Digital Image Processing (2024)

Homework 3

{Chromatic Adaptation + Image Enhancement +

Color Temperature Adjustment}

Deadline: 113.12.05 23:59

1. Chromatic Adaptation (40%)

You should modify the color temperature of the input images to recover from the incorrect white balance of the given image.

You can use the colorchecker(the color palette) as a reference to determine if it's correct.

Input1.bmp

output1_1.bmp

[Input]

input1.bmp input2.bmp input3.bmp input4.bmp

[Output]

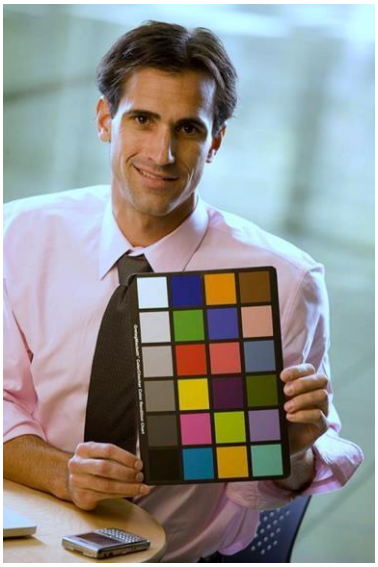
output1_1.bmp output2_1.bmp output3_1.bmp output4_1.bmp

2. Image Enhancement (30%)

You should enhance the image quality of your output images in part I, by operating at least one particular image enhancement technique on each image.

Choices are: sharpness, saturation, contrast, or any content that has been mentioned in the lecture.

output1_1.bmp



output1_2.bmp

[Input] Your previous output files, will not be provided!!

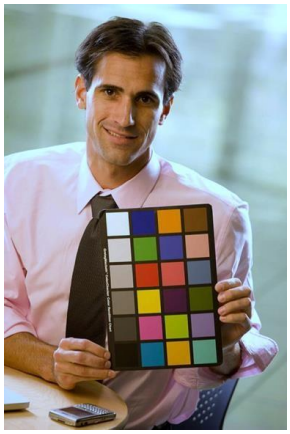
output1_1.bmp output2_1.bmp output3_1.bmp output4_1.bmp

[Output]

output1_2.bmp output2_2.bmp output3_2.bmp output4_2.bmp

3. Color Temperature Adjustment (30%)

You should modify the color temperature of input images to create both warmer and cooler effects.



output1_2.bmp

output1_3.bmp

output1_4.bmp

[Input] Your previous output files, will not be provided!!

output1_2.bmp output2_2.bmp output3_2.bmp output4_2.bmp

[Output]

output1_3.bmp output2_3.bmp output3_3.bmp output4_3.bmp

output1_4.bmp output2_4.bmp output3_4.bmp output4_4.bmp

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Homework Rules and Grading Policy

Homework will be graded by:

1. Correctness (70%)
2. Report (30%)

    - Explain your algorithm and do some discussion in at most 4 pages. (A4)

Demo:

Online Demo

Upload:

[web] E3

[File Name] hw3_StudentID.zip (ex: hw3_123456789.zip)

- report in the format of .pdf.
- C, C++ codes with comments.
- ReadMe.txt file which describes how to run your program.
- all output images.

Remind:

Deadline

We DO NOT accept any late submission after the deadline.

Test failure

If you does not pass the demo, half of the score will be deducted, but there is a chance for remediation.

Plagiarism

We will check for code similarity. If two codes exist high similarity. Both codes receive zero marks after confirmation.

Notice

Cannot use the toolbox. (OpenCV)

Color Constancy Introduction

Scene illumination can have a notable effect on the overall RGB values of an image, introducing color casts that are perceptually undesirable and that have adverse effect on subsequent processing such as object recognition.

The existing color constancy methods can be categorized by the type of information they use to estimate illumination.

i.e.

(1) **Methods based on color distribution**: all these methods are based on statistical hypothesis about the spectral properties of the scene. The most popular methods are the *max-RGB* **[1,2]** and *Grey world method* **[3]**. For example, the Grey world method and variants assume that the average of a particular Minkowsky norm of a scene's RGB value is achromatic (i.e. a constant for all the three color channels). Thus,
performing such a norm average on the color data of an image will estimate the illumination direction.

(2) **Methods based on spatial information**: a spatial domain operator is applied on the image to obtain a transformed image. These methods operate directly in the transformed image. For example, the *Grey edge* **[4,5]** hypothesizes that the derivatives of an image in the spatial domain represent achromatic color. As with the *Grey world*, a pth Minkowsky norm can be used to estimate the illumination direction operating on the transformed image.

References

[0] http://www.cse.yorku.ca/~mbrown/pdf/ColorConstancyJOSAv10.pdf

[1] https://color2.psych.upenn.edu/brainard/papers/retinex.pdf

[2] https://www2.cs.sfu.ca/~funt/Funt+Shi_MaxRGB_Reconsidered_JIST2012.pdf

[3] https://www.sciencedirect.com/science/article/abs/pii/0016003280900587

[4] https://ieeexplore.ieee.org/document/4287009

[5] https://ieeexplore.ieee.org/document/5444872

Target image: