



Principles and Applications of Digital Image Processing

【Fall, 2018】

Homework 2

Part 1: (30%)

Solve the problems 2.5, 2.12, 2.18, 3.4, 3.12, 3.22 in the textbook.

Part 2: (70%) Image File Reading, Display and Basic Processing

Design a software program that can achieve the following image processing operations:

- 1 Read a color BMP or JPEG image file and display it on the screen. You may use the functions provided by Qt, OpenCV, or MATLAB to read and display an image file. (10%)
- 2 Convert a color image into a grayscale image using the following equations:

A. $GRAY = (R+G+B)/3.0$

B. $GRAY = 0.299*R + 0.587*G + 0.114*B$

Compare the grayscale images obtained from the above equations. One way to compare the difference between two images is by image subtraction (10%)

- 3 Determine and display the histogram of a grayscale image. (10%)
- 4 Implement a manual threshold function to convert a grayscale image into a binary image. (10%)
- 5 Implement a function to adjust the spatial resolution (enlarge or shrink) and grayscale levels of an image. Use interpolation on enlarging the image. (10%)
- 6 Implement a function to adjust the brightness and contrast of an image. (10%)
- 7 Implement a histogram equalization function for automatic contrast adjustment. (10%)

Test your image processing functions with various images and compare the processed image with those processed with Photoshop, PhotoImpact, or other similar commercial image processing software.

Notes:

1. Please submit your programs and report to the CEIBA course website before **Oct. 10**. Hand in the hardcopies of your report in the class of **Oct. 17 (2:20PM)**.
2. Late submission will have a penalty of 10% discount per day of your grade toward a minimum score of 60. No late submission over a week will be accepted.