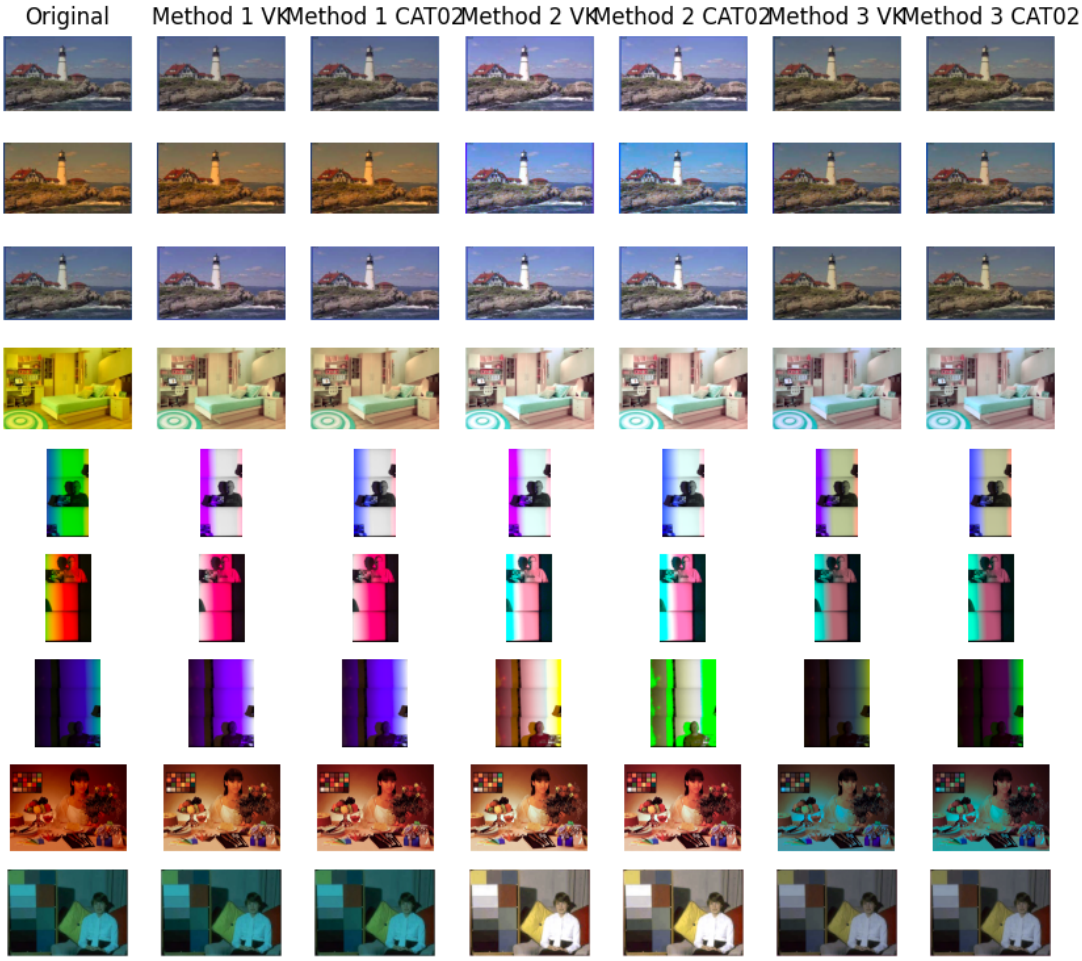
HPC - 2.5.1

Taha Enayat
Spring 2024

The goal of this assignment was to explore different white balance algorithms to achieve chromatic adaptation in digital images, making them appear as humans perceive them under different lighting conditions. Three methods were used along with two chromatic adaptation transforms (von Kries and CAT02) to balance the images to the D65 illuminant. The results of these methods are shown in the attached image.



Method 1

This method assumes the brightest object in the image is white. The achromatic channel A = 2L + M + 1/20S was used to identify this object.

with von Kries adaptation, it resulted in a reasonable correction for most images but tended to overemphasize certain colors, making some images appear unnatural. in CAT02 adaptation, this method provided a more balanced correction, but still had issues with overly bright highlights in some images.

Overall, this method did not perform the best, which was expected from beginning as brightest point may not always be white. But on the other hand, this method is simple and automatic.

Method 2

In this method, a white object was manually selected in the image. Its color data was used to apply the chromatic adaptation transforms.

With von Kries adaptation, this method produced fairly accurate results since the manually selected white object provided a good reference. However, it was highly dependent on the accuracy of the manual selection.
in CAT02, it gave the best results in terms of natural appearance, closely matching the perceived colors under D65.

This method in terms of advantages, it is very accurate if the white object is correctly identified. But it has the drawback that manual selection is time-consuming and subjective, introducing potential errors.

Method 3

Here, the average color of the image was assumed to be a medium gray (gray-world assumption).

In von Kries adopted images, the results were mixed, with some images appearing too warm or cool depending on the average color. And in CAT02, it generally provided similar results to von Kries' but with slightly better balance.

The main Advantages of this method is that it's automatic and less prone to errors if the average color is truly representative. And the main disadvantage is that it can be inaccurate for images with strong color casts, as the average may not reflect true gray.