Homework 9 (Due: 5/22)

Perform contrast enhancements for a color image.

(1) Input a *RGB* color image;

(2) Scale its *RGB* pixel values to *rgb* values,
where $0 \le r, g, b \le 1$;

(3) Transfer *rgb* pixel values into *hsi* values;

(4) Apply the histogram equalization algorithm to the *i* component to obtain the i' component;

(5) Transfer the *hsi*′values into $r'g'b'$ values;

(6) Scale $r'g'b'$ values to $R'G'B'$ values,
where $0 \le R', G', B' \le 255$;

(7) Output the *RGB* and $R'G'B'$ color images.

- ***RGB → HSV***

$$V = \max\{R, G, B\},$$

$$\delta = V - \min\{R, G, B\}, \quad S = \delta / V$$

If $V = R$, then $H = \frac{1}{6}\left(\frac{G - B}{\delta}\right)$

If $V = G$, then $H = \frac{1}{6}\left(2 + \frac{B - R}{\delta}\right)$

If $V = B$, then $H = \frac{1}{6}\left(4 + \frac{R - G}{\delta}\right)$

If H ends up being negative, add 1.

If $(R,G,B) = (0,0,0)$, then $(H,S,V) = (0,0,0)$

- ***HSV → RGB***

$$H' = \lfloor 6H \rfloor$$

$$F = 6H - H'$$

$$P = V(1-S)$$

$$Q = V(1-SF)$$

$$T = V[1-S(1-F)]$$

H'	R	G	B
0	V	T	P
1	Q	V	P
2	P	V	T
3	P	Q	V
4	T	P	V
5	V	P	Q