

CLRS720 – Computational Vision Science– Lab 2 – Constant Stimuli

Objective The objectives of this lab assignment are to practice building a Matlab GUI, running a method of constant stimuli (2AFC) experiment, processing, analyzing, and plotting data in Matlab, and writing a research summary.

Background 'Unique hues' are defined as colors that are perceived to have no mixture of other colors. There are typically four colors that can be perceived as unique (red, green, blue, yellow). There is often considerable interobserver (between multiple observers) and intraobserver (within the same observer) variability when assessing perceptions of unique hues.

Instructions In this lab, you will estimate unique hues using the method of constant stimuli. For each unique hue (blue, yellow), you will present a series of nearby hues, and ask the observer which side it is on. For example, for unique blue and yellow, the observer answers whether it is "greenish" or "reddish".

The paper **Shamey (2019)** provides some data where you might find unique hues, which can be used as a starting point. You will pick a range of colors nearby each unique hue, display these, and use your visual judgment to estimate unique hues.

For each unique hue, you must select **9 colors** with nearby hues, centered on your estimate of the unique hue, and spanning a large enough range so that the extremes are obviously different than the center hue.

You will build a Matlab GUI that displays the stimuli (for blue and yellow) and records the responses. You must program the GUI to show all 9 stimuli for a given unique hue in **random order**, and present each hue in **blocks** (e.g., all blue hues in a random order, then all yellow hues in a random order). You will **repeat** the experiment 10 times, so that you can draw a psychometric curve and estimate your unique hues.

For this lab, work in CIELAB LCh color space, holding L (lightness) and C (chroma) constant while varying h (hue angle). Use D65 as a white point and use a 50% gray as the background display.

The deliverables for this lab are a PDF file, a Matlab script file, a Matlab GUI file, and an Excel data file. The PDF will be titled **YourNameLab2.pdf**, with a lab writeup (~2-3 pages) summarizing the experiment: Use the attached template to write an Abstract, Introduction/Background, Methods, and Results section with Figures and References. Make sure Figures are clear, with appropriate titles and axis labels. The Matlab script file will be titled **YourNameLab2.m**, and will contain the Matlab code used to process, analyze, and plot the data. The Matlab GUI file will be titled **YourNameLab2GUI.m** will be the GUI function used to run the experiment. The Excel data file will be titled **YourNameLab2Data.xls** will be your output data from the experiment.