Fundamental Biomedical Image Processing

Assignment 2

Post Date: Oct. 13, 2025; Due Date: Oct. 27, 2025

NOTE:

- Your assignments / project can be in Matlab, Python, C++.
- You can get extra bonus without using libraries.
- Deadline. The solutions to the assignments / project should be submitted by 12 pm on the date they are due. The late assignments will not be accepted.

Theoretical questions

1. Give a single intensity transformation function for spreading the intensities of an image so the lowest intensity is 0 and the highest is L-1.
2. Show that subtracting the Laplacian from an image is proportional to unsharp masking. Use the definition for the Laplacian given in Eq.

Programming exercises (Send the source code)

1. Histogram Equalization
   (a) Write a computer program for computing the histogram of an image.
   (b) Implement the histogram equalization technique on Fig. 1-1 to 1-4.
2. Averaging Filter
   Write a computer program of smoothing with square averaging filter masks of size m = 3, 5, 9, 15, and 35, respectively. (Fig. 2-1).
3. Roberts Cross Gradient Operators
   Write a computer program performing the Roberts cross gradient operator on Fig. 3-1.
4. Combining Spatial Enhancement Methods
   Write a program to perform a combination of spatial enhancements.
   (a) Fig. 4-1
   (b) Laplacian of (a)
   (c) Adding (a) and (b)
   (d) Sobel gradient of (a)
   (e) Smoothed with a 5*5 averaging filter of (d)
   (f) Product of (c) and (e)
   (g) Sum of (a) and (f)
   (h) Applying a power-law transformation to (g)