

# Homework 5: Color Image Processing

**Due date:** 7pm June 20, 2016 (No delay is given)

**Submission files:**

1) Source code: the code should work well with no modification. Provide 'readme.txt' and an interface for easily setting input images and parameters used in the code.

2) Technical report including all results and analysis

**Programming tools:** C (C++) or MATLAB depending on your preference

## 1. Color Balancing Method

Convert the images to the linear RGB domain assuming a display  $\gamma$  of 2.2 with the following equation.

$$\{R, G, B\} = \{R, G, B\}_{linear}^{1/\gamma}$$

Then, perform color balancing on each image in the linear RGB domain using each of the following algorithms. Finally, convert the linear RGB image to the original RGB domain using the above equation.

Input images: 'leaf.jpg', 'macbeth.jpg'

1-1. Gray-world method

1-2. White patch method

1-3. Shades-of-gray: Use the following equation. Produce the results when  $p=1, 5, 6, 100$ .

$$\begin{bmatrix} R'_{linear} \\ G'_{linear} \\ B'_{linear} \end{bmatrix} = \begin{bmatrix} (\sum_{x,y} R^p(x,y))^{1/p} / (\sum_{x,y} G^p(x,y))^{1/p} & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & (\sum_{x,y} B^p(x,y))^{1/p} / (\sum_{x,y} G^p(x,y))^{1/p} \end{bmatrix} \begin{bmatrix} R_{linear} \\ G_{linear} \\ B_{linear} \end{bmatrix}$$

1-4. Plot the histogram of the results. How are the histograms transformed through the color balancing operation for the different  $p$  values?

### \* Note

In technical report, you should include the following three things.

1) Description of your algorithm

2) The reason of the parameter setting you chose in your source code.

3) Show the results of your algorithm using various images which you want to use.