Homework 2: Hough Transform

INSTRUCTOR: DANIEL L. PIMENTEL-ALARCÓN   DUE 02/25/2020

GO GREEN. AVOID PRINTING, OR PRINT 2-SIDED MULTIPAGE ;)

In this homework you will implement the Hough transform and use it to find lines in a medical image.

(a) Create your own function to implement the Hough Transform.

(b) Create an artificial image that only has three aligned points. Use `subplot` to display (i) the original image, (ii) its Hough transform produced by your code, and (iii) its Hough transform produced by Matlab's `hough` function. Are they roughly the same? If not, why?

(c) Load the `leg_after.jpg` image into Matlab. You can download it from `https://danielpimentel.github.io/teaching.html`. Transform it to grayscale using your code from Homework 1. Show your code, and use `subplot` to display (i) the original image, (ii) the grayscale image, and (iii) a histogram of its values.

(d) Using the histogram above as guideline, find a threshold that segments the metal rod. Show your code, and use `subplot` to display (i) the original image, (ii) the thresholded (binary) image, (iii) its Hough transform produced by your code, and (iv) its Hough transform produced by Matlab's `hough` function.

(e) Based on the Hough transform, what are the (approximate) values of θ and r that describe the line of the rod? Do these values make sense?

(f) Repeat the same procedure for the image `leg_before.jpg`, also available in the same website. What are your observations/conclusions? Display whatever images you think necessary to make your points.