Principles and Applications of Digital Image Processing

【Fall, 2022】

Homework 2

Part 1: (30%)

Solve the problems 2.12, 2.16, 2.18, 2.37, 3.12, 3.18 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 constrast of an image. (10%)
7. Implement a histogram equalization function for automatic constrast 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. Write a report to describe and discuss your image processing program. You are encouraged to design a graphical user-friendly interface for your program containing the designated functions.

Notes:

1. Please submit your programs and report to the AUTOLAB course website before **Oct. 5 (2:20PM).**
2. Late submission will have a penalty of 10% discount per day of your homework total score toward a maximum of 50% discount. No late submission over five days will be accepted.