CS294-164 Report - Week 4

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September 18, 2019

1 The dimensionality of color vision in carriers of anomalous trichromacy

1.1 Main Idea

This paper examines the dimensionality of color vision in anomalous trichromats. Due to X-chromosome inactivation, anomalous trichromats have four classes of cones rather than three in their retinae. This leads to tetrachromatic behaviour. In this work they test this further by (1) a forced-choice version of the Rayleigh test, (2) a test using multidimensional scaling to reveal directly the dimensionality of the participants' color space, and (3) molecular genetic analyses to estimate the X-linked cone peak sensitivities of a selected sample of strong candidates for tetrachromacy. While tetrachromatic behaviour wasn't observed 23 of the participants with deuteranomaly, one of them exhibited tetrachromatic behaviour in all experiments.

1.2 New idea based on readings

It would be interesting to simulate this in software to test if there's a way to allow people with anomalous trichromacy to distinguish spectral stimuli which is not visible to the normal human eye. If there cone cells can be stimulated under certain conditions (such as in Oz Vision), will they be able to see color beyond the visible spectrum? Can analysing this help treat color blindness? Further, can this behaviour be transferred to cameras in some way by simulating the arrangement of cones/rodes?

2 Do EnChroma glasses improve color vision for colorblind subjects?

2.1 Main Idea

This work evaluated the effectiveness of EnChroma glasses in improving color vision. The first trategy is to measure recognition, arrangment and discrimination with and without the glasses. The second complementary strategy they use

the spectral transmittance of the glasses to simulate the appearance of stimuli in a set of scenes for normal observers and observers with CVD. The results show that the glasses may not be as effective as the makers claim them to be. These glasses do not pass the Ishira test. They only introduce a variation of the perceived color, but neither improve results in the diagnosis tests nor allow the observers with CVD to have a more normal color vision.

2.2 New idea based on readings

1. Analysing case studies of people who have benefit with the usage of these glasses might lead to interesting insights. It might help better set the goals and understand the expectations from other surgical/software solutions to CVD.

2. Do we ever see a future where color vision deficiency can be rectified surgically? With laser surgeries, now it's possible to correct near and far sightedness.

3. Is dynamic automatic recolorization of an image an effective solution to CVD? Understanding the type of color blindness affecting the person, we can recolorize an image on the fly and project using something like Google Lense to project a version of the image where the colors are distinguishable to the person wearing them. Can brightness, texture and other cues be used as distinguishing factors?