

Thalamic Labs C++ Challenge

A lightbulb company is designing a new bulb and would like to ensure that the bulbs appear white to the human eye and have a consistent colour temperature over time.

In order to check the colour of the lightbulbs, as perceived by the human vision system, an optical spectrometer was used to measure the light emitted by the bulbs over time. All of the light observed by the spectrometer came from the bulb, but as with all instruments, there may be some noise in the data.

Part 1

Given data from an optical spectrometer, write a program that calculates the perceived colour of the light as a (x, y) coordinates on a CIE-1931 chromaticity diagram. The program can be written for any platform using C++.

The measurement data is provided as two CSV files per trial, in the following format:

Wavelengths.csv:

```
# Bin Number, Wavelength
1, 450
2, 451
...
```

Intensities.csv:

```
#Timestamp, Bin 0, Bin 1, Bin 2, Bin 3
1, 0.00001, 0.002, 0.003, 0.04, ...
2, 0.00001, 0.001, 0.006, 0.08, ...
3, 0.00001, 0.003, 0.332, 0.12, ...
...
```

At each measurement, the optical spectrometer provides an array of intensities where each element corresponds to the intensity of the light at a particular wavelength. The wavelengths of each element are provided in wavelengths.csv, and the set of measurements in a trial are in intensities.csv.

Part 2

Determine how stable the perceived colour is over time.

References

- Colour Matching Functions (<http://cvrl.ioo.ucl.ac.uk/cmfs.htm>)