Master 1 IMAGINE Projet Image

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1 Project Structure

This week we set up the project structure. We use Cmake to compile the project. This makes it easy to compile multiple files, because all the files in the src folder are automatically added to the project. Also, the main file is mostly used to read the parameters and to chain together the different operations on the images. All the logic is transferred to other files, which makes the project much more structured and easier to understand.

2 Helper Classes

Working with color images can be quite complicated, because every pixel uses three positions in the array to save its three colors. Therefore, one always has to take care when converting between the pixel coordinates and the index of the pixel in the array. We wrote a class ColorImage that takes care of all the things that need to be done with a color image: loading from or writing to a file, allocating and freeing memory and setting pixel colors. It also checks if a pixel is inside the image, so that there are now memory issues.

It uses the class Color, to set its pixels. This class also supports the conversion from RGB to HSL Color space which is usefully when working with colors.

3 Converting Color Schemes

Lastly we added a function that converts an image to use a given color scheme. In this case a color scheme is defined by an array of hues (from 0 to 360 in HSL Color Space).

For each pixel we convert its RGB colors into HSL colors. Then we check which hue of the color scheme is closest to its hue. Then we set its hue to this value while keeping saturation and luminosity the same.

The final image then uses only the hues defined by the color scheme. This can be used to turn an image with multiple colors like Image 1 into a monochrome images like Image 2 or one that uses two colors like Image 3.

This transformation does not look good on every image though: Image 4 uses a complementary color scheme. Especially in the sky there are clear borders between these two colors where there should not be one. This issue could be addressed in the future.

Figure 1: Original image
(Source: https://tf-cmsv2-smithsonianmag-media.s3.amazonaws.com/legacy$_b$*log*/*opposite.jpg*).

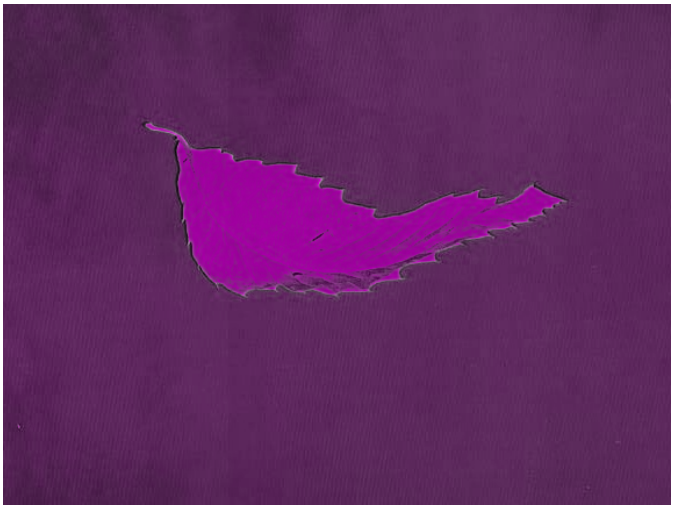

Figure 2: Image converted to a monochrome image.

Figure 3: Image converted to use two colors.

Figure 4: Image converted to use complementary colors.
(Original Image: https://news.melbourne.vic.gov.au/wp-content/uploads/2023/05/DJI$_0$192 $-$ $HDR_edit - landscape - 1000.jpg$)