Biomedical image processing: Fall 2020

Homework 6

Due: **11/11 AM 9:10**

1. Examine the *"edge"* built-in function in Matlab and create a simplified version of the Canny edge detector with the syntax as follows: [E, M, A, Gx, Gy] = canny(I, sig), where E refers to the edge map after non-maximum suppression, M contains the smoothed gradient magnitude, A shows the gradient angle, and Gx and Gy are the gradient components along x and y directions, respectively.   The input of this function, on the other hand, contains original image (I) and standard deviation (σ) for the smoothing filter.   Use *gantrycrane.png* as an original image to illustrate your results.

   (a) Display all the output images, E, M, A Gx and Gy.

   (b) Show the effect of σ in edge detection by choosing three different σ values when smoothing. Note that you need to indicate which σ works best as a comment in your assignment.

   (c) BONUS: you may want to examine the impact of double thresholding on the resulting image. Adjust high threshold (T_H) and low threshold (T_L) as additional input variables and display the resulting edges with three different settings of threshold ratio. 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 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.