# School of Computing
# National University of Singapore
# CS4243 Computer Vision and Pattern Recognition
# Semester 1, AY 2015/16

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## Lab 4 – Color

**Objective:**

To understand the materials covered in the lecture through

- Implementing color conversion using python codes
- Performing histogram equalization on color images.

**Preparation:**

- Download the file lab4.zip from IVLE into your working directory. Uncompress the file and you should find the following document and pictures: color_v1.pdf, flower.jpg, bee.png.

**Introduction and Coding Instructions**

This is an exercise to understand the concept of color, color conversion and histogram equalization on color images. You must write python code in this lab. Specific instructions are:

- You can only use OpenCV for the following, and only for the following:
  - cv2.imread
    - to read an image (eg. image = cv2.imread('filename.jpg') )
  - cv2.imwrite
    - to save an image (eg. cv2.imwrite('filename.jpg', image) )
  - cv2.imshow
    - to display an image on screen (eg. cv2.imshow('title', image) )
  - cv2.waitKey(*x*)
    - *x* is duration, if you set it to 0, it waits for your key press
  - cv2.destroyAllWindows()
    - to kill all windows created by cv2.imshow

- You are not allowed to use any other methods in OpenCV or any other packages other than python, numpy and math.

- You must implement color space conversion by writing the python codes yourself (i.e. you cannot get the codes from elsewhere). The formula for RGB to HSV conversion can be found in

  http://www.rapidtables.com/convert/color/rgb-to-hsv.htm

and the formula for HSV to RGB conversion can be found in:

http://www.rapidtables.com/convert/color/hsv-to-rgb.htm

**Requirements**

1. Perform RGB to HSV conversion on the image flower.jpg
    a. Display and save the hue component in the file hue.jpg
    b. Display and save the saturation component in the file saturation.jpg
    c. Display and save the value (i.e. brightness, intensity) component in the file brightness.jpg
    d. Why does the red/yellow/orange portion of the picture appear dark in the hue image ?
    e. Why does the white flower petal appear dark in the saturation image?

2. Perform an HSV to RGB conversion on the HSV image obtained in Step 1.
    a. Compare the result with flower.jpg. Is there any noticeable difference between the two images?
    b. Save this new RGB image in the file hsv2rgb.jpg

3. Perform RGB to HSV conversion on the image bee.png.
    a. Perform histogram equalization on the V channel of the HSV image that you obtained in step 1.
    b. Save the histogram equalized result into the V channel of the HSV image
    c. Convert the HSV image to RGB and save this RGB image in the file histeq.jpg.

**Submission Instruction**

Submit the following:

1. Print-out of your Python codes.

2. Put your answers to 1(d), 1(e), 2(a) in a file *yourName*.pdf.

3. Save your python code, *yourName*.pdf, hue.jpg, saturation.jpg, brightness.jpg, hsv2rgb.jpg, histeq.jpg in a folder and zip the folder.

4. Submit the softcopy of your holder to IVLE.
    - Use the following convention to name your folder: *MatriculationNumber_yourName_Lab4*. For example, if your matriculation number is A1234567B, and your name is Chow Yuen Fatt, for this lab, your file name should be *A1234567B_ChowYuenFatt_Lab4*

Please remember to write your name on the hardcopy print-out of your python code.