

Biomedical Image Investigation: Fall 2024

Homework 6

Due: 11/4 PM 2:10

1. Create your version of the Canny edge detector with the syntax as follows: $[E, M, A, G_x, G_y] = \text{canny}(I, \sigma)$, where E refers to the edge map after non-maximum suppression, M contains the smoothed gradient magnitude, A shows the gradient angle, and G_x and G_y are the gradient components along x and y directions, respectively. The input of this function, on the other hand, contains the original image (I) and the standard deviation (σ) for the smoothing filter. Read the MATLAB demo image, *gantrycrane.png*, as the original image to illustrate your results.
 - (a) Display all the output images, E , M , A , G_x , and G_y .
 - (b) Show the effect of σ in edge detection by choosing three different σ values for smoothing. Note that you need to indicate which σ works the best and speculate about the possible reasons.
 - (c) Examine the impact of double thresholding on the resulting image. Adjust the high threshold (T_H) and low threshold (T_L) as the additional input variables in your function script and display the resulting edges with three different threshold ratio (T_H/T_L) settings. Please also comment on the best choice of ratio you would suggest.
2. Given a fixed σ , use the resulting edge map from Problem 1(b) as the input image. Apply the Hough transform to extract the vertical pillar in the middle of the image. Please also describe how you utilize the $\rho\theta$ -plane to obtain the vertical lines.