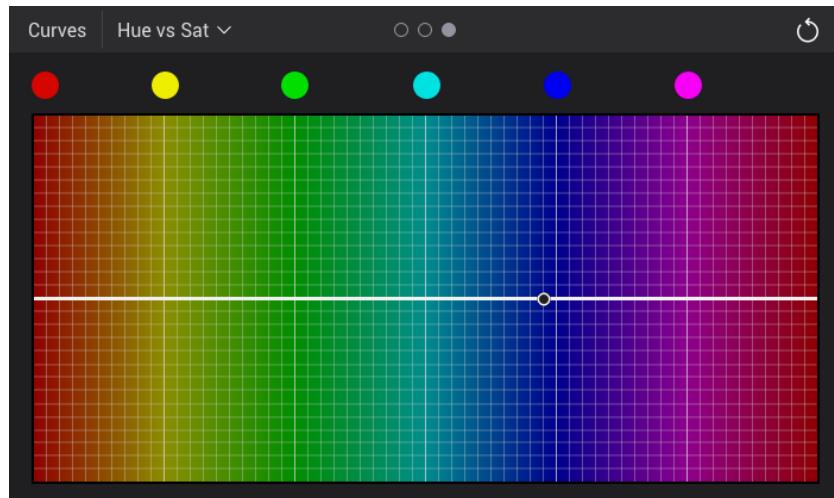


Figure 52: The appearance of Hue vs Sat, when the user has marked a point on the line to be able to make an adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

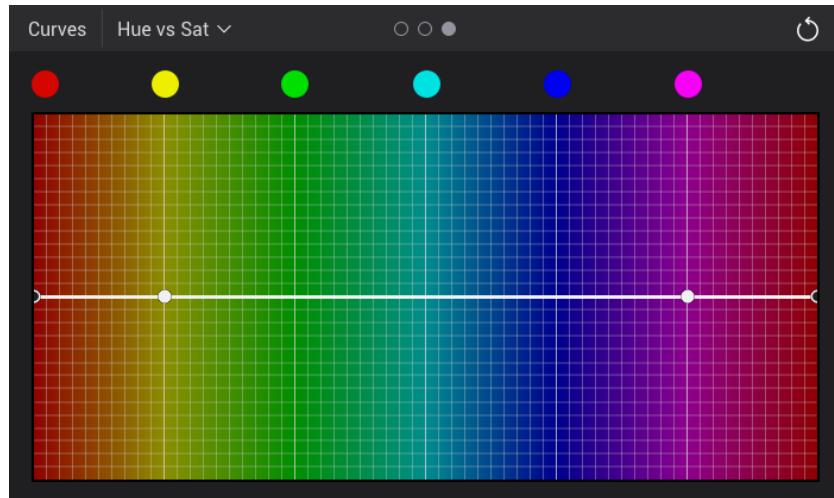


Figure 53: The appearance of Hue vs Sat, when the user has highlighted red by clicking on the red color circle to make an adjustment.

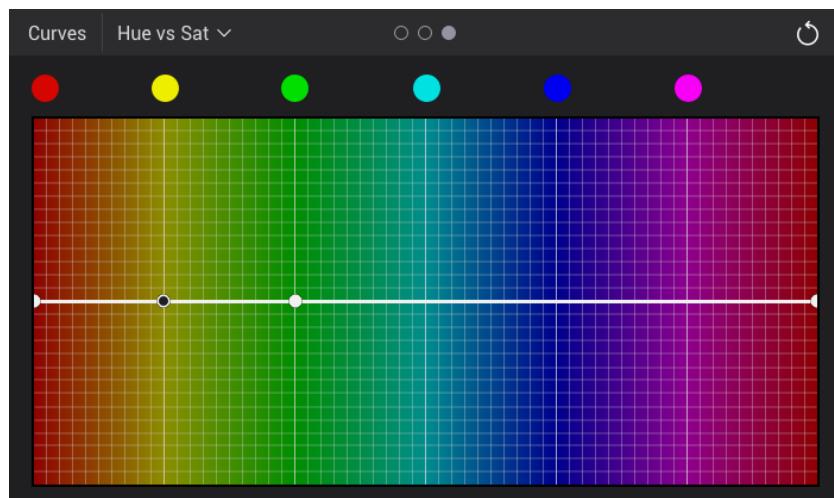


Figure 54: The appearance of Hue vs Sat, when the user has highlighted yellow by clicking on the yellow color circle to make an adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

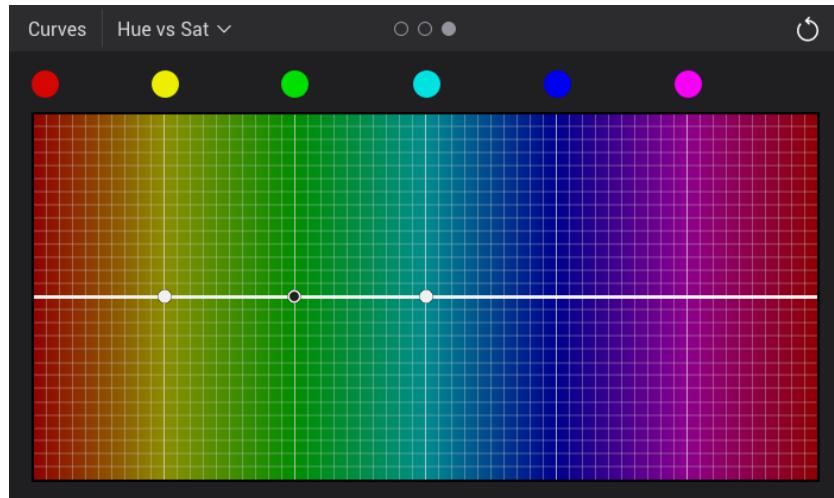


Figure 55: The appearance of Hue vs Sat, when the user has highlighted green by clicking on the green color circle to make an adjustment.

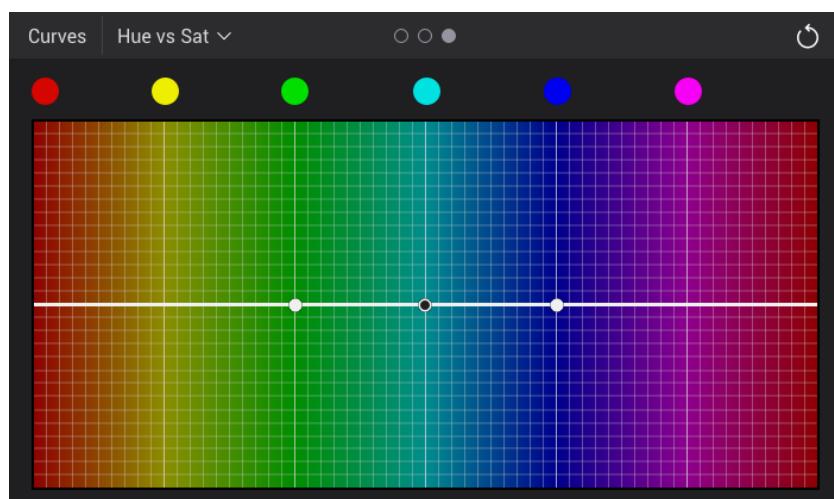


Figure 56: The appearance of Hue vs Sat, when the user has selected cyan by clicking on that cyan color circle to make an adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

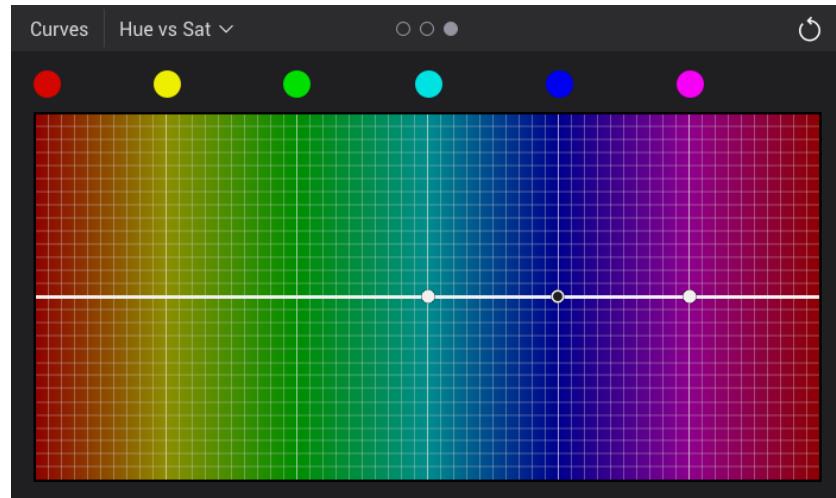


Figure 57: The appearance of Hue vs Sat, when the user has highlighted blue by clicking on the blue color circle to make an adjustment.

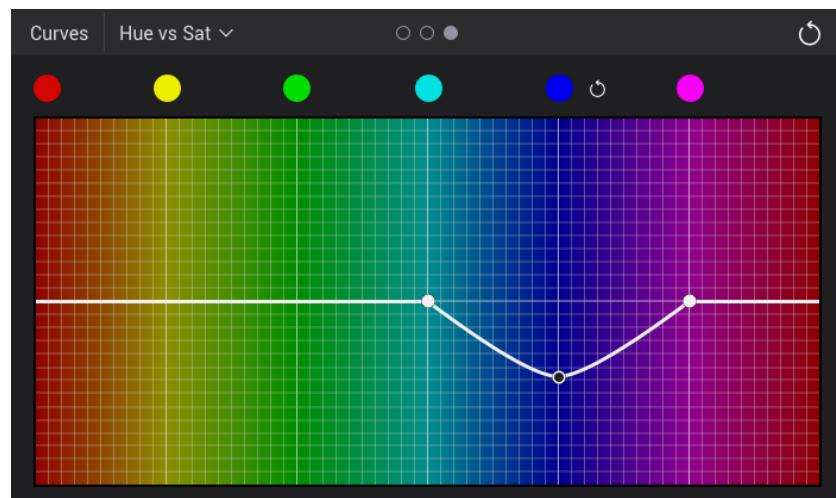


Figure 58: The appearance of Hue vs Sat, when the user has highlighted blue by clicking on the blue color circle and making an adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

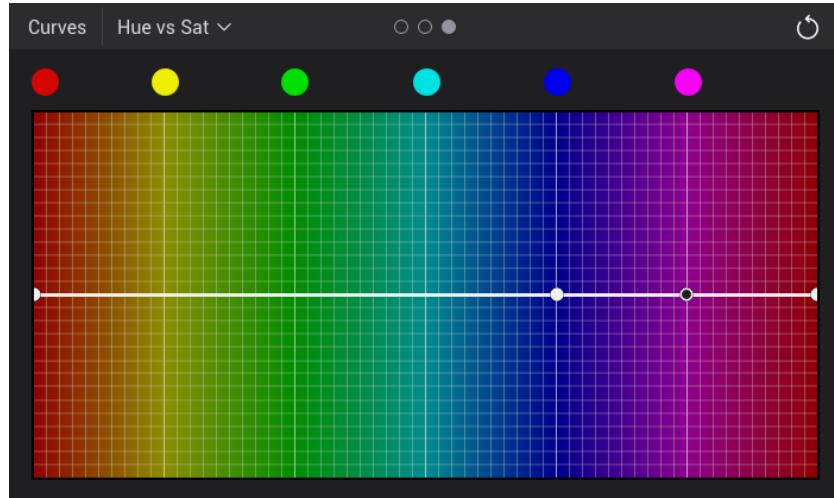


Figure 59: The appearance of Hue vs Sat, when the user has selected magenta by clicking on the magenta color circle to make an adjustment.

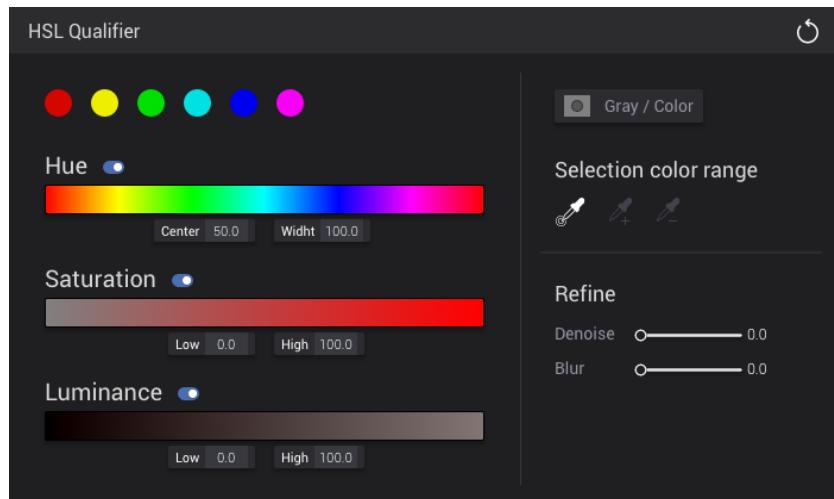


Figure 60: Appearance of the *HSL Qualifier* tool. The image shows when the view is opened and no adjustments are made. This is where the user keying out an area they want to influence and there is also a button with a function that allows everything that is not marked to be gray so that the user can more easily see what it is that is chosen.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

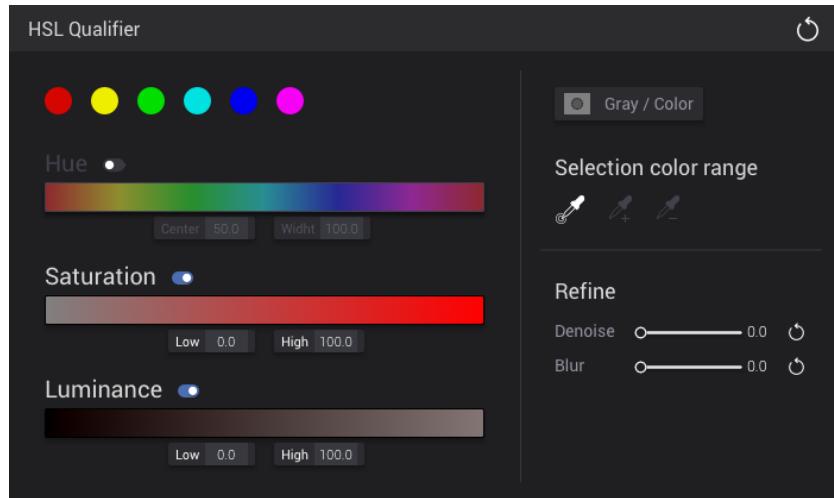


Figure 61: The appearance of the *HSL Qualifier*, when the user has deselected Hue, off, and thus can not perform an adjustment on Hue.

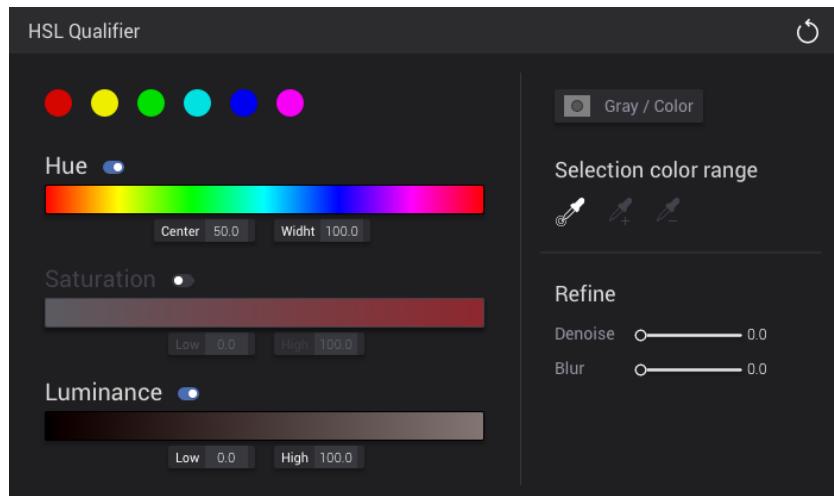


Figure 62: The appearance of the *HSL Qualifier*, when the user has deselected Saturation, off, and thus can not make an adjustment on Saturation.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

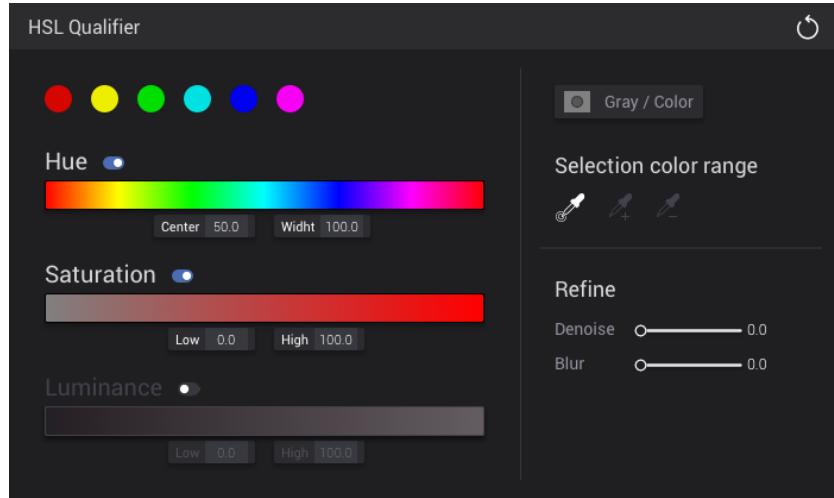


Figure 63: The appearance of the *HSL Qualifier*, when the user has deselected Luminance, off, and thus can not make an adjustment on Luminance.

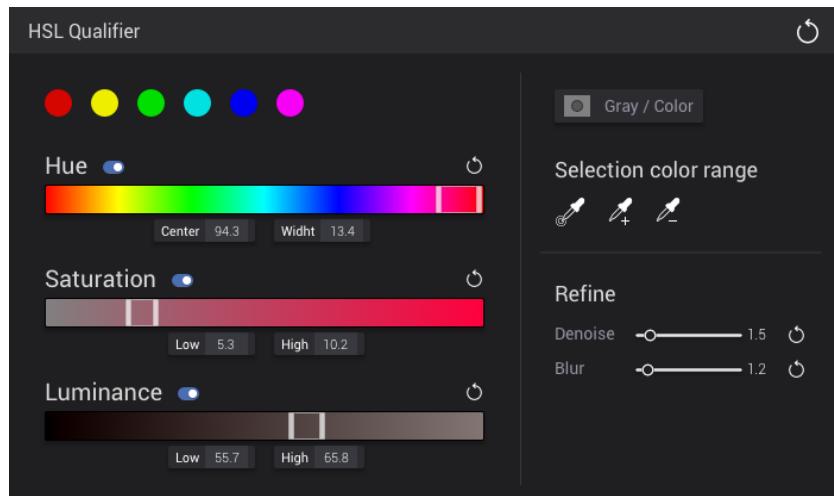


Figure 64: Appearance of *HSL Qualifier*, when the user has selected a color, and performed adjustment. Here the user can choose that in the area Hue, Saturation and Luminance should be smaller or larger depending on what it is it wants to mark. The user can also adjust Denoise which affects the outer edges of the selected area regarding sharpness. In Blur, the sharpness inside the selected area is affected.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

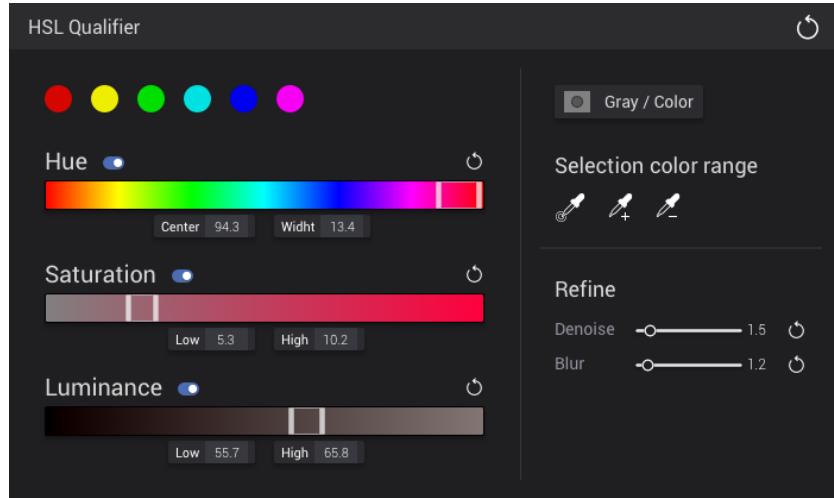


Figure 65: The appearance of the *HSL Qualifier*, when the user has selected a color, made an adjustment and clicked the Gray / Color button. This is to make the video image gray on the unselected areas and the color of the selected area, to see if what is meant to be selected is correct.

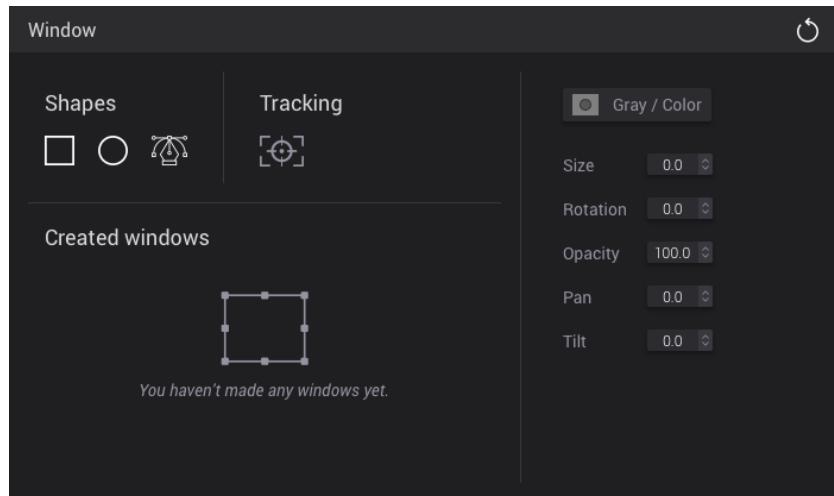


Figure 66: Appearance of the *Window* tool, when the user opens the view and does not create a window. The user has three options on shapes; square, circle and the icon to be able to draw a pattern freely. As well as the tracking function that tracks the window when the images are moving. Here, too, is the button Gray/Color to see what has been highlighted.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

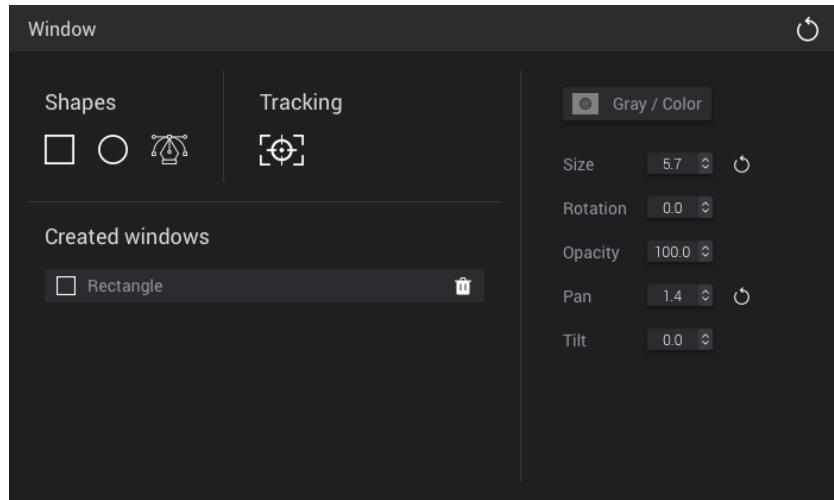


Figure 67: The appearance of *Window*, when the user has created a window of the shape rectangle and made adjustments.

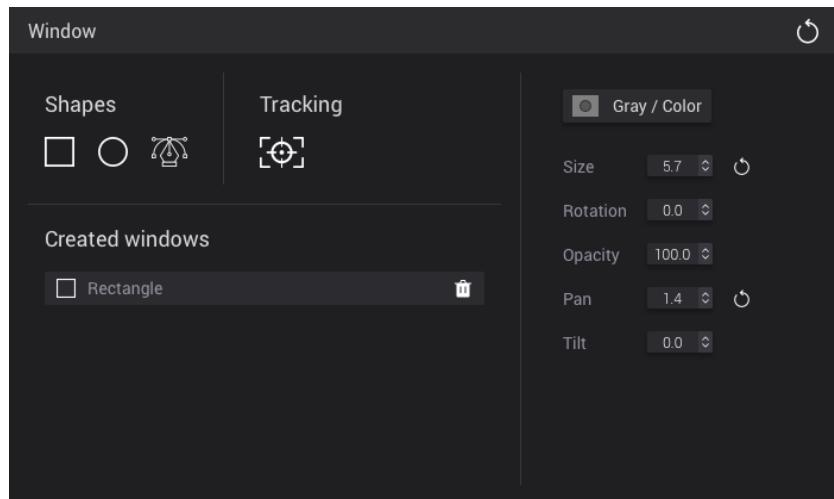


Figure 68: The appearance of *Window*, when the user has created a window of the shape rectangle, and made adjustments and clicked the Gray / Color button. This is to make the video image gray on the unselected areas and the color of the selected area, to see if what is meant to be selected is correct.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

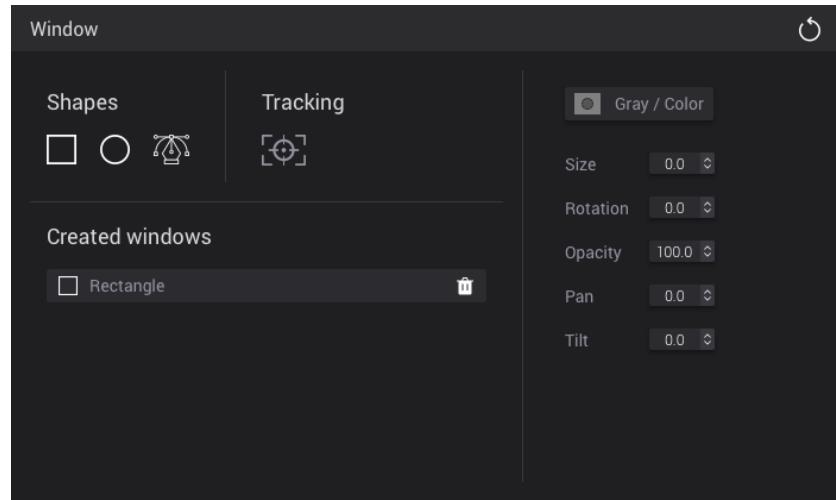


Figure 69: The appearance of *Window*, when the user has created a window of the shape rectangle. Here the user has removed the window on the video image but saved the window to be able to reuse it if desired.

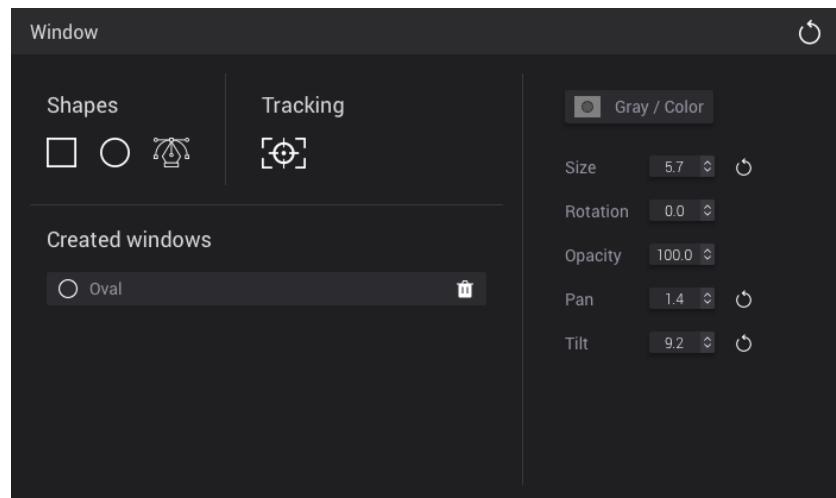


Figure 70: The appearance of *Window*, when the user has created a window of the shape oval and made adjustments.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

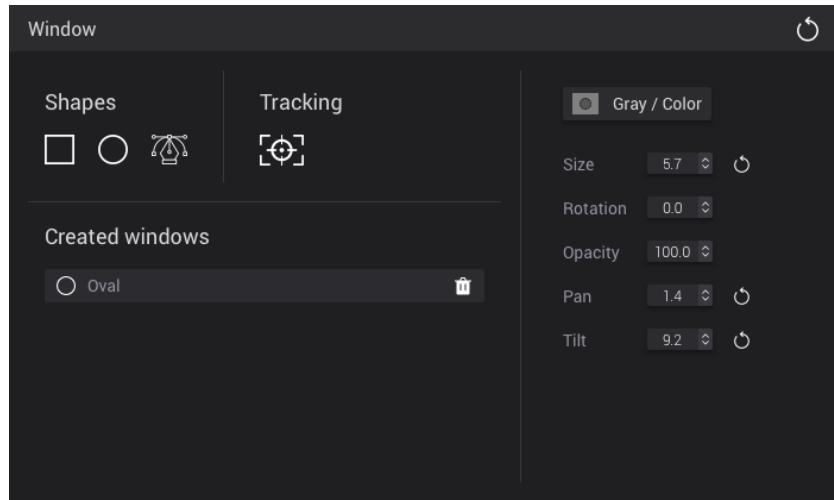


Figure 71: The appearance of the *Window*, when the user has created a window of the shape oval, made adjustments and clicked on the Gray / Color button. This is to make the video image gray on the unselected areas and the color of the selected area, to see if what is meant to be selected is correct.

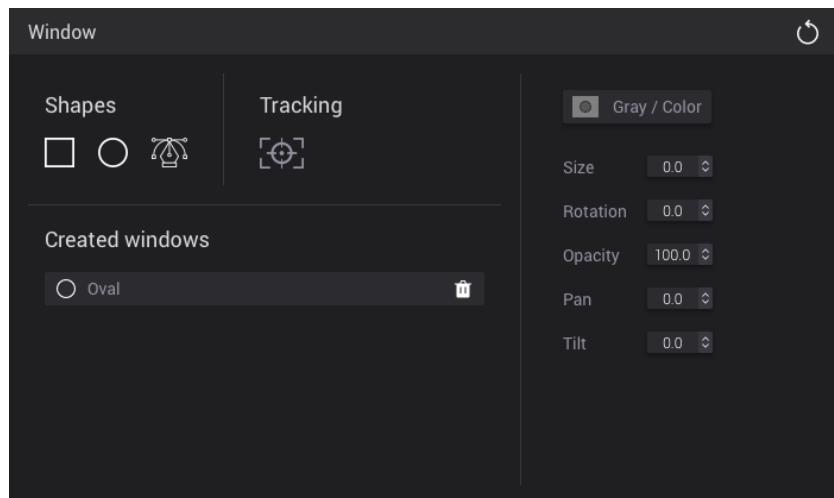


Figure 72: The appearance of *Window*, when the user has created a window of the shape oval. But here the user has removed the window on the video image but saved the window to be able to reuse it if desired.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

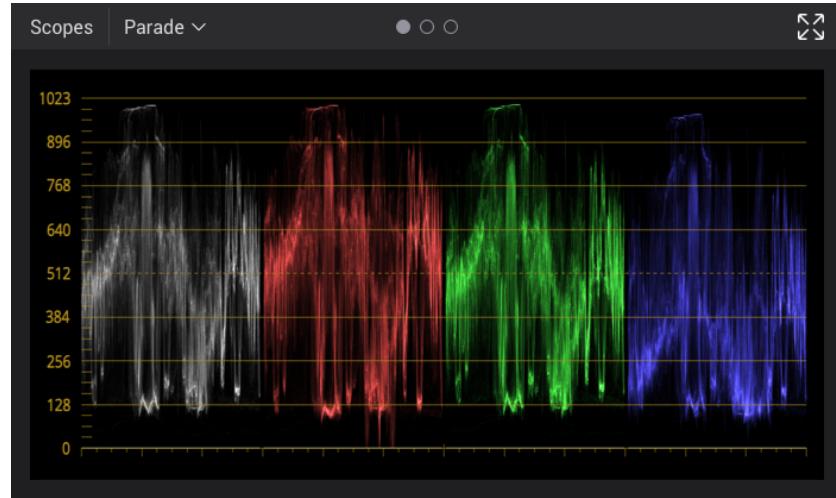


Figure 73: The appearance of the *Scopes* tool, with the Parade view.

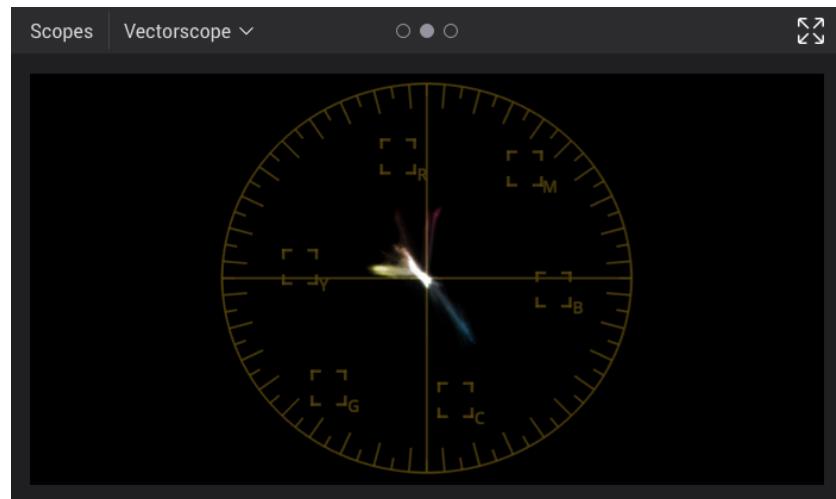


Figure 74: The appearance of the *Scopes* tool, with the Vectorscope view.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

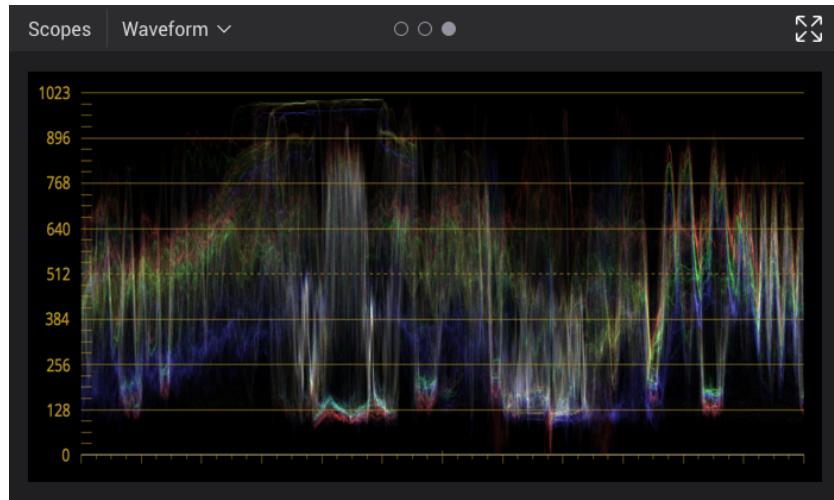


Figure 75: The look of the *Scopes* tool, with the Waveform view.

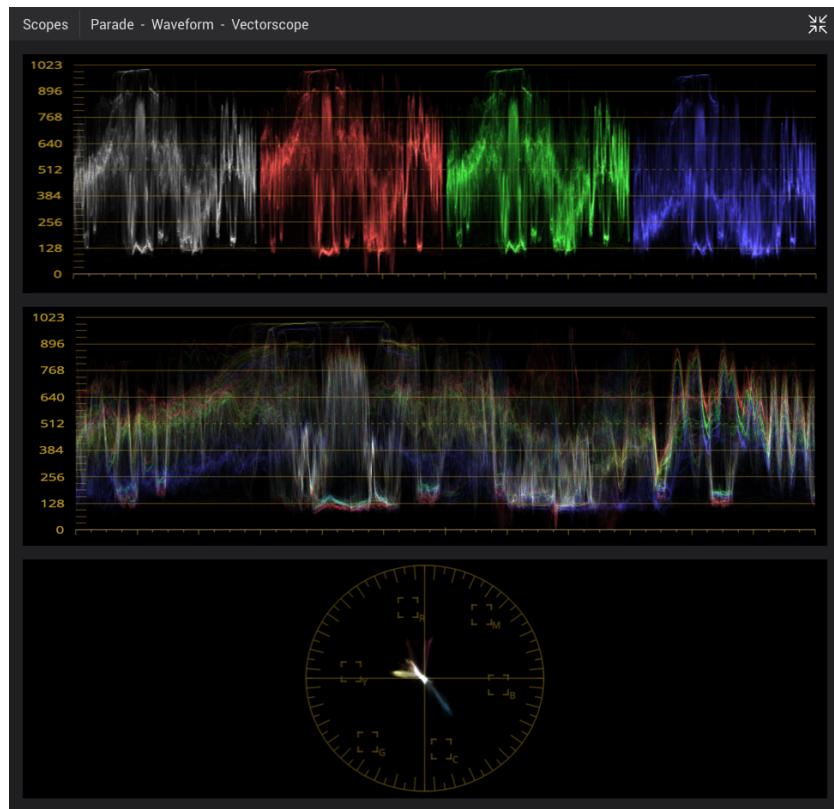


Figure 76: The appearance of the *Scopes* tool when expanded, showing all three views at once.

The tools with their menu

On the tools that have different views, there is a menu selection. They are the tools *Primaries*, *Curves* and *Scopes*. A look has been created with menus on each image, even with those that are adjusted.

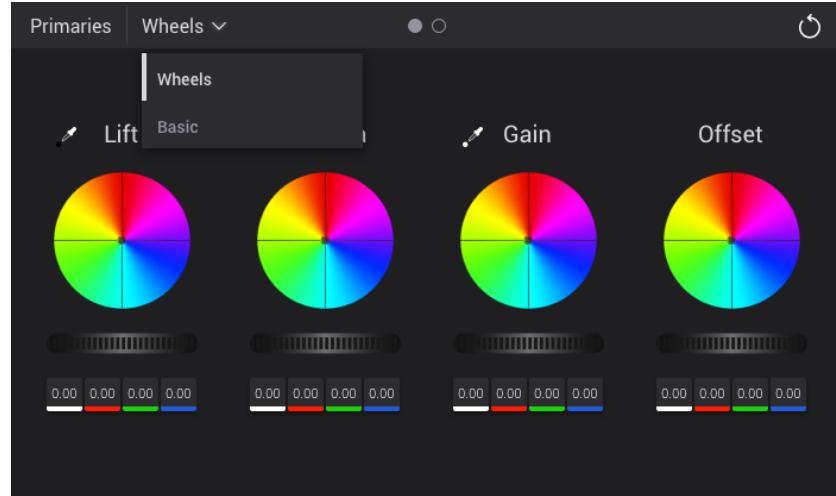


Figure 77: The appearance of the tool *Primaries*, in the Wheels view, without adjustment, when the user has clicked the menu.



Figure 78: Appearance of the tool *Primaries*, Wheels, with adjustment, when the user has clicked on the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

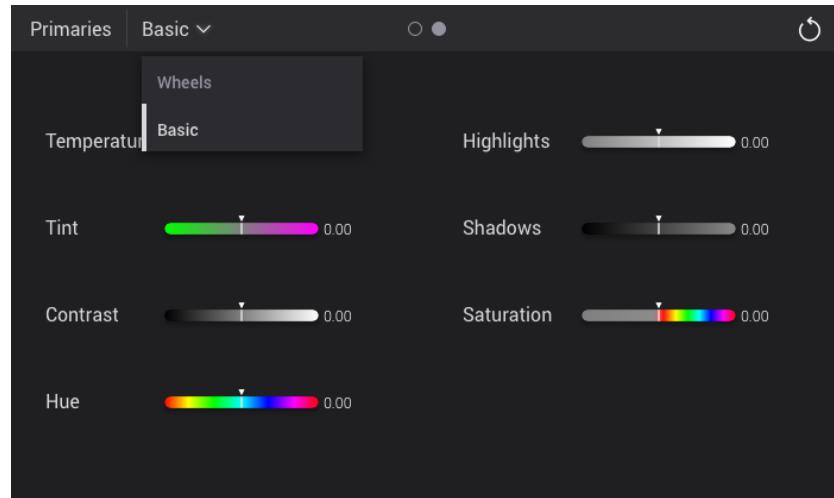


Figure 79: The appearance of the tool *Primaries*, in the Basic view, without adjustment, when the user has clicked the menu.

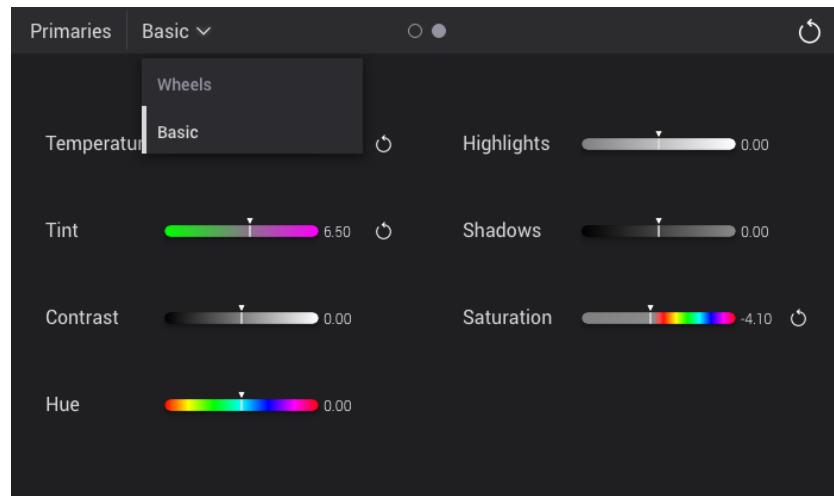


Figure 80: The appearance of the *Primaries* tool, in the Basic view, with adjustment, when the user has clicked the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

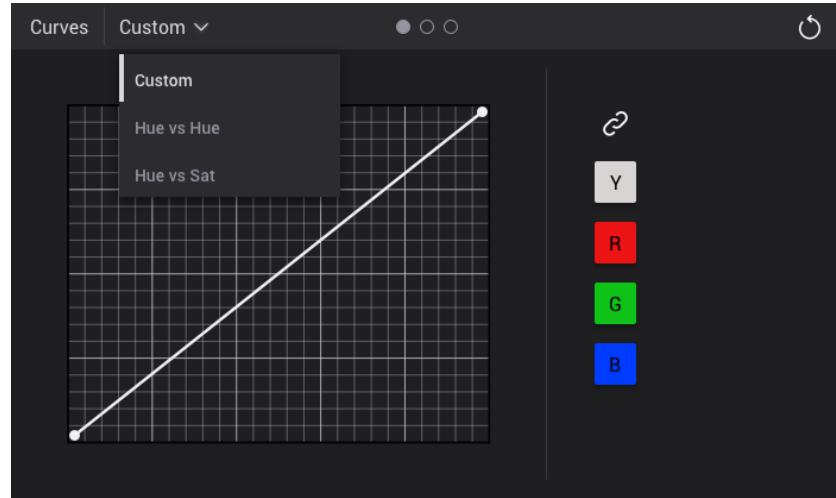


Figure 81: The appearance of the *Curves* tool, in the Custom view, without adjustment when they are linked, when the user has clicked the menu.

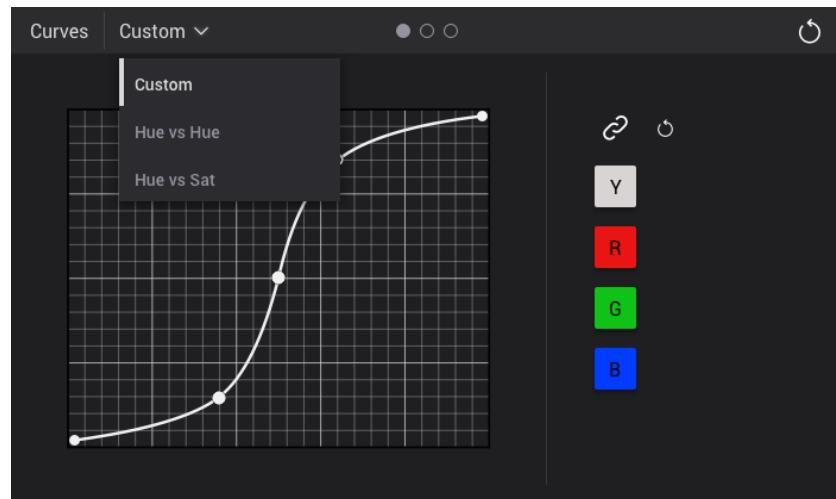


Figure 82: The appearance of the *Curves* tool, in the Custom view, with adjustment when they are linked, when the user has clicked the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

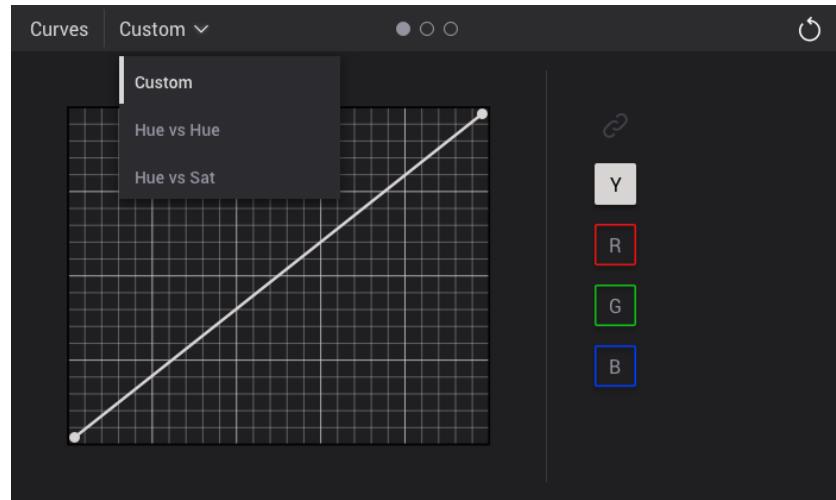


Figure 83: The appearance of the tool *Curves*, in the Custom view, and only has Luminance active without adjustment, when the user has clicked the menu.

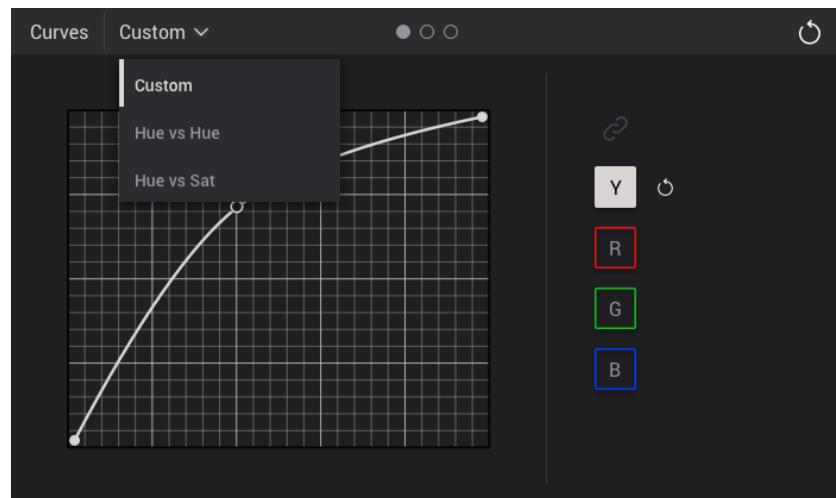


Figure 84: The appearance of the tool *Curves*, in the Custom view, and only has Luminans active with adjustment, when the user has clicked the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

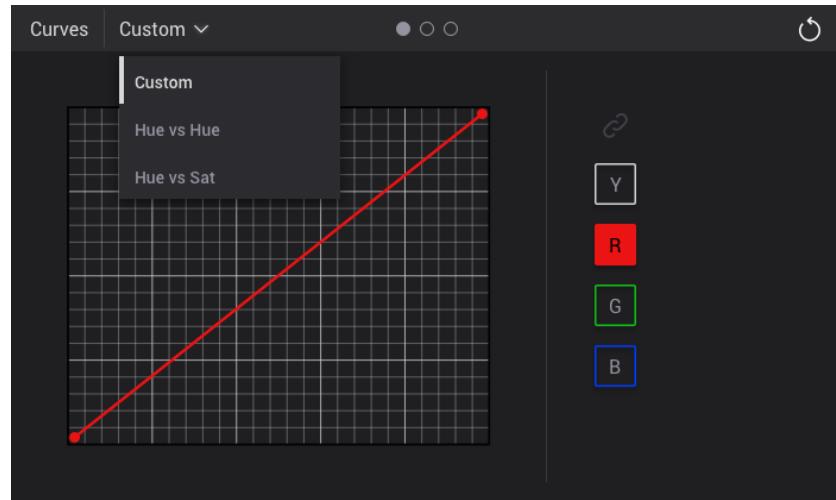


Figure 85: The appearance of the tool *Curves*, in the Custom view, and only has Red active without adjustment, when the user has clicked the menu.

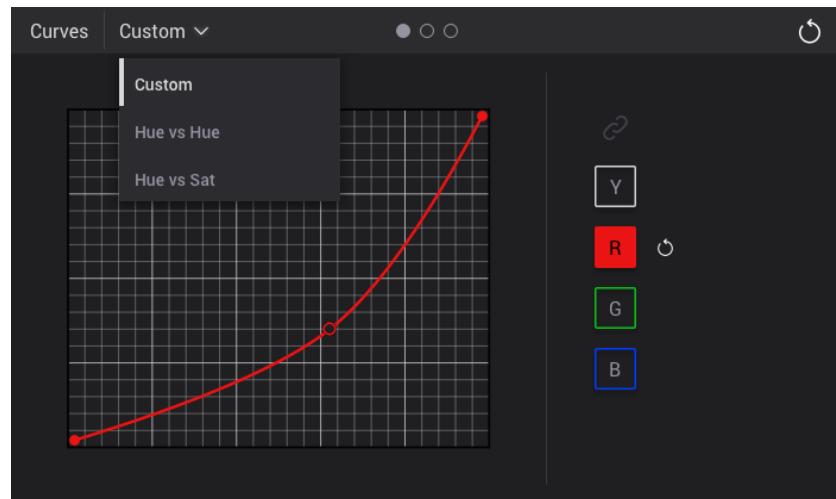


Figure 86: The appearance of the tool *Curves*, in the Custom view, and only has Red active with adjustment, when the user has clicked the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

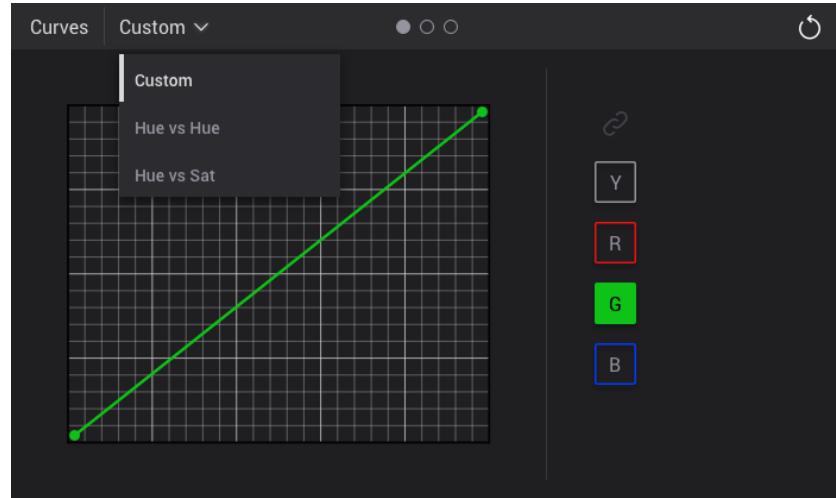


Figure 87: The appearance of the tool *Curves*, in the Custom view, and only has Green active without adjustment, when the user has clicked the menu.

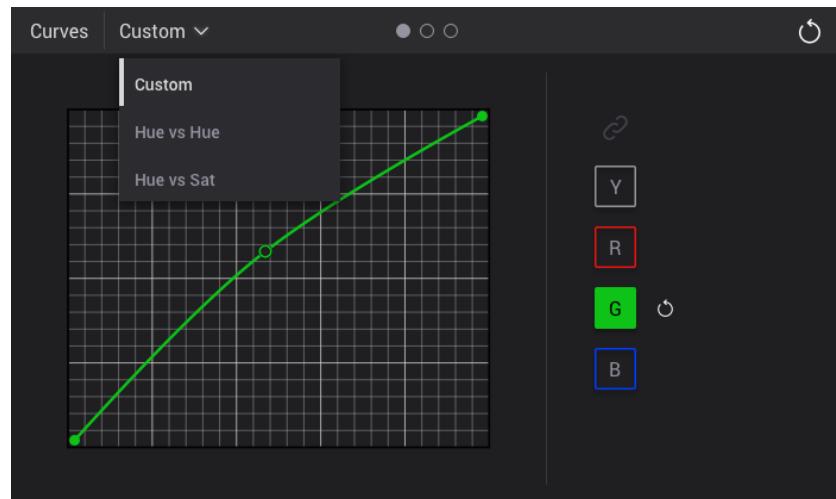


Figure 88: The appearance of the tool *Curves*, in the Custom view, and only has Green active with adjustment, when the user has clicked the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

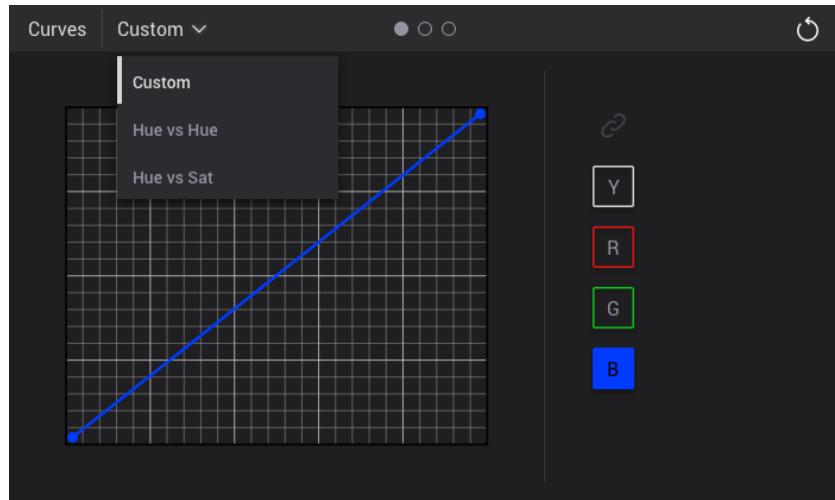


Figure 89: The appearance of the tool *Curves*, in the Custom view, and only has Blue active without adjustment, when the user has clicked the menu.

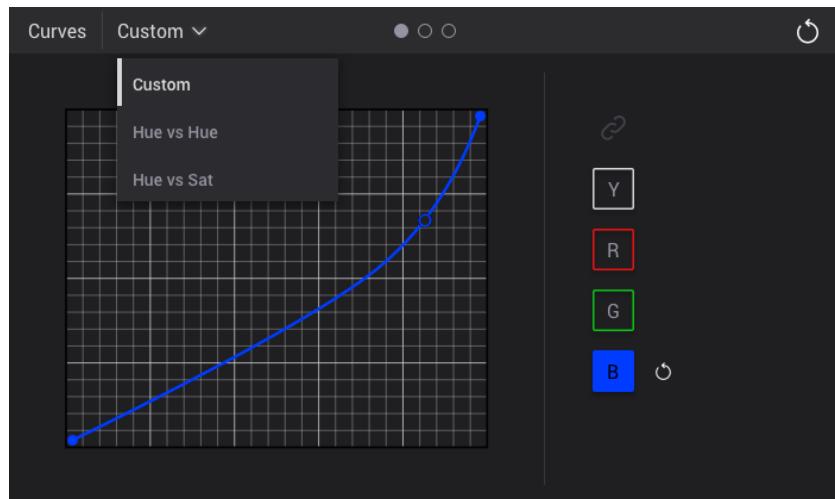


Figure 90: The appearance of the tool *Curves*, in the Custom view, and only has Blue active with adjustment, when the user has clicked the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

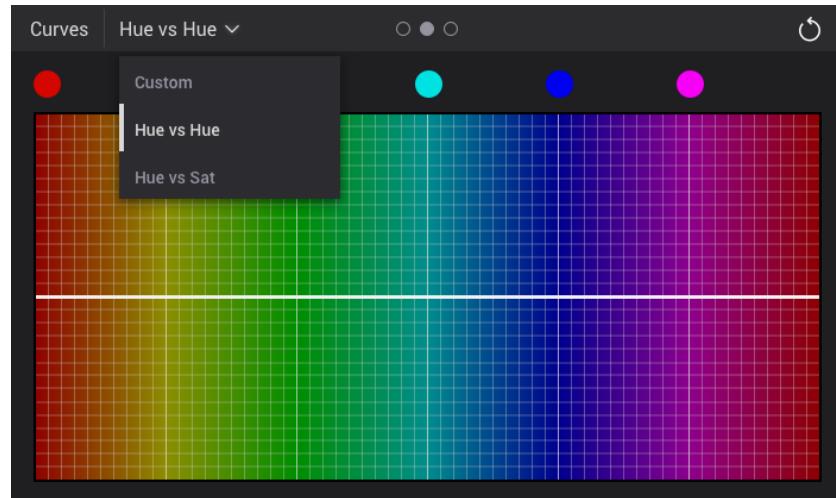


Figure 91: The appearance of the *Curves* tool, in the Hue vs Hue view, without adjustment, when the user has clicked the menu.

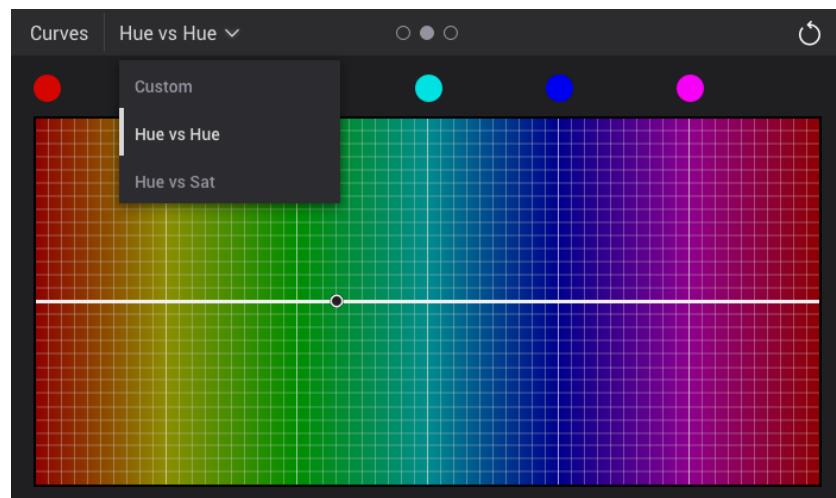


Figure 92: The appearance of the tool *Curves*, in the view Hue vs Hue, and has marked a point on the line, when the user has clicked on the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

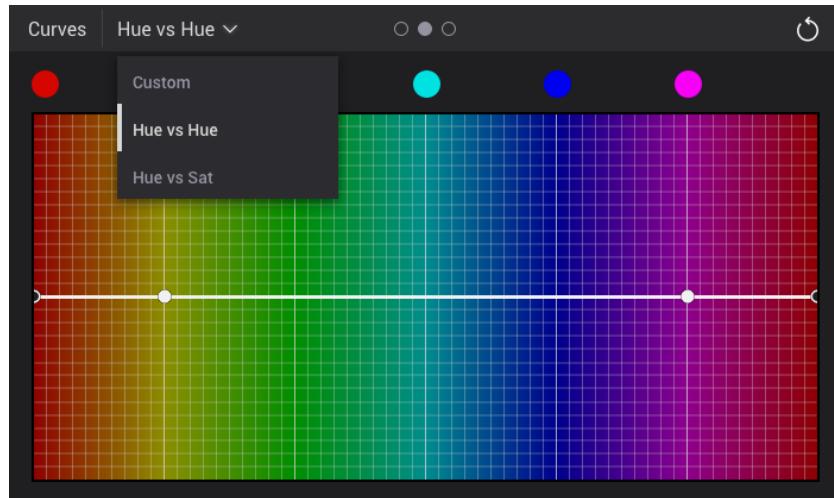


Figure 93: The appearance of the tool *Curves*, in the view Hue vs Hue, and red has been highlighted without adjustment, when the user has clicked on the menu.

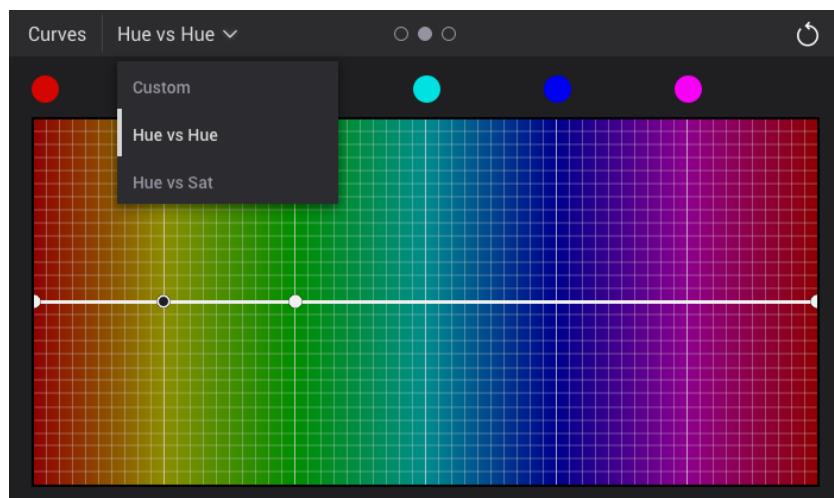


Figure 94: The appearance of the tool *Curves*, in the view Hue vs Hue, and yellow has been highlighted without adjustment, when the user has clicked on the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

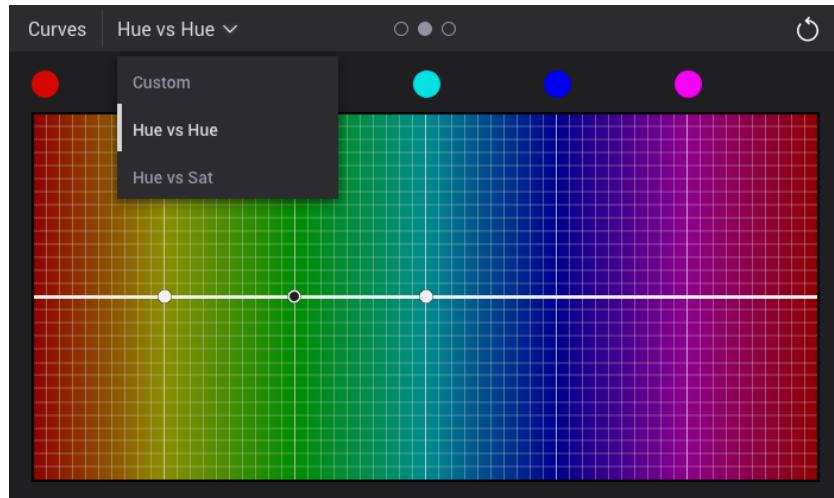


Figure 95: The appearance of the *Curves* tool, in the Hue vs Hue view, and green have been highlighted without adjustment, when the user has clicked on the menu.

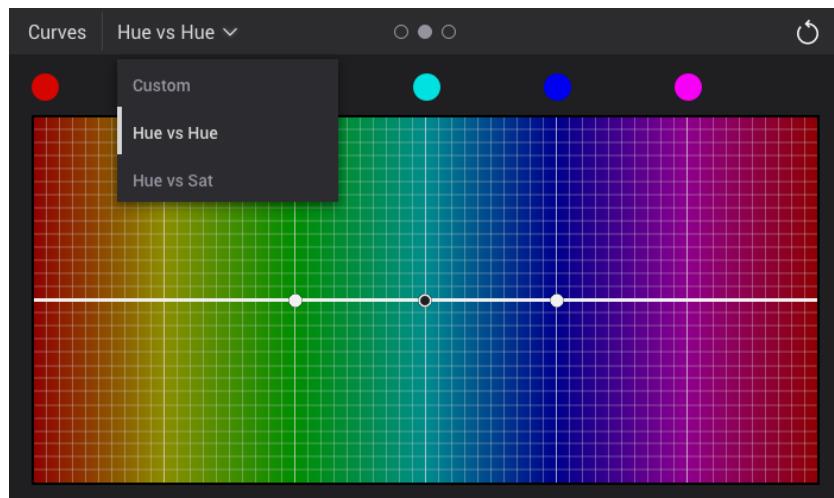


Figure 96: The appearance of the *Curves* tool, in the Hue vs Hue view, and cyan has been highlighted without adjustment, when the user has clicked on the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

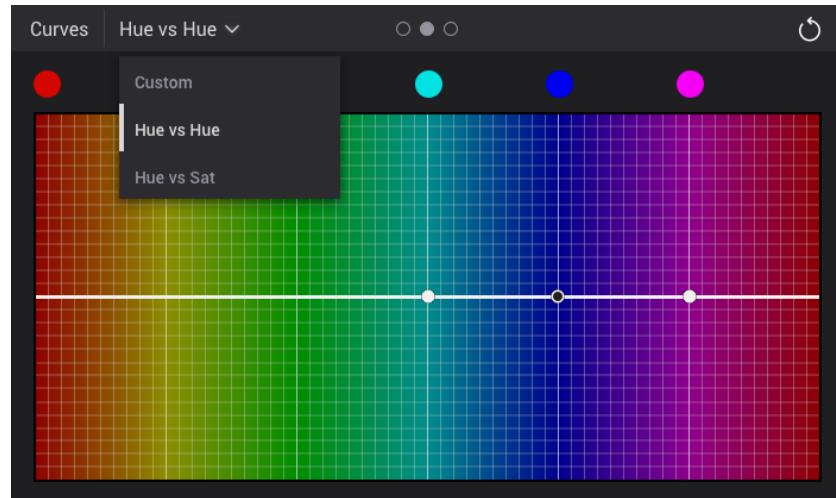


Figure 97: The appearance of the tool *Curves*, in the view Hue vs Hue, and blue has been highlighted without adjustment, when the user has clicked on the menu.

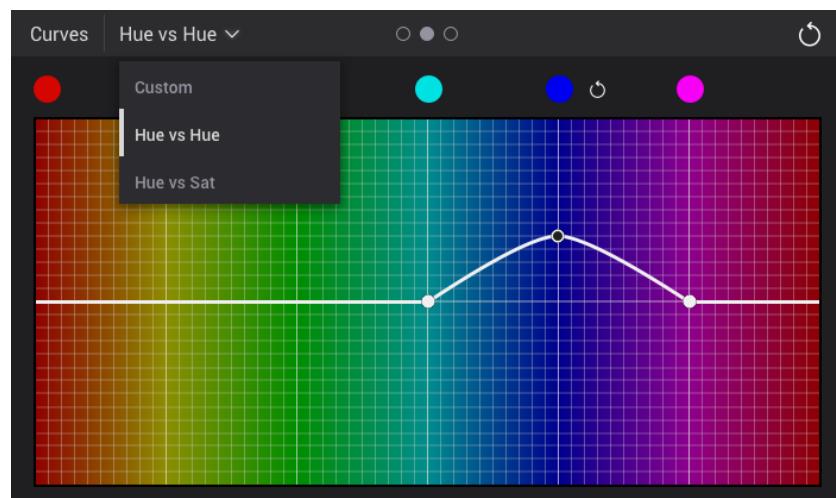


Figure 98: The appearance of the tool *Curves*, in the view Hue vs Hue, and blue has been highlighted without adjustment, when the user has clicked on the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

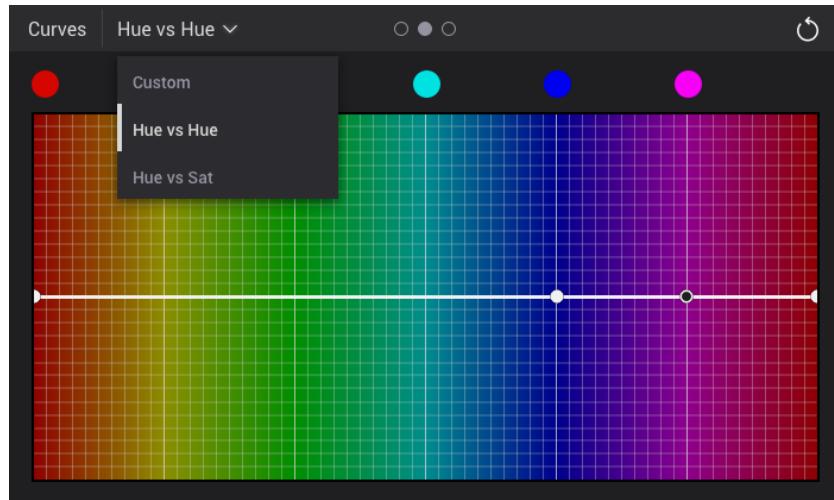


Figure 99: The appearance of the tool *Curves*, in the view Hue vs Hue, and magenta has been selected without adjustment, when the user has clicked on the menu.

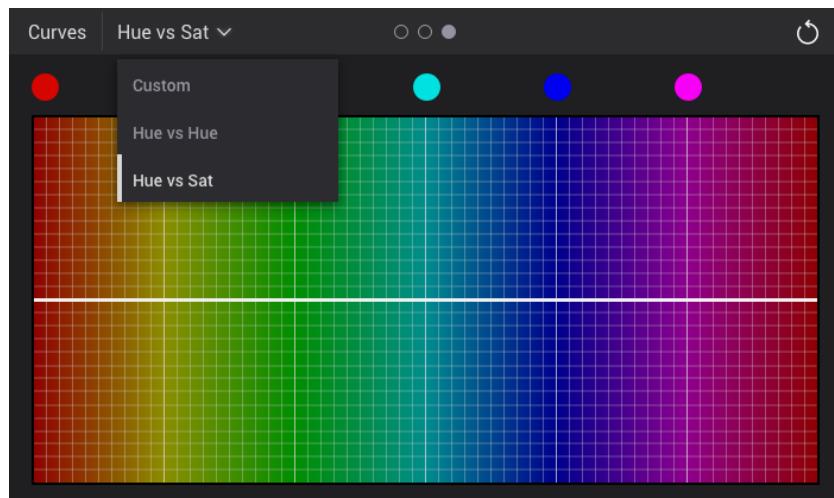


Figure 100: The appearance of the *Curves* tool, in the Hue vs Sat view, without adjustment, when the user has clicked the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

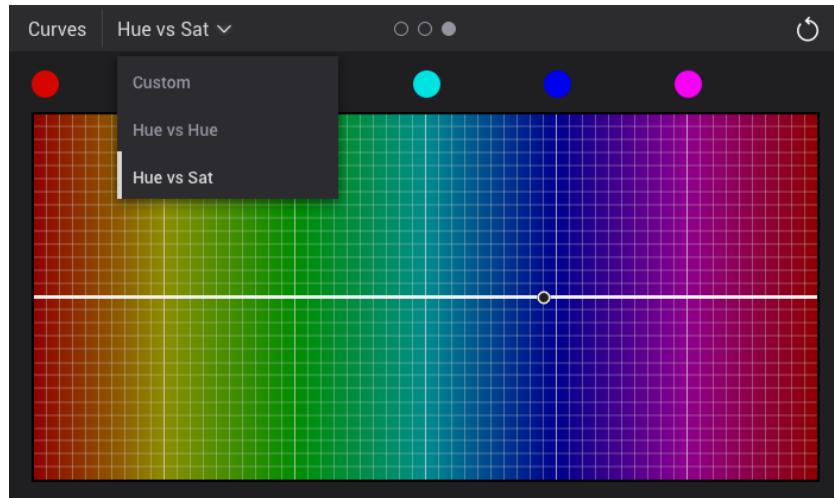


Figure 101: The appearance of the *Curves* tool, in the Hue vs Sat view, and has marked a point on the line, when the user has clicked the menu.

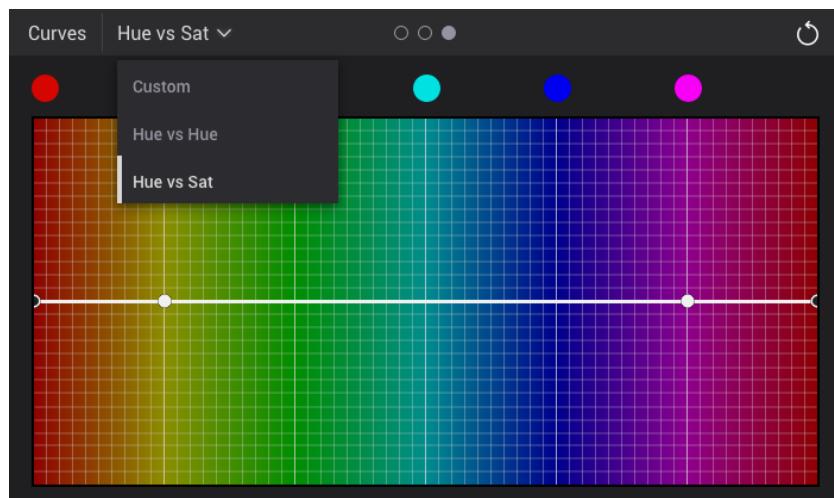


Figure 102: The appearance of the tool *Curves*, in the view Hue vs Sat, and red has been highlighted without adjustment, when the user has clicked on the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

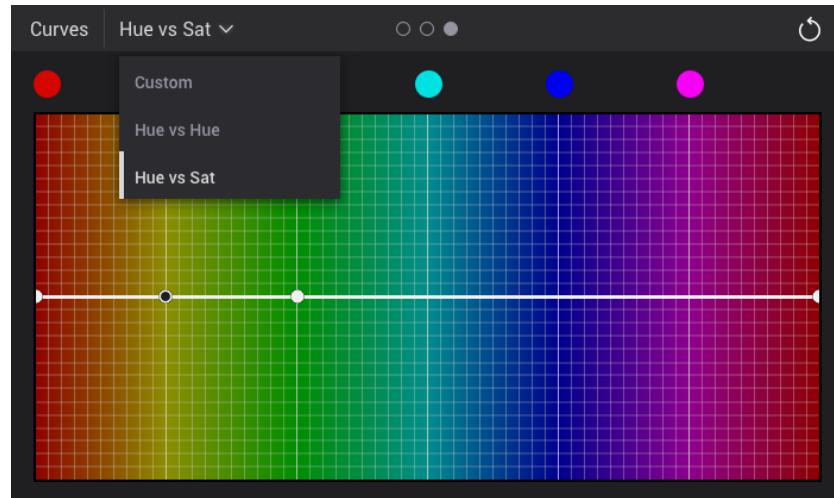


Figure 103: The appearance of the *Curves* tool, in the Hue vs Sat view, and yellow has been highlighted without adjustment, when the user has clicked the menu.

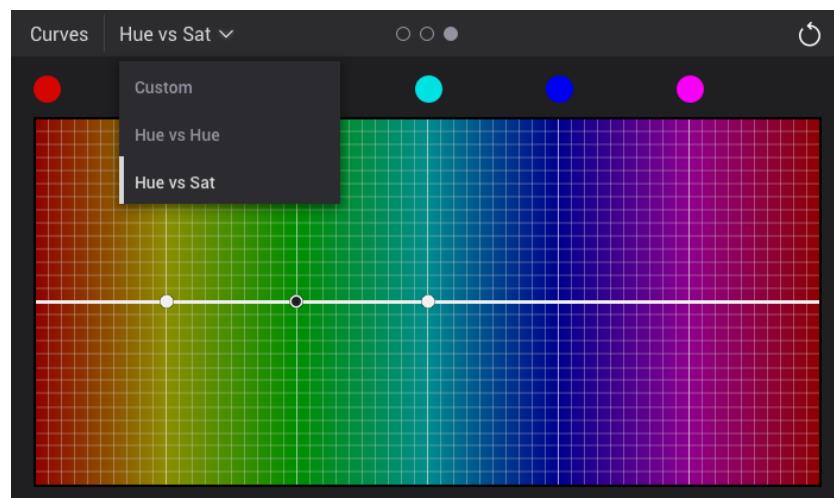


Figure 104: The appearance of the tool *Curves*, in the view Hue vs Sat, and green has been highlighted without adjustment, when the user has clicked on the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

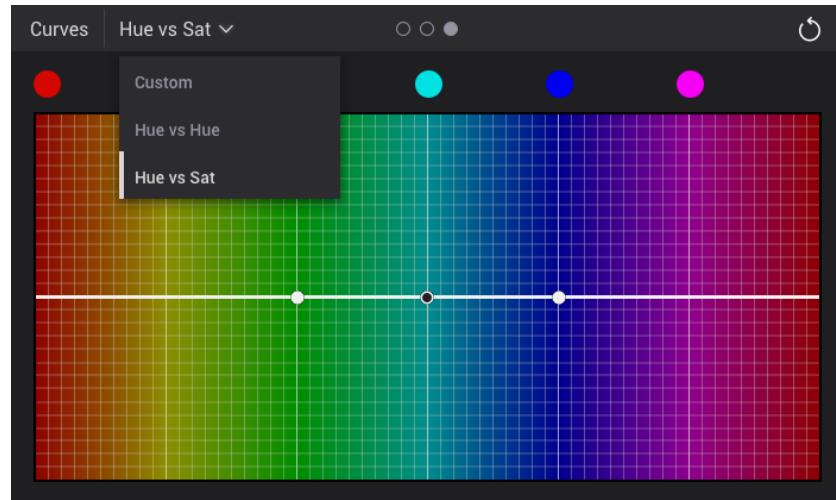


Figure 105: The appearance of the tool *Curves*, in the view Hue vs Sat, and cyan has been highlighted without adjustment, when the user has clicked the menu.

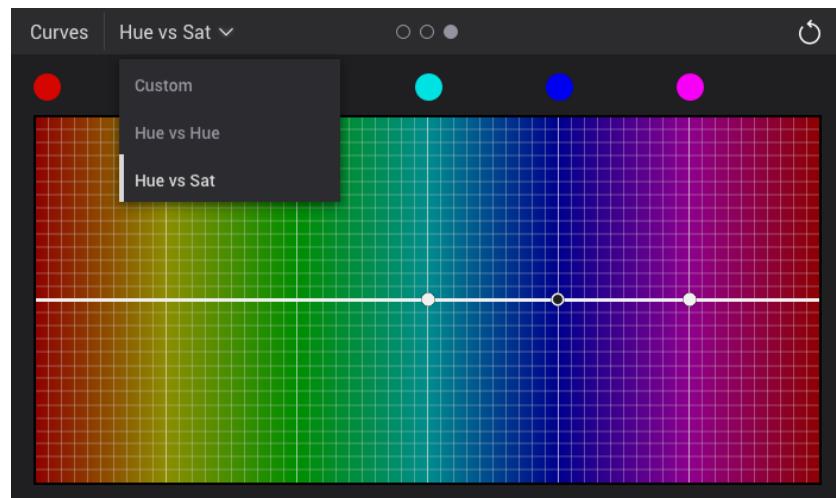


Figure 106: The appearance of the tool *Curves*, in the view Hue vs Sat, and blue has been highlighted without adjustment, when the user has clicked on the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

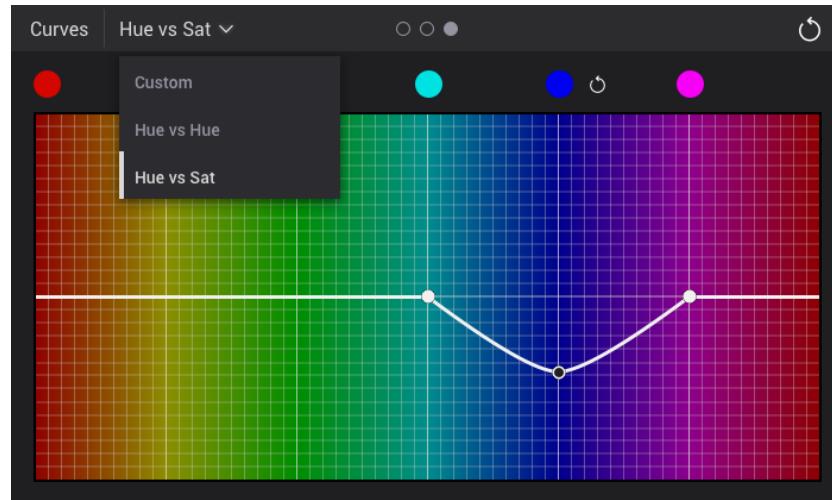


Figure 107: The appearance of the tool *Curves*, in the view Hue vs Sat, and blue has been highlighted with adjustment, when the user has clicked on the menu.

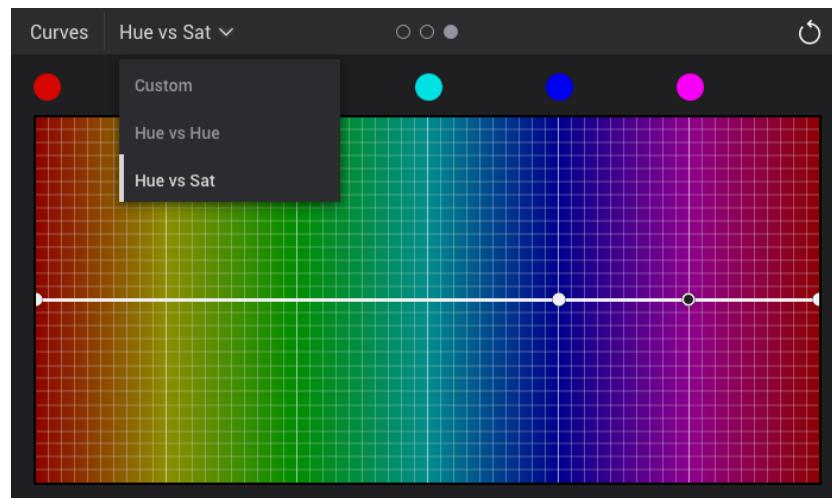


Figure 108: The appearance of the tool *Curves*, in the view Hue vs Sat, and magenta have been highlighted without adjustment, when the user has clicked on the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

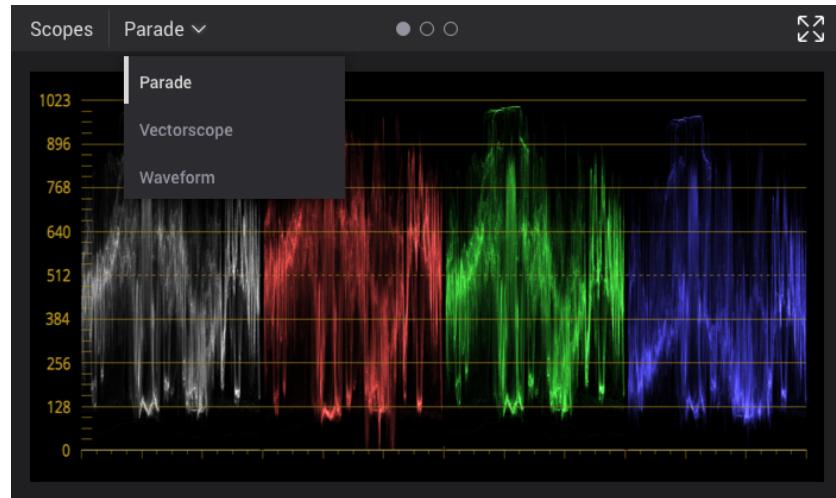


Figure 109: The appearance of the tool *Scopes*, in the Parade view, when the user has clicked on the menu.

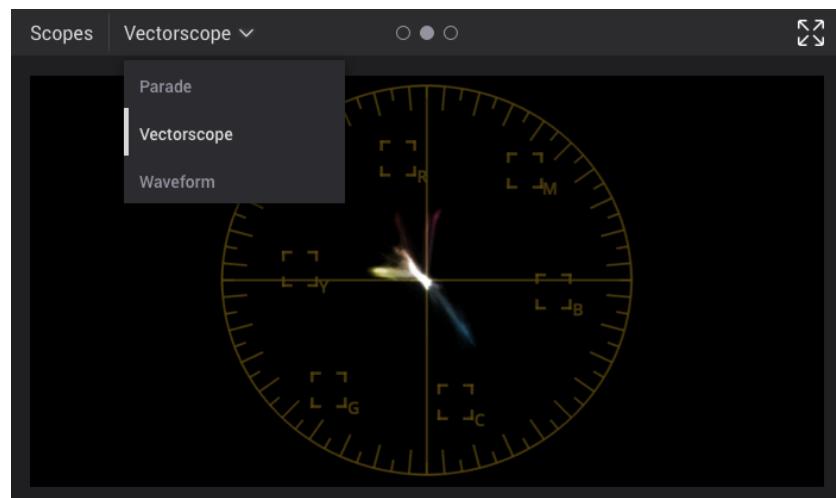


Figure 110: The appearance of the tool *Scopes*, in the Vectorscope view, when the user has clicked on the menu.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

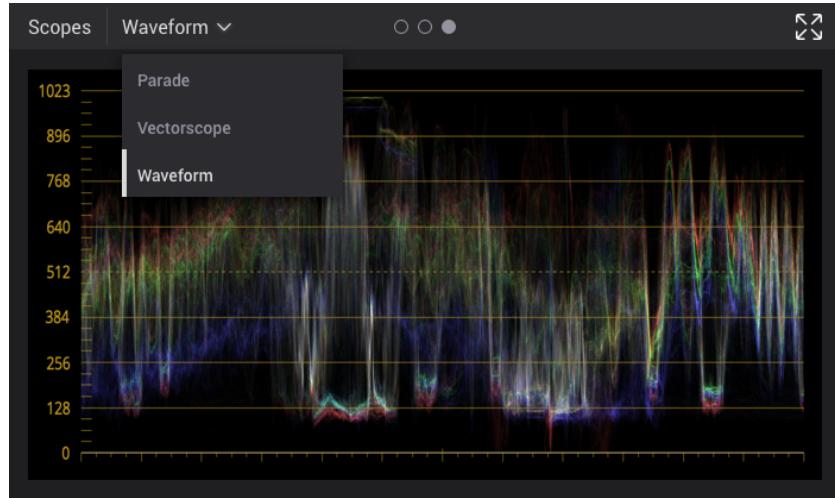


Figure 111: The appearance of the tool *Scopes*, in the Waveform view, when the user has clicked on the menu.

The Color page where the user works

Here are views on what the workspace can look like for the user when they perform color correction and grading, depending on which tools and which tab is selected to be displayed.

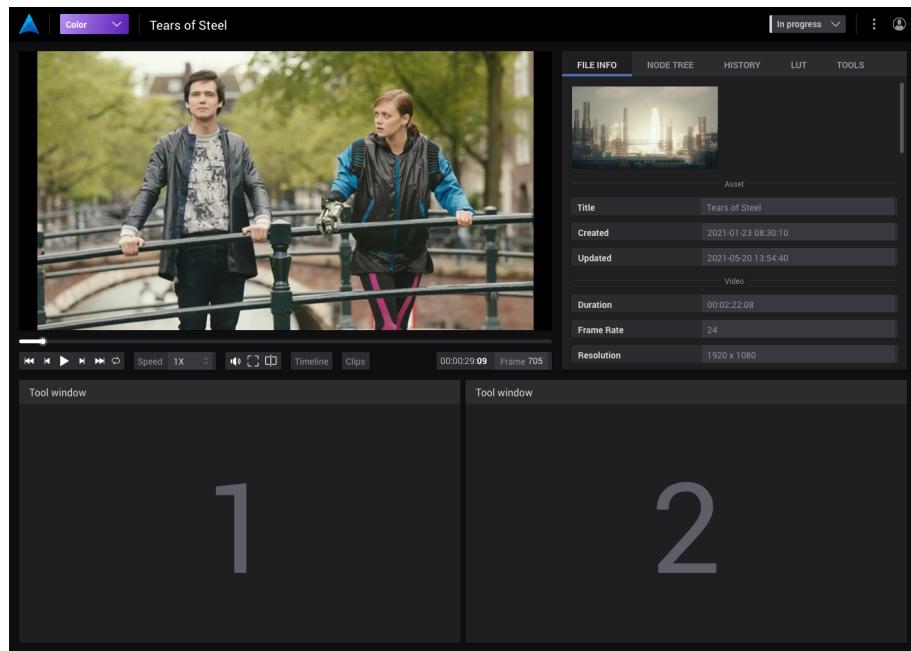


Figure 112: Appearance on the Color page when the File info tab is visible and no tool is selected.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

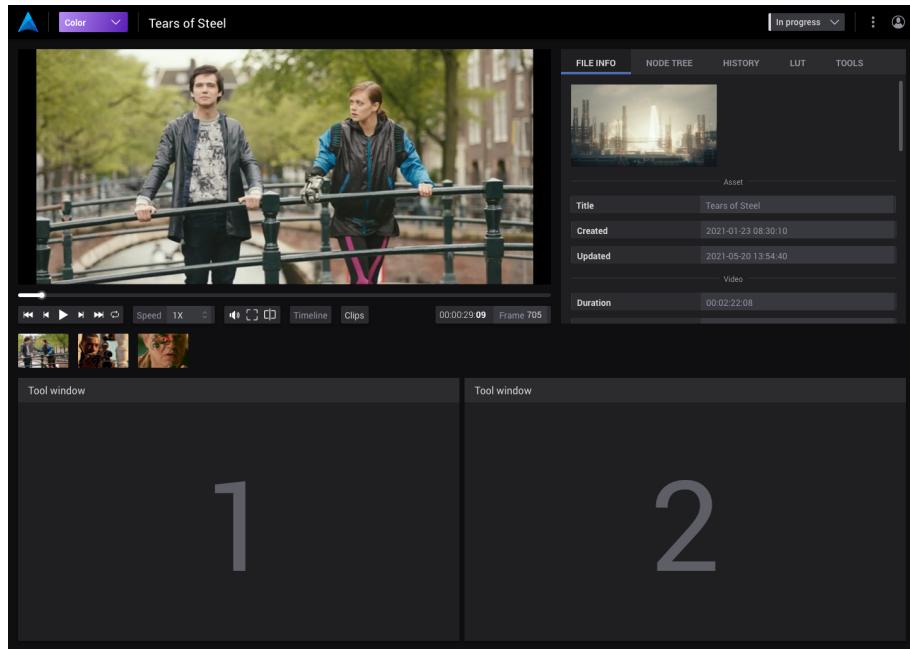


Figure 113: Appearance on the Color page when the File info tab is visible, no tool is selected and the user has clicked Clips.

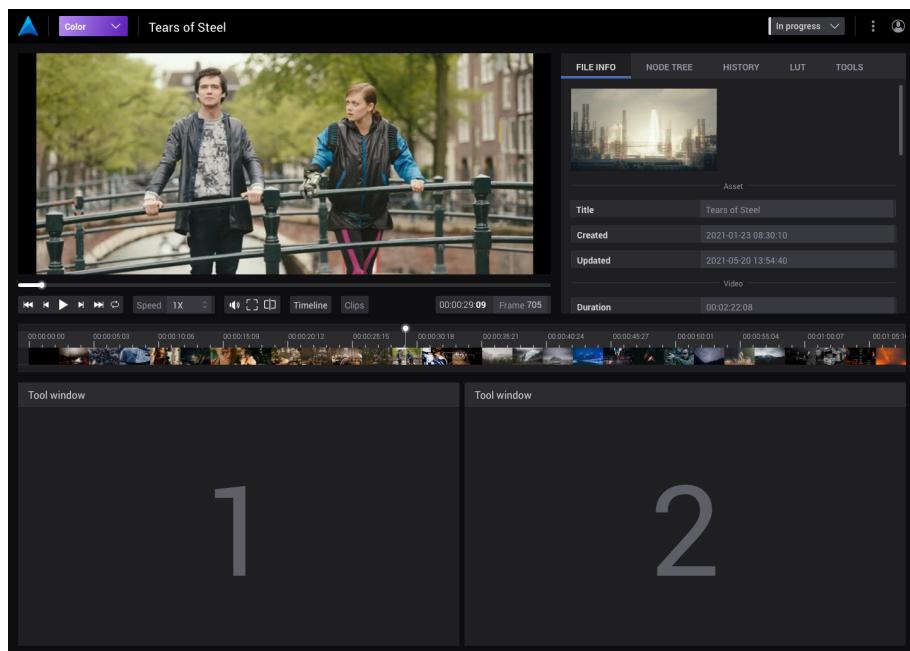


Figure 114: Appearance on the Color page when the File info tab is visible, no tool is selected and the user has clicked timeline.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

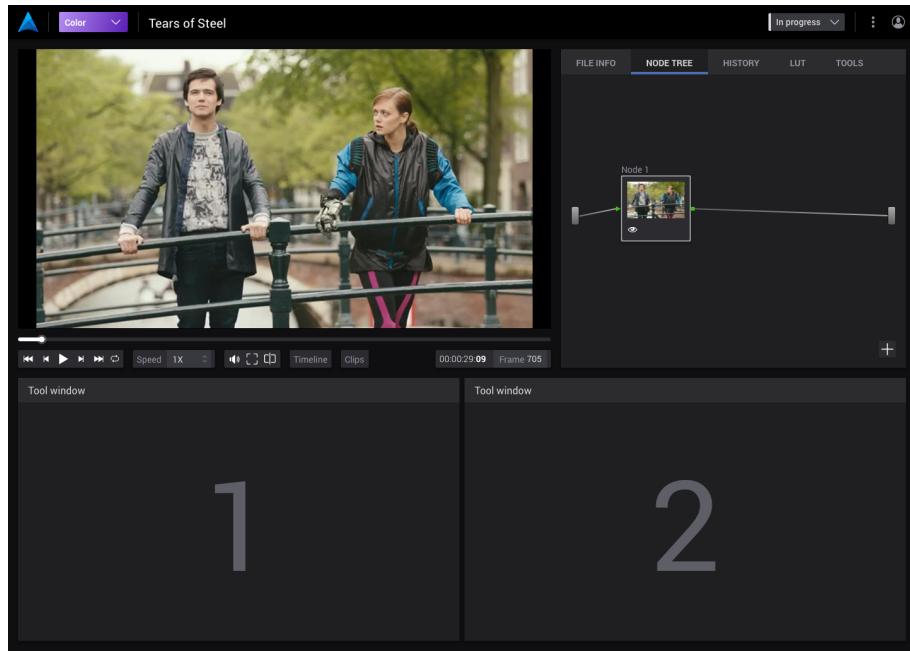


Figure 115: Appearance on the Color page when the Node tree tab is visible, where no adjustment has been made and no tool is selected.

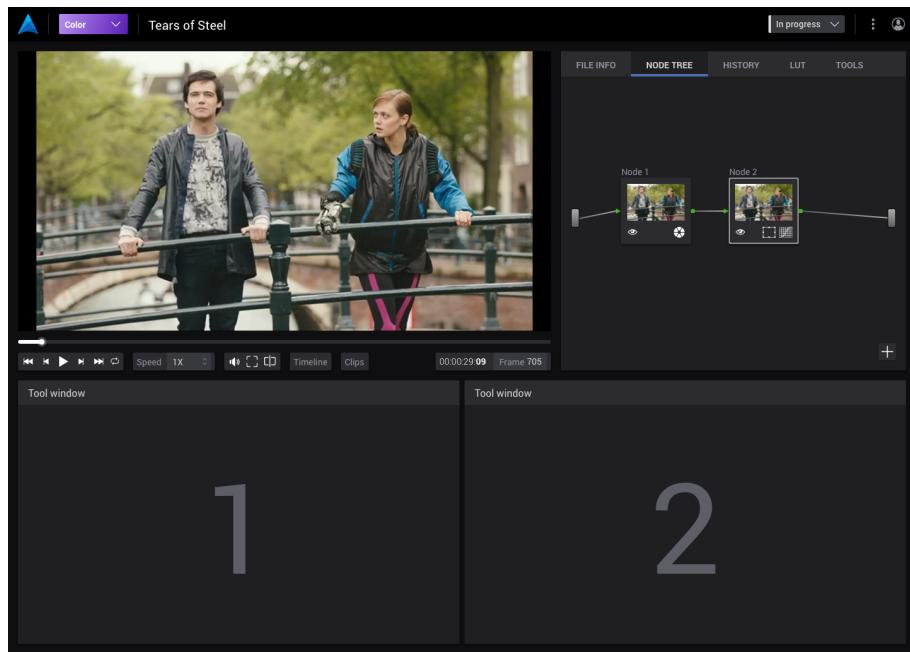


Figure 116: Appearance on the Color page when the Node tree tab is visible, where adjustment has been made.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

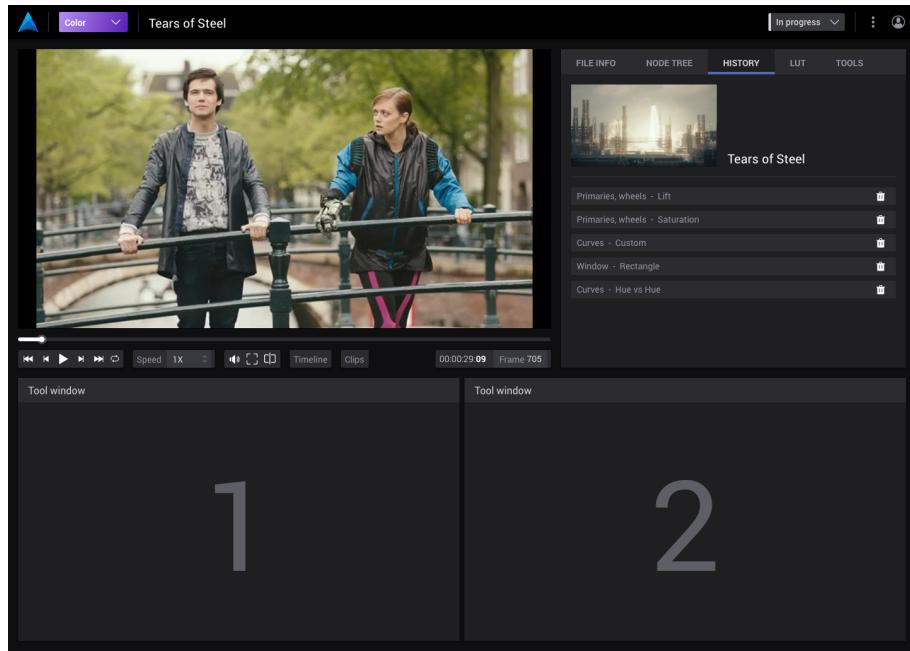


Figure 117: Appearance on the Color page when the History tab is visible and no tool is selected.

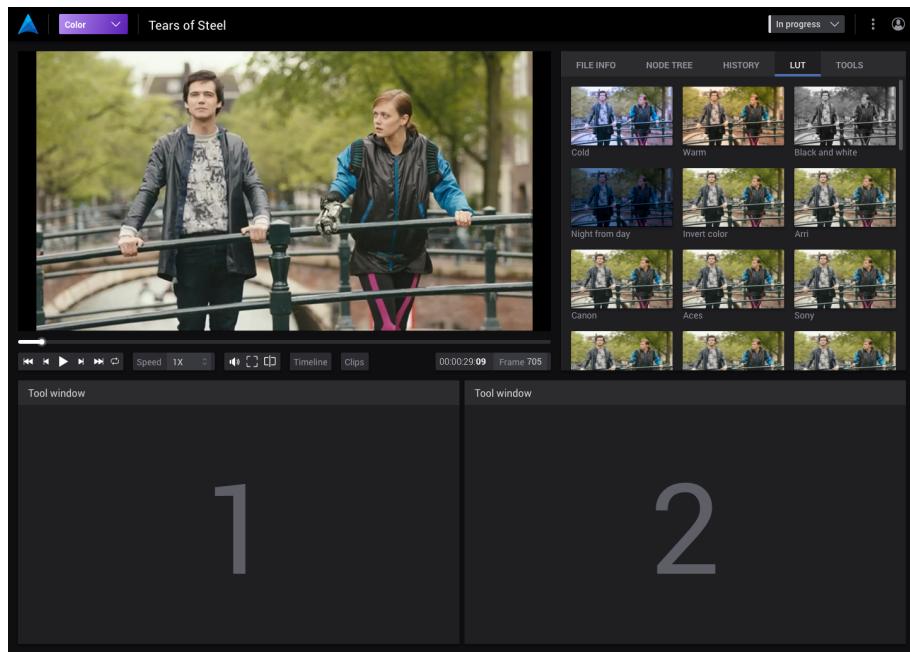


Figure 118: Appearance on the Color page when the LUT tab is visible, where no LUT has been selected and no tool is selected.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

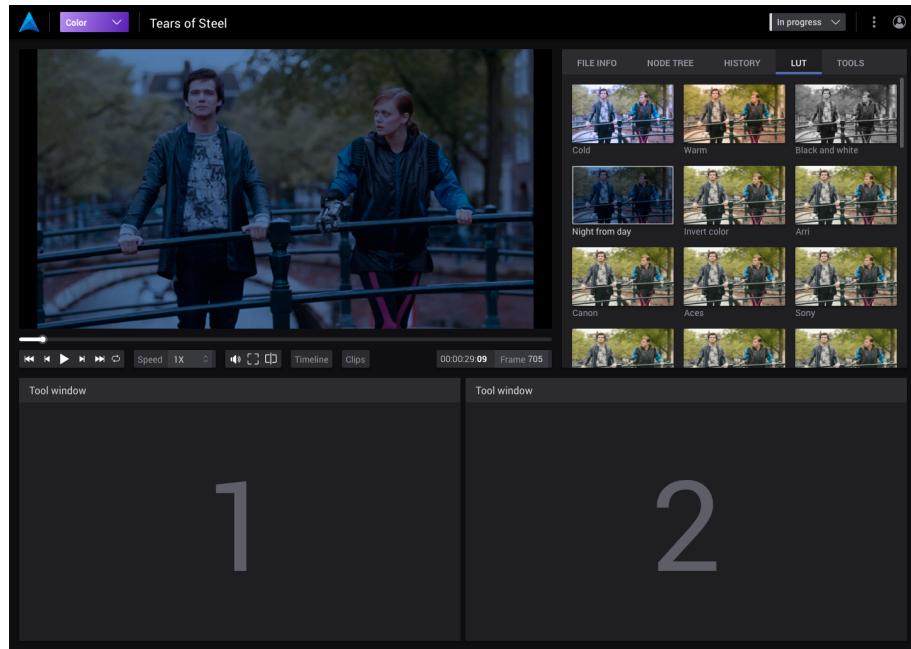


Figure 119: Appearance on the Color page when the LUT tab is visible, where the LUT Night from day is selected and no tool is selected.

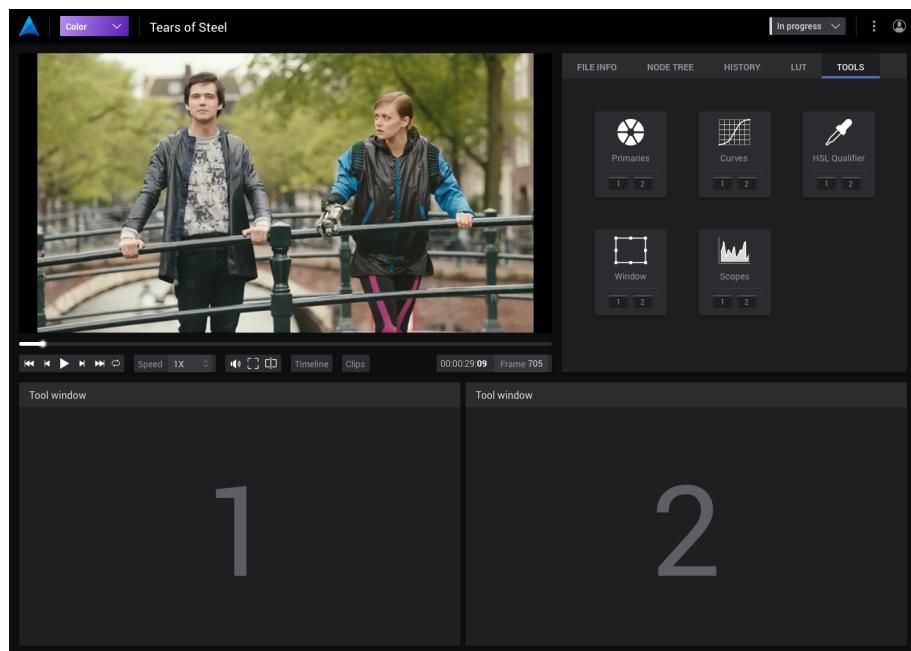


Figure 120: Appearance on the Color page when the Tools tab is visible and no tool is selected.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

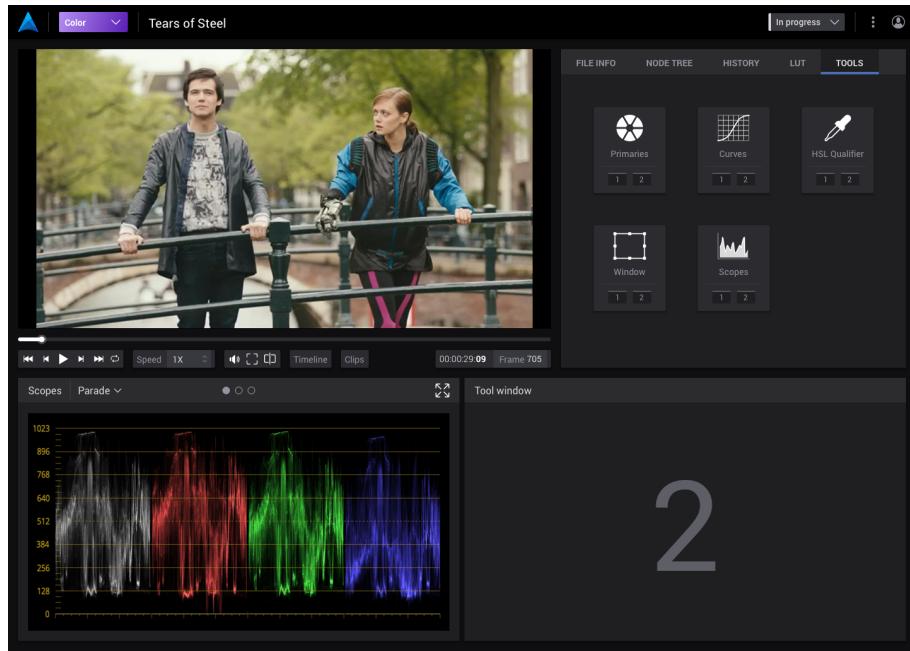


Figure 121: The appearance of the Color page where the Tools tab is visible, the Scopes tool is selected and where the Parade view is visible. In this case, the user has chosen to place it in position 1.



Figure 122: The appearance of the Color page where the Tools tab is visible, the Scopes tool is selected and where the Vectorscope view is visible. In this case, place 1 has been selected.

APPENDIX C. HIGH-FIDELITY PROTOTYPE

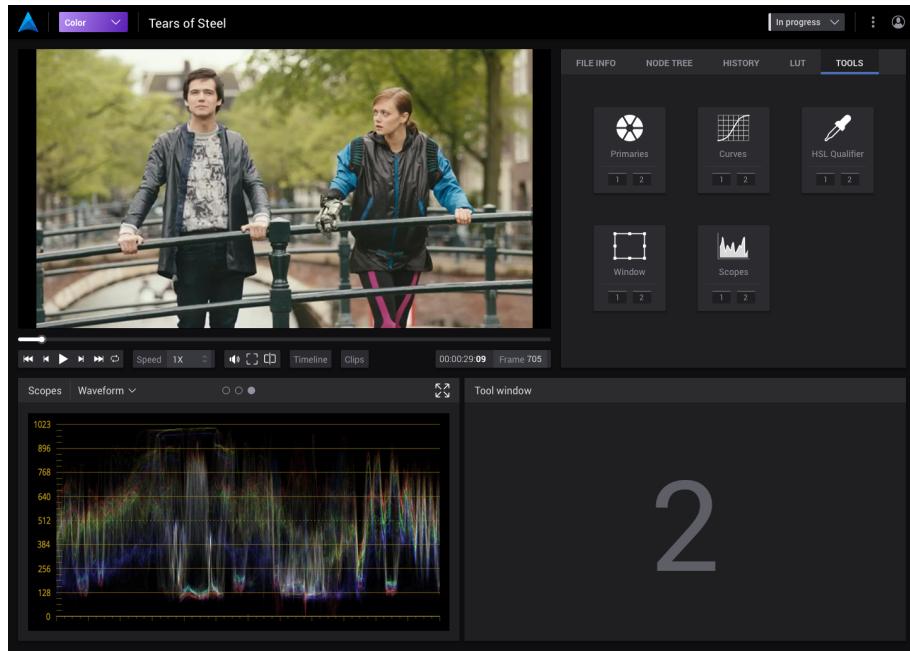


Figure 123: Appearance on the Color page when the Tools tab is visible, the Scopes tool is selected and where the Waveform view is visible. In this case, place 1 has been selected.

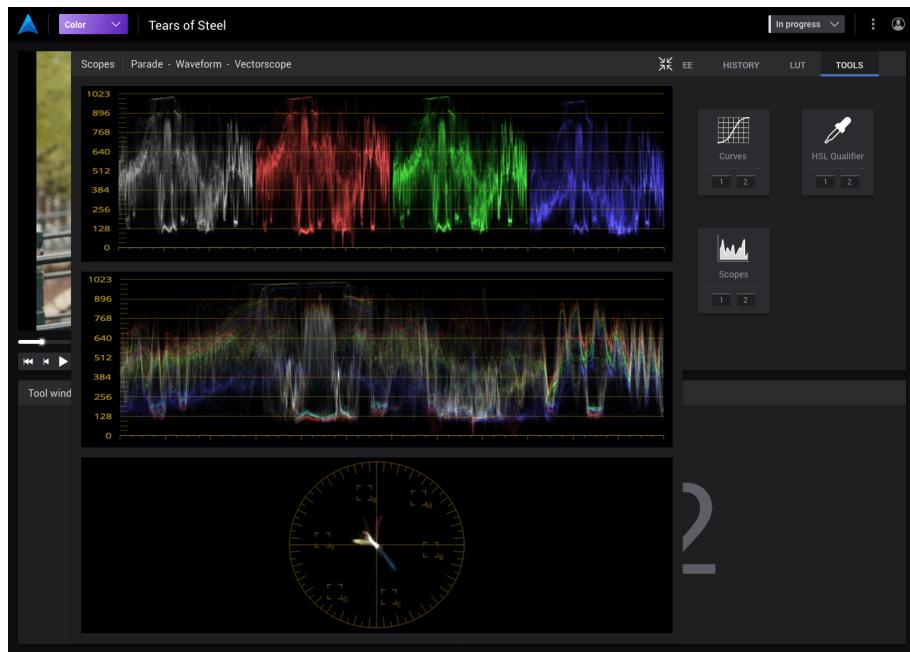


Figure 124: Appearance on the Color page when the Tools tab is open, where places 1 and 2 are empty. The user has clicked to enlarge the scope tool and can now see all three views at the same time, and can drag that window to place it where desired.

APPENDIX C. HIGH-FIDELITY PROTOTYPE



Figure 125: Appearance on the Color page when the Tools tab is visible. In place 1, the user has chosen to place the Scopes tool where the Parade view is visible, and in place 2 placed the Primaries tool, where the Wheels view is visible without adjustment.



Figure 126: Appearance on the Color page when the Tools tab is visible. In place 1, the user has chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Primaries, where the Wheels view is visible with adjustment.

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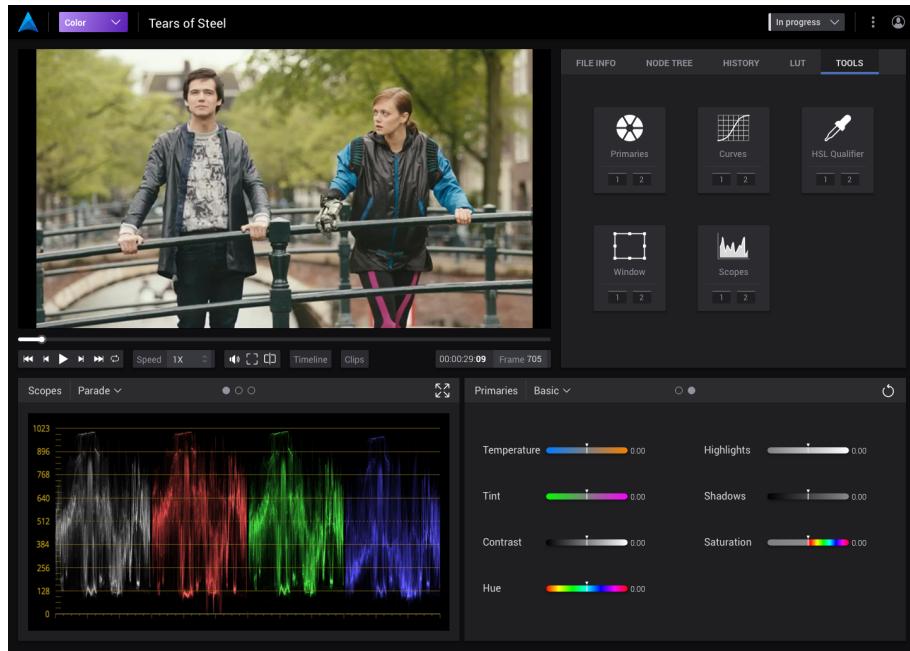


Figure 127: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes, where the Parade view is visible, and in place 2 placed the tool Primaries, where the Basic view is visible without adjustment.

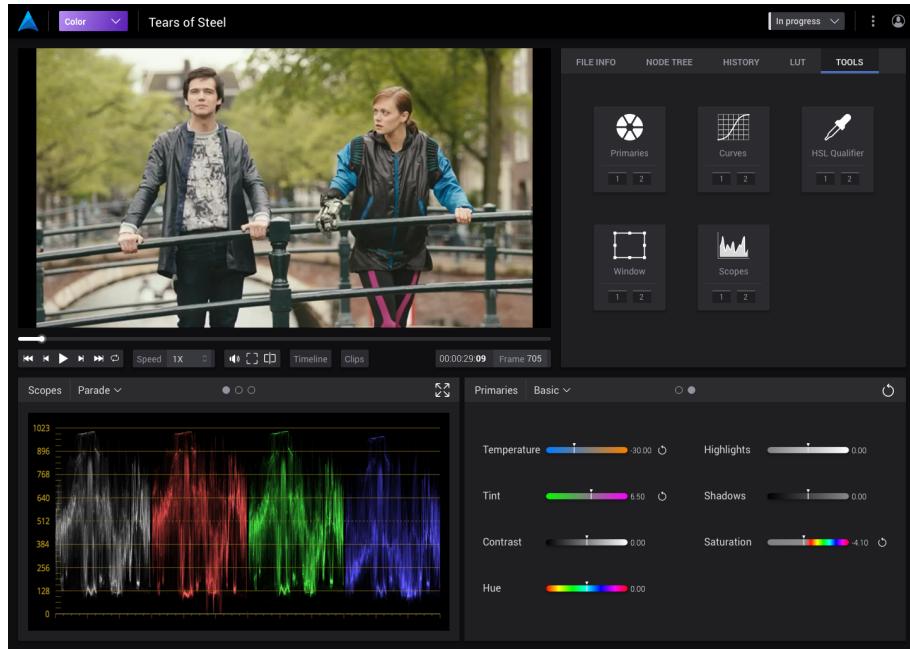


Figure 128: Appearance on the Color page when the Tools tab is visible. In place 1, the user has chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Primaries, where the Basic view is visible with adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE



Figure 129: Appearance on the Color page when the Tools tab is visible. In place 1, the user has selected the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the Custom view is visible without adjustment.



Figure 130: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the Custom view is visible with adjustment when they are linked (Luminance, Red, Green, Blue).

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Figure 131: Appearance on the Color page when the Tools tab is visible. The user has in place 1 selected the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the Custom view is visible with only Luminance active without adjustment.



Figure 132: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the Custom view is visible with only Luminance active with adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE



Figure 133: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curve where the Custom view is visible with only Red active without adjustment.



Figure 134: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the Custom view is visible with only Luminance active with adjustment.

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Figure 135: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the Custom view is visible with only Green active without adjustment.



Figure 136: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the Custom view is visible with only Green active with adjustment.

APPENDIX C. HIGH-FIDELITY PROTOTYPE



Figure 137: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool where the Parade view is visible, and in place 2 placed the tool Curves, where the Custom view is visible with only Blue active without adjustment.



Figure 138: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the Custom view is visible with only Blue active with adjustment.

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Figure 139: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Hue is visible without adjustment.



Figure 140: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes, where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Hue is visible with a point selected.

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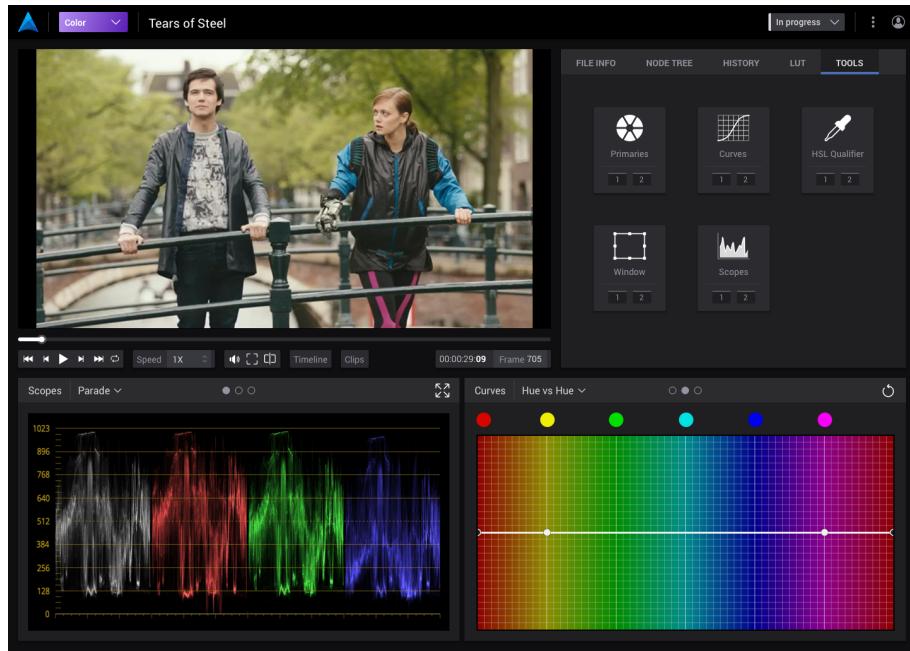


Figure 141: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Hue is visible with red being marked without adjustment.



Figure 142: Appearance on the Color page when the Tools tab is visible. The user has in place chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Hue is visible with yellow being marked without adjustment.

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Figure 143: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Hue is visible with green being marked without adjustment.



Figure 144: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the view Parade is visible, and in place 2 placed the tool Curves, where the view Hue vs Hue is visible with the cyan has been marked without adjustment.

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Figure 145: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the view Parade is visible, and in place 2 placed the tool Curves, where the view Hue vs Hue is visible with blue marked without adjustment.



Figure 146: Appearance on the Color page when the Tools tab is visible. The user has in place 1 selected the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Hue is visible with blue marked with adjustment.

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Figure 147: Appearance on the Color page when the Tools tab is visible. The user has in place 1 selected the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Hue is visible with the magenta marked without adjustment.



Figure 148: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the Hue vs Sat view is visible without adjustment.

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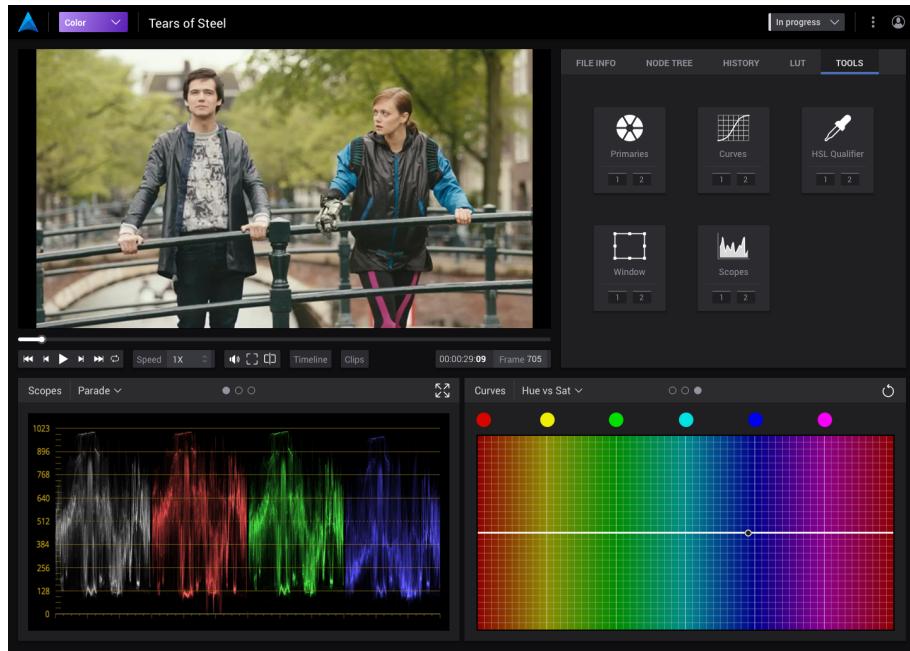


Figure 149: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Sat is visible with a point selected.



Figure 150: Appearance on the Color page when the Tools tab is visible: The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the Hue vs Sat view is visible with red highlighted without adjustment.

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Figure 151: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Sat is visible with yellow marked without adjustment.



Figure 152: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Sat is visible with green marked without adjustment.

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Figure 153: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Sat is visible with the cyan being marked without adjustment.



Figure 154: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Sat is visible with the blue marked without adjustment.

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Figure 155: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Sat is visible with blue marked with adjustment.



Figure 156: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Curves, where the view Hue vs Sat is visible with the magenta marked without adjustment.

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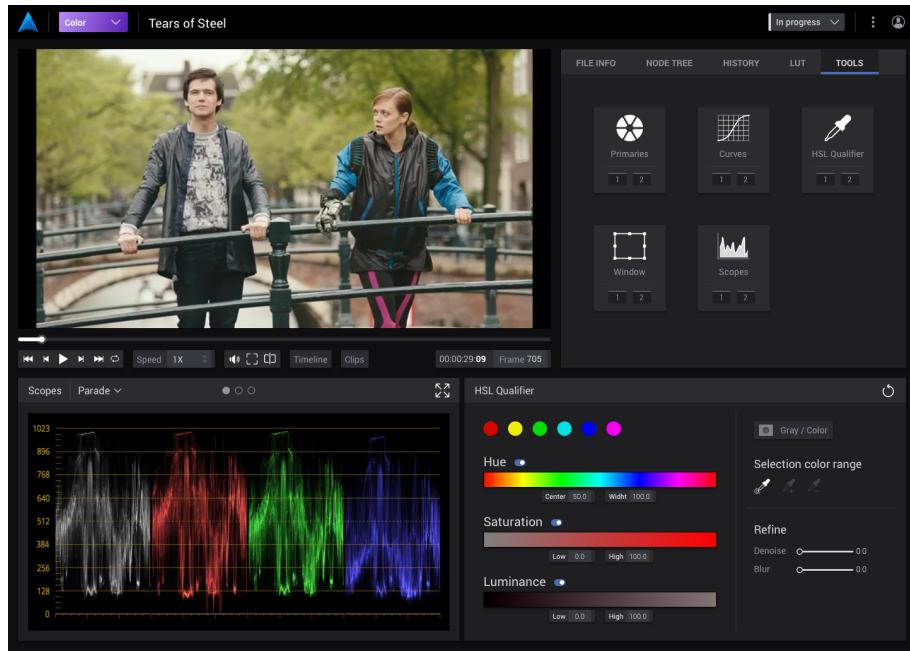


Figure 157: Appearance on the Color page when the Tools tab is visible. The user has chosen to place in place 1 the tool Scopes where the Parade view is visible, and in place 2 placed the tool HSL Qualifier.



Figure 158: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool HSL Qualifier, where the user has set Hue off.

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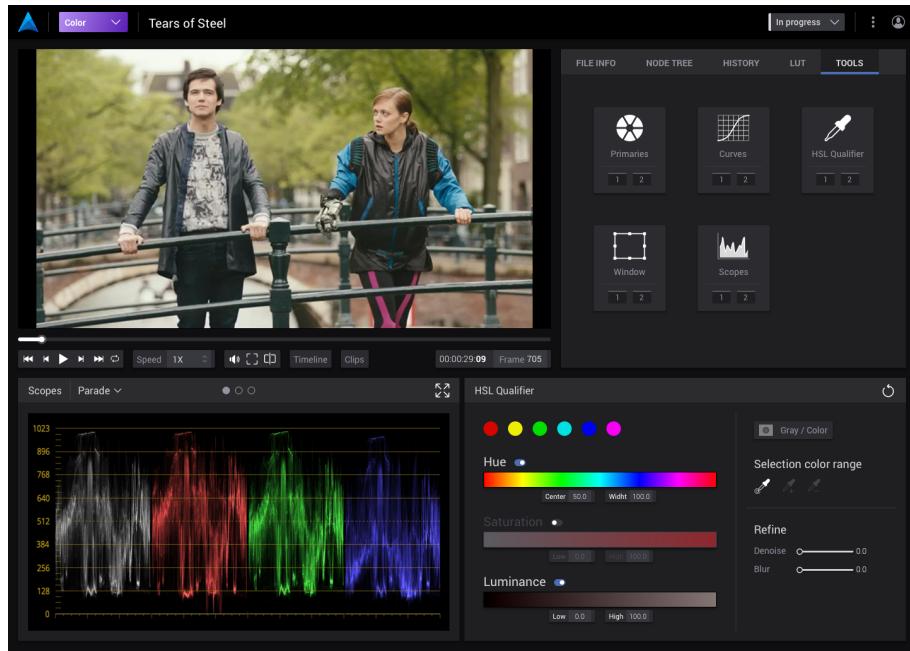


Figure 159: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool HSL Qualifier, where the user has set Saturation off.



Figure 160: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool HSL Qualifier, where the user has set Luminance off.

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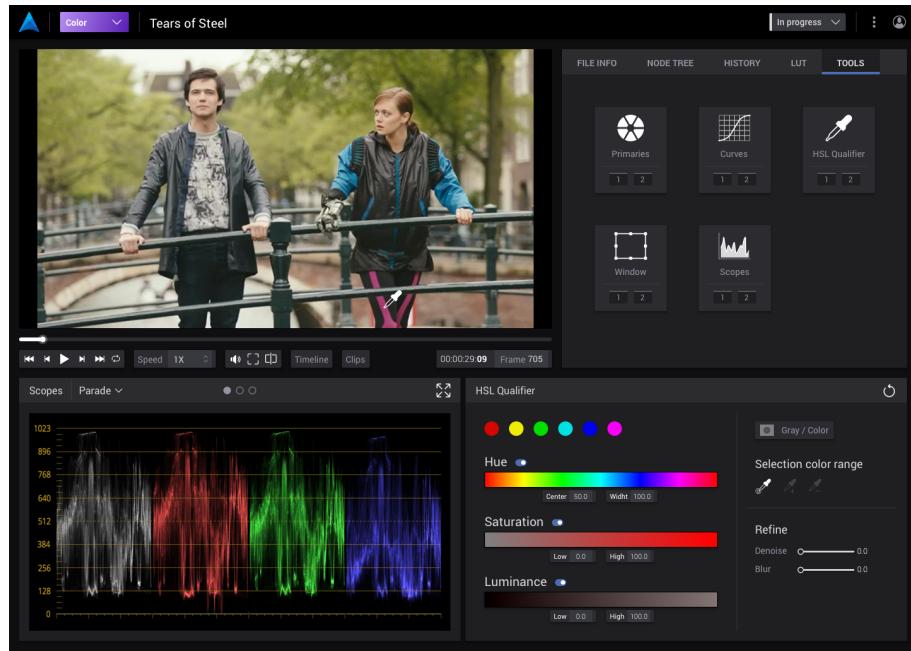


Figure 161: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes, where the Parade view is visible, and in place 2 placed the tool HSL Qualifier, where the user has chosen the pipette to pinpoint a color in the image, in this case the pink on the pants.

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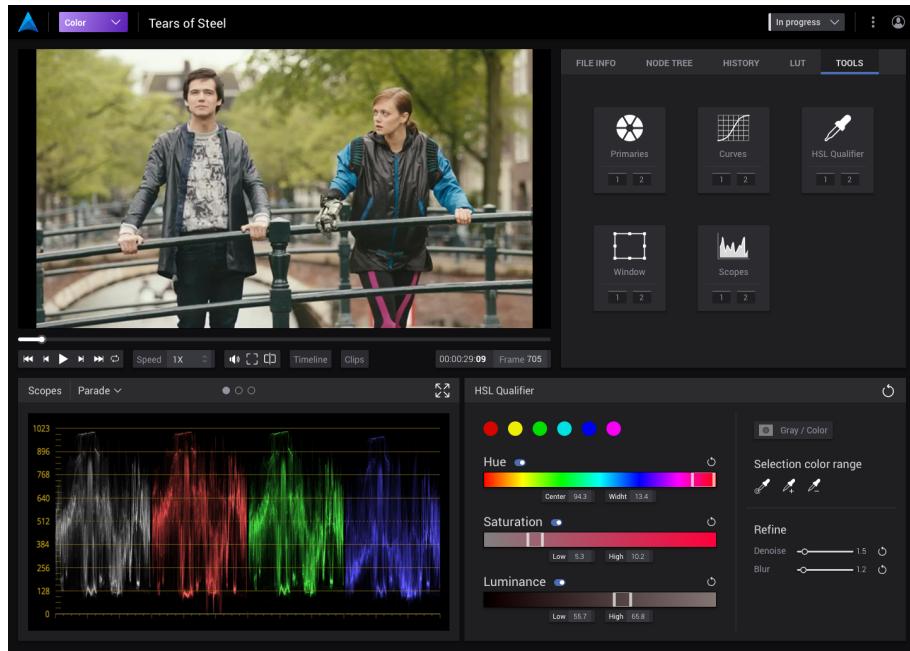


Figure 162: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes, where the Parade view is visible, and in place 2 placed the tool HSL Qualifier, where the user has pinpointed a color in the image. In this case, the pink on the pants and made an adjustment on the selected area.

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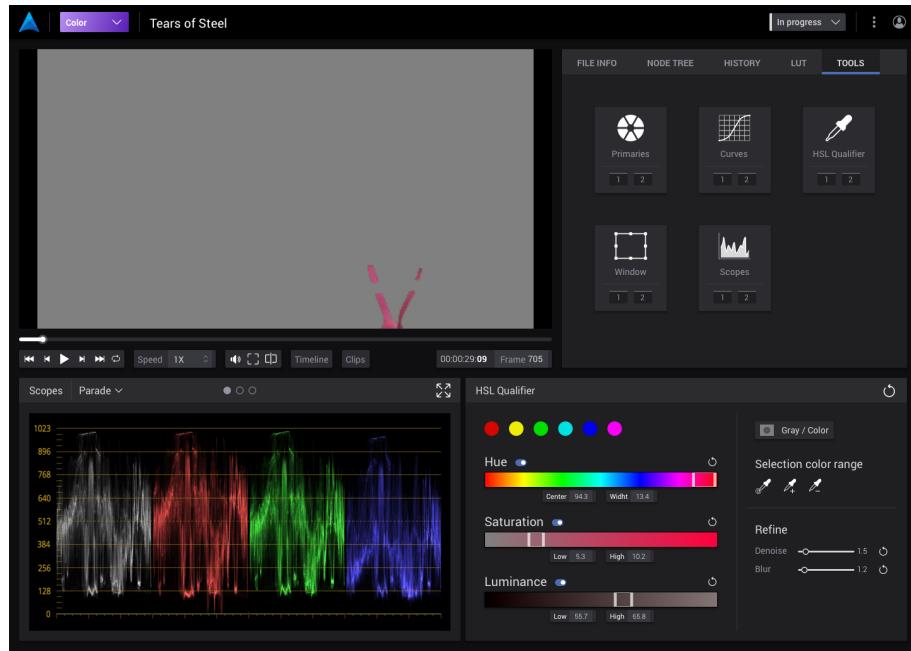


Figure 163: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool HSL Qualifier, where the user has pinpointed a color in the image. In this case, the pink on the pants, and made an adjustment on the selected area. Here, the user has also clicked on the Gray / Color button to be able to better see what is selected.

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Figure 164: Appearance on the Color page when the Tools tab is visible. The user has in place 1 selected the tool Scope, where the Parade view is visible, and in place 2 placed the tool Window, without any adjustment.



Figure 165: Appearance on the Color page when the Tools tab is visible. The user has in place 1 placed the tool Scopes where the Parade view is visible, and in place 2 placed the tool Window. The user has created a rectangle window and made adjustments.

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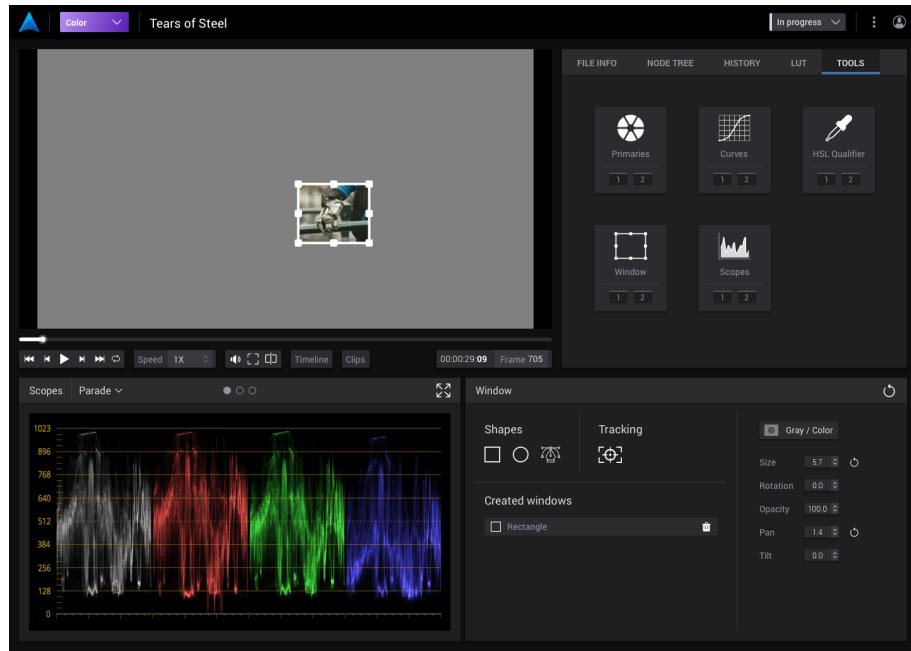


Figure 166: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Window. The user has created a rectangle window and made adjustments. Here, the user has also clicked on the Gray / Color button to be able to better see what is selected.

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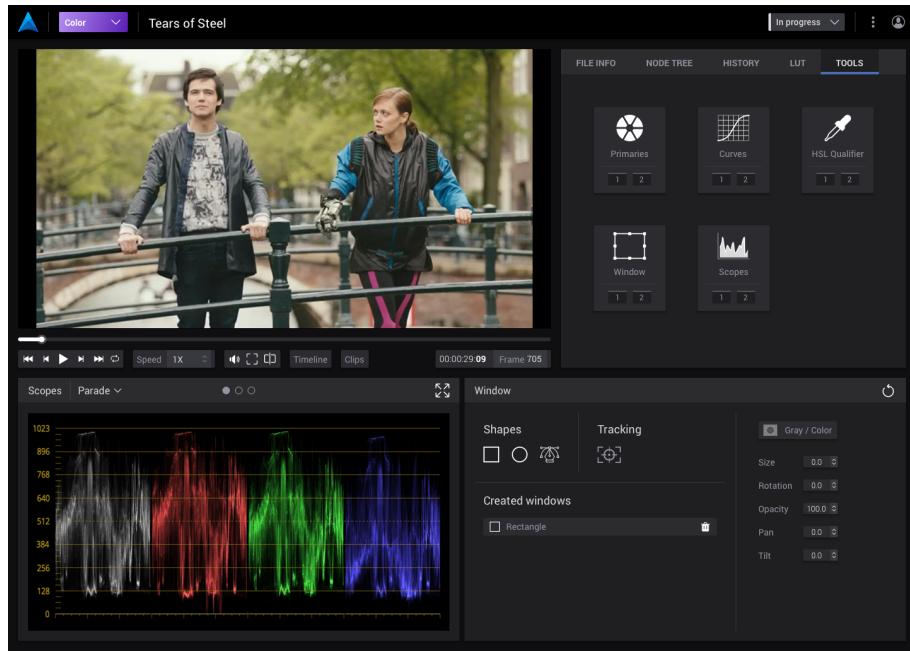


Figure 167: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Window. The user has deleted the window but has saved it to be able to reuse if desired.



Figure 168: Appearance on the Color page when the Tools tab is visible. The user has in place 2 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Window, where the user has created a circle window and made an adjustment.

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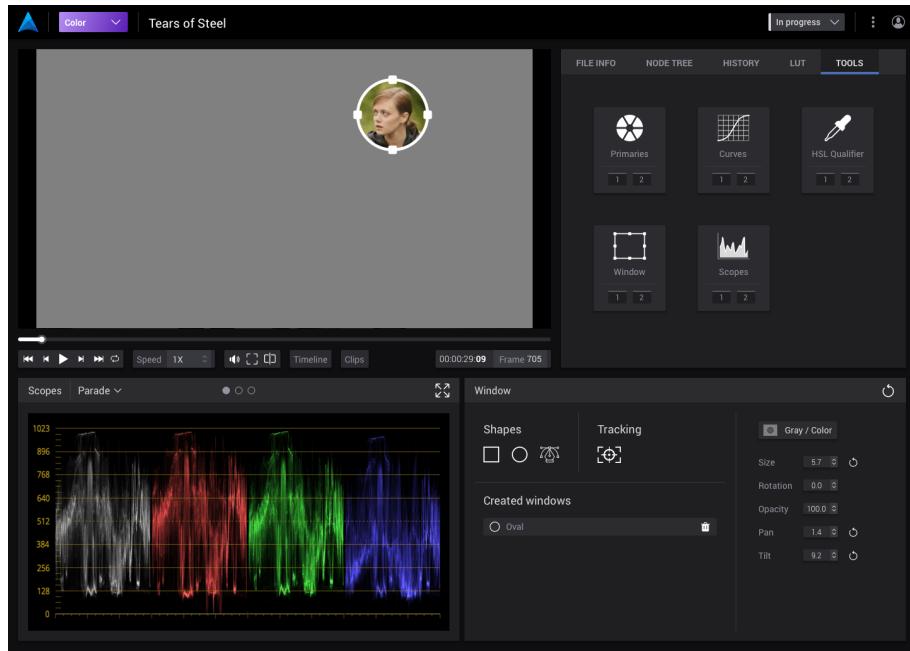


Figure 169: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Window. Here the user has created a circle window and made adjustments. The Gray / Color button has also been clicked to be able to better see what is selected.



Figure 170: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and in place 2 placed the tool Window. The user has deleted the window but has saved it to be able to reuse if desired.

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Figure 171: Appearance on the Color page when the Tools tab is visible. The user has in place 1 chosen to place the tool Scopes where the Parade view is visible, and also chosen to place the tools Scope again but in place 2, where the view Vectorscope is visible. In this way be able to see two different scopes if desired.