

Coding Assignment 2
Department of Electronics & Electrical Communication Engineering, IIT Kharagpur.

Course: EC60002, Computer Vision
Academic Term: Spring 2021-22
Maximum Marks: 30

Instructions:

- Do not use downloaded or inbuilt functions related to the implementations required in order to get proper results.
- Do not convert the images supplied into any other format. Figure out a way to import them or read them as 3D arrays, as supplied [you can contact the TA reg. this].
- 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:

- 10 Color Images

Relevant Expressions:

RGB to HSI

$$H = \begin{cases} \theta, & \text{if } B \leq G \\ 360 - \theta, & \text{if } B > G \end{cases}, \theta = \cos^{-1} \left(\frac{0.5[(R - G) + (R - B)]}{[(R - G)^2 + (R - B)(G - B)]^{0.5}} \right)$$
$$I = \frac{R + G + B}{3} \quad \& \quad S = 1 - \frac{\min(R, G, B)}{I}$$

AWB through Gray world Assumption:

$$R'(x, y) = R(x, y) \times \frac{m}{\text{Avg}_{x,y} R(x, y)}, \quad G'(x, y) = G(x, y) \times \frac{m}{\text{Avg}_{x,y} G(x, y)}$$
$$B'(x, y) = B(x, y) \times \frac{m}{\text{Avg}_{x,y} B(x, y)}, \quad m = \min \left(\text{Avg}_{x,y} R(x, y), \text{Avg}_{x,y} G(x, y), \text{Avg}_{x,y} B(x, y) \right)$$

Task:

Find, tabulate and discuss the average hue, saturation and intensity differences in the 10 color images between:

1. The original given image $I(x, y) = [R(x, y), G(x, y), B(x, y)]$ and $I'(x, y) = I(x, y) \times p, 0 < p < 1$. Ignore all pixels of $I(x, y)$ where $R(x, y) = G(x, y) = B(x, y)$.
2. The original given image $I(x, y) = [R(x, y), G(x, y), B(x, y)]$ and $I'(x, y) = I(x, y) + [G(x, y) - R(x, y), B(x, y) - G(x, y), R(x, y) - B(x, y)]$. Again, ignore all pixels of $I(x, y)$ where $R(x, y) = G(x, y) = B(x, y)$.
3. The original given image $I(x, y) = [R(x, y), G(x, y), B(x, y)]$ and $I'(x, y) = [R'(x, y), G'(x, y), B'(x, y)]$ obtained by applying the given AWB. While doing analysis of the hue change, ignore all pixels of $I(x, y)$ where $R(x, y) = G(x, y) = B(x, y)$ and $R'(x, y) = G'(x, y) = B'(x, y)$.

Caution: Hue difference is angle difference!

Deliverables (in a single .zip file):

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