

CS825-001 Assignment 3

Assigned Date: Friday, June 19, 2020

Due Date: Wednesday, July 1, 2020

Problem 1. (15 marks - *Programming, Cross-Correlation, Template Matching*)

Write a complete program for template matching. Test it on "text_image.raw" using "letter_R.raw" as the template. The output is a gray scale image displaying the magnitudes of the cross-correlation results.

Problem 2. (15 marks – *Programming, Sobel Operator, Edge Detection*)

Write a complete program to implement the 3×3 Sobel operators. The input image is "building.raw". The output images are: 1) the result of applying G_x ; 2) the result of applying G_y ; 3) the gradient $[G_x^2 + G_y^2]^{0.5}$; and 4) the edge map with threshold $T_E = 128$.

[Note: Since the partial derivatives in 1) and 2) are real values and can be negative, your gray scale output images display the magnitude of real values. In addition, the real values need to be scaled and converted to integers in the range $[0, 255]$. Similarly, the gradient values in 3) need also to be converted to integers in the range $[0, 255]$. The edge map in 4) should be a binary image, such that the values greater than or equal to T_E is converted to 255 and otherwise to 0.]

Problem 3. (15 marks – *Programming, Laplacian Operator, Zero-crossing points*)

Write a complete program to implement the 3×3 Laplacian operator. The input image is also "building.raw". The output image is the zero-crossing points map.

[Hint: A zero-crossing is between two adjacent pixels with one in positive and the other negative. Since we have to set the zero-crossing point on a grid point, you may choose to set either the negative side pixel or the positive side pixel as the zero-crossing point.]

Problem 4. (15 marks – *Programming, Laplacian Operator, Image Sharpening*)

Write a complete program to implement the 3×3 Laplacian sharpening filter. Test your program with the image "moon.raw", with at least two different values of w .