

Homework 3 – Color model

PART I – color model converting

- Convert RGB images to HSI images and also do the other way around.
- Answer the question in the template file.

PART II – histogram equalization

- Perform histogram equalization on colored images.
- Answer the question in the template file.

PART III – covert noisy images

- Observe the effects of converting noisy images between different color models.
- Answer the question in the template file.

More details are described in the template.



Rules

- Deadline: **2019/12/13 23:55**
NO LATE SUBMISSION
- Upload file: **Your_Student_ID.ipynb**
- In this homework, a HW3_template.ipynb file is provided and you have to **modify the file directly**. I've marked the part where you need to modify.
- Do not use any high-level function of color model converting.
- Answer the questions in your ipynb file directly. The more detailed the answer, the better score you'll get.
- Do not copy/paste other's code.

Jupyter Notebook

Tutorials for jupyter notebook:

- <https://jupyter.readthedocs.io/en/latest/content-quickstart.html>
- <https://www.datacamp.com/community/tutorials/tutorial-jupyter-notebook>
- <https://www.youtube.com/watch?v=HW29067qVWk>



RGB to HSI

RGB to HSI

Where $R \in [0,1]$, $G \in [0,1]$, $B \in [0,1]$
and $H \in [0,360]$, $S \in [0,1]$, $I \in [0,1]$

$$H = \begin{cases} \theta & \text{if } B \leq G \\ 360 - \theta & \text{if } B > G \end{cases}$$

$$\theta = \cos^{-1} \left\{ \frac{\frac{1}{2}[(R - G) + (R - B)]}{[(R - G)^2 + (R - B)(G - B)]^{1/2}} \right\}$$

$$S = 1 - \frac{3}{R + G + B} [\min(R, G, B)]$$

$$I = \frac{1}{3} (R + G + B)$$



HSI to RGB

HSI to RGB

For $0^\circ < H \leq 120^\circ$

$$b = \frac{1 - S}{3}$$

$$r = \frac{1}{3} \left(1 + \frac{S \cos H}{\cos(60^\circ - H)} \right)$$

$$g = 1 - (r + b)$$

For $120^\circ < H \leq 240^\circ$

$$H = H - 120^\circ$$

$$r = \frac{1 - S}{3}$$

$$g = \frac{1}{3} \left(1 + \frac{S \cos H}{\cos(60^\circ - H)} \right)$$

$$b = 1 - (r + g)$$

For $240^\circ < H \leq 360^\circ$

$$H = H - 240^\circ$$

$$g = \frac{1 - S}{3}$$

$$b = \frac{1}{3} \left(1 + \frac{S \cos H}{\cos(60^\circ - H)} \right)$$

$$r = 1 - (b + g)$$

where $r = R/3I, g = G/3I, b = B/3I$



- If you have any question about this homework, please e-mail to lynn97.ee08g@nctu.edu.tw

