CS1310 Introduction to Computational Thinking

Lab 3

Due Wednesday, October 25

For this lab you will gain additional practice with analysis of brain images and you will become familiar with user-defined functions.

1. Modify your program from lab 2 to provide the same functionality, but now use functions. Implement (at least) the following functions:
   
   (a) Display an image
   (b) Determine the pixels to microns calibration constant
   (c) Display a rectangular box given the coordinates of its top-left and bottom-right corners.
   (d) Prompt the user to enter the rectangles; return the coordinates of the smallest and largest regions
   (e) Given the coordinates of two regions, determine if they overlap

2. Write a program to estimate the branching of a neuron at various radii. As in the previous item, your program should be broken into meaningful functions, it is up to you to device how to do that. Your program should do the following:
   
   (a) Prompt the user to select one of the three images provided.
   (b) Read and display the image chosen.
   (c) Obtain the calibration constant, as done in labs 1 and 2. As before, the bar is 50 microns long.
   (d) Ask the user to click on the center of the neuron to analyze (there is one neuron in every image).
   (e) Draw concentric circles with radii of 15, 30 and 45 microns.
   (f) Ask the user to click all the places where an axon intersects a circle and count them. The user should press enter when he/she is done entering points.
   (g) Print results showing the number of intersections for every radius.

For reference, here’s one of the sample images:

Write a report including (at least) the following items:
1. Problem description.
3. Experimental results. Show a few instances of images output by your program and messages printed to the screen.
4. Discussion of results. Do the algorithms work as expected? Why or why not?
5. Conclusions. Describe what you learned, what was challenging, what was interesting, what was boring, etc.

6. Appendix: Source code; make sure it is adequately documented.