CS294-164 Report - Week 2

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1 Color in the Wild

1.1 Main Idea

This reading mainly focuses on the different basic aspects of human color perception, the color spectrum and the definition of color. It also highlights some common misconceptions among researchers regarding color. Some key points are:

1. Color has nothing to do with wavelength. Colors do not have a one-to-one relation with their monochromatic parts. i.e. yellow can be matched by red+green as well.

2. Humans are mostly trichromats, i.e. they have three types of cone cells. The three types of cones are L, M, and S, which have pigments that respond best to light of long, medium, and short wavelengths respectively.

3. Color of objects is defined by the spectral reflection factors of objects. A mirror reflects light in only one direction and has no color of it's own. Primordial objects have visible surfaces which are roughly Lambertian, they reflect light in all directions. All colors are caused by the fact that the spectral reflectance factor is less that that of white, so all colors are "related" to white.

4. **Colorimetry** is the science of measuring color. Radiant power spectra can be added to each other by superimposing them. Metamerism is when two colors which are not the same appear the same under certain lighting conditions. There are infinitely many colors, they can be mapped one-to-one on a three-dimensional continuum. Depending on culture, there are 2-11 colors.

1.2 New idea based on readings

1. Metamerism as a software tool. It would be interesting to see if we can predict what an image would look like under certain lighting conditions and apply such effects on an image as a post processing step.

2. Using the concepts mentioned in this write up, an interesting experiment I would like to try is color enhancement/modifications to parts of an image. Is it possible to programatically increase the intensity of red and decrease the intensity of yellow? If so what is the best color space to do this?

3. Effects of using different representations of color (eg., different color spaces) for deep learning experiments such as object detection.

2 Experiments on Color, as perceived by the Eye, with remarks on Color blindness

2.1 Main Idea

The paper mainly talks about the rotating disc and similar experiments to understand more on how humans perceive color. The rotating disc experiment is conducted by taking discs of paper and arranging them around a round axis. When the discs are set in motion, the sectors of color become indistinguishable. These experiments led to three main revelations:

1. The human eye is capable of estimating the likeliness of colors with a good precision

2. The judgement formed by the eye is not dependent on the real identity of the colors

3. Eyes of different observers vary in accuracy, but agree with each other.

Shade, hue and tint are another mode of reducing the elements of color to three.

2.2 New idea based on readings

Can we synthesize motion in an image by using tricks in coloring the image? For example, given a sketch which needs to be colored, what are the different ways to color this to induce different effects?