**Coding Assignment 1**

**Department of Electronics & Electrical Communication Engineering, IIT Kharagpur.**

**Course: EC60002, Computer Vision**

**Academic Term: Spring 2020-21**

**Maximum Marks: 20 (8% of Total)**

**Deadline: 24th January, 2021, 11am**

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## Instructions:

- Do not use downloaded or inbuilt functions related to the implementations required in order to get proper results.
- You are free to use any coding language provided that it can be run in Google Colab.
- All the deliverables must be submitted in a single zip file at the relevant Google form.
- Solutions will be discussed in the Q&A session immediately after the deadline.

## Data Supplied:

- Spectral tristimulus values / color matching functions [normalized, sum. 1] corresponding to the XYZ color representation system. (slightly different from actual due to precision issues)
  Tristimulus arrays [1x95]: *x*, *y* and z, and corresponding wavelength array [1x95]: *wavelength_L*
- 3 different illuminants [normalized, max. 1]
  Illuminant arrays [1x95]: philips_spectra, silvania_spectra, uniform_spectra

## Relevant Expressions:

Tristimulus values *X Y Z* from spectral tristimulus values $x(\lambda), y(\lambda)\ \&, z(\lambda)$ computation:

$$X = \int C(\lambda)x(\lambda)d\lambda, Y = \int C(\lambda)y(\lambda)d\lambda, Z = \int C(\lambda)z(\lambda)d\lambda$$

Light spectra from an object with reflectance $\rho$ under the influence of light illuminant *I*:

$$C(\lambda) = I(\lambda)\rho(\lambda)$$

*RGB* to *XYZ*

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} 0.49 & 0.31 & 0.2 \\ 0.177 & 0.813 & 0.01 \\ 0 & 0.01 & 0.99 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

## Task:

(a) Find and discuss the RGB representation of a true white object (reflectance unity for all wavelengths) captured by the above spectral tristimulus system under the 3 different illuminants stated.

(b) Considering the uniform illumination spectra and the object reflectance as $\rho(\lambda) = \frac{w(\lambda)}{\max_\lambda w(\lambda)}$ with $w \in \{x, y, z\}$, find and discuss the RGB representations of the object captured by the above spectral tristimulus system for all the 3 object reflectances.

## Deliverables (in a single .zip file):

1. A document containing all the findings asked under the task given along with discussion using not more than 300 words in each part.
2. Codes used to generate the findings along with a command sequence to generate all the findings.