

DMET 901: Assignment #2
Due: Sunday, November 30th, 2008 (11:59 PM)

Important:

☞ The assignment is to be solved individually. You may discuss your work with your colleagues but you have to submit your own copy. Cheating cases will be dealt with firmly.

☞ You have to implement the techniques below step-by-step yourself. Do not use built-in histogram functions.

Question 1:

Create a dialog-based application that uses OpenCV to implement the histogram equalization technique we studied on a color image of your choice. This is to be done by applying it on individual channels of R, G and B. Display the image after equalization.

Convert the RGB colors into HSV color space and apply the equalization step to the V channel only. Convert the image back to RGB space and display it. Generate the image histogram and the cumulative histogram before and after the equalization process.

To transform from RGB to HSV, use the following equations:

$$H = \begin{cases} 0 & \text{if } MAX = MIN \\ 60^\circ \times \frac{G - B}{MAX - MIN} + 0^\circ & \text{if } MAX = R \text{ and } G \geq B \\ 60^\circ \times \frac{G - B}{MAX - MIN} + 360^\circ & \text{if } MAX = R \text{ and } G < B \\ 60^\circ \times \frac{B - R}{MAX - MIN} + 120^\circ & \text{if } MAX = G \\ 60^\circ \times \frac{R - G}{MAX - MIN} + 240^\circ & \text{if } MAX = B \end{cases}$$

$H \in [0^\circ, 360^\circ[$
 $R \in [0.0, 1.0]$
 $G \in [0.0, 1.0]$
 $B \in [0.0, 1.0]$
 $S \in [0.0, 1.0]$
 $V \in [0.0, 1.0]$

$$S = \begin{cases} 0 & \text{if } MAX = 0 \\ \frac{MAX - MIN}{MAX} & \text{otherwise} \end{cases}$$

$MAX = \max(R, G, B)$
 $MIN = \min(R, G, B)$

$$V = MAX$$

To transform from HSV to RGB, use the following equations:

$$H_i = \left\lfloor \frac{H}{60} \right\rfloor$$

$$f = \frac{H}{60} - H_i$$

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

$$q = V(1 - fS)$$

$$t = V(1 - (1 - f)S)$$

H_i	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

Question 2:

Create a dialog-based application that uses OpenCV to implement the contrast stretching technique we studied on a gray-scale image of your choice. The user should be able to enter the desired range of output values.

Submission:

1. Submit a typed report, written as an MS Word file (or in LaTeX), including all results along with applicable theory and discussion including sample images and snapshots for the dialog.
2. Your code completed with useful comments.