CS270 Digital Image processing
Homework 3：Image segmentation
Due date: Dec 18th, 2018
作业结果提交纸质版，课堂提交或送至信息学院 2 号楼 302G 办公室（请务必同时在名单上签名）
程序代码每题一个文件夹，请加入注释，最后压缩打包发送至助教陈宏宇邮箱：chenhy3@shanghaitech.edu.cn。请在邮件和附件的标题中注明姓名和学号。

1. Edge Detection Combined with Smoothing and Thresholding

(1) Write the program to compute the Sobel gradient using the masks as below.

−1	−2	−1	−1	0	1
0	0	0	−2	0	2
1	2	1	−1	0	1

Your program should implement Eq. (10.2-20),

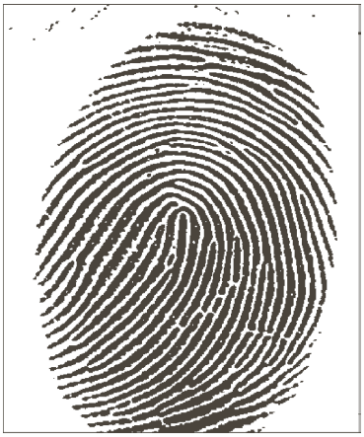
and have the option of outputting a binary image by comparing each gradient point against a specified threshold, T.

(2) By combining smoothing with a 3 x 3 mask and your program from (a), process "Test1.mat" and produce a binary image that isolates (segments) the large blood vessel in the center of the image. This will require repeated trials of smoothing and choices of T. Looking at the histogram of the gradient image before it is thresholded, and that will help you select a value for T.

2. Global Thresholding

(1) Write a global thresholding program in which the threshold can be automatically estimated using the procedure discussed in Section 10.3.2. The output of your program should be a segmented (binary) image.

(2) Apply your program to “Test2.mat”. Verify if the result is the same as below.



3. Region Growing

(1) Implement Otsu's optimum thresholding algorithm to “Test3.mat” to produce the binary image as below

(2) Implement a region-growing algorithm for segmenting an image into two regions. You are free to choose any parameters you wish. Use the image from (1), and attempt to segment the two light rings surrounding the two largest "blobs" in the image.

(3) If you are not able to solve (2), extend your algorithm to region splitting and merging