Biomedical image processing: Fall 2020

Homework 3

Due: **10/07 AM 9:10**

1. Please use image gradients to locate edges. Take a photo of a white piece of paper on a dark background using your phone. Read this photo by MATLAB and then apply any two of the edge detectors provided below to your own photo/image. Make sure the image is a grayscale image before any further processing. Document your results using the following steps.
   (a) Obtain x-gradient and y-gradient of the image
   (b) Calculate gradient magnitude
   (c) Apply thresholding to gradient magnitude to obtain edges
   (d) BONUS: for those who implement any image enhancement method prior to edge detection which aid in better edge indication

Prewitt

1	0	-1
1	0	-1
1	0	-1

-1	-1	-1
0	0	0
1	1	1

Sobel

1	0	-1
2	0	-2
1	0	-1

-1	-2	-1
0	0	0
1	2	1

Frei-Chen

1	0	-1
$\sqrt{2}$	0	$-\sqrt{2}$
1	0	-1

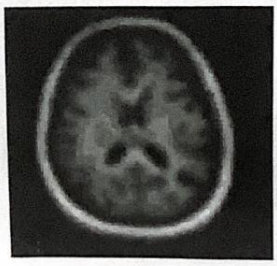
-1	$-\sqrt{2}$	-1
0	0	0
1	$\sqrt{2}$	1

Roberts

1	0
0	-1

0	1
-1	0

2. Please finish the following questions with the MR image provided in HW2.
   (a) Find the contour of the brain tissue by using Sobel gradients or Laplacian filters mentioned in class. Is there any difference if the process is performed after histogram equalization of the original image?
   (b) The figure shown below was obtained by using several spatial imaging filters. Can you tell what they are? Try to repeat the style.



(Hint: To open the photo in MATLAB: img = imread('yourPhoto.jpg');)
(Hint2: The MATLAB codes you might use include: *hist*, *histeq*, *conv2*, *filter2*, *imfilter*, *fspecial* …)