

## ECE 4310/6310 Introduction to Computer Vision

### Lab #5 – active contours

In this project each student must implement the active contour algorithm. The program must load a grayscale PPM image and a list of contour points. The contour points must be processed through the active contour algorithm using the options given below. The program must output a copy of the image with the initial contour drawn on top of it, and a second image with the final contour drawn on top of it. The program must also output a list of the final contour pixel coordinates.

The program does not need to have a graphical user interface. It can run entirely from a command line, and find the file names as either command line arguments or via string prompts to the user. In the output images, each contour point should be drawn using a “+” shape that is 7x7 pixels with a grayscale value of 0 so they can be clearly seen.

The file containing the list of contour points is a text file, with column and row coordinates separated by spaces, and each point ending with a carriage return. An example is given at the course website.

The active contour should use 2 internal energy terms and 1 external energy term. The internal energy terms are the square of the distances between points, and the square of the deviation from the average distance between points. The former term is detailed in the lecture notes. The latter term can be found by first calculating the average distance between all contour points, and then taking the square of the difference between that average and the distance between the current contour point and the next contour point. It can be assumed that the contour encloses an area, so that the last contour point can be connected to the first contour point to calculate internal energy terms. The external energy term is based on the image gradient magnitude, and should be calculated using convolution with a Sobel template.

You must experiment with different window sizes and weightings of each energy term, to find which gives the best result. Each energy term can be normalized by rescaling from min-max value to 0-1, to assist with weighting. The active contour algorithm should run for a maximum of 30 iterations, but you should experiment with fewer iterations.

You must write a brief report that includes the code. The report should show your result for the Sobel edge gradient magnitude image. The program must be tested on the image hawk.ppm and hawk\_init.txt files at the course website. The image with the initial contour should be displayed, along with the image with the final contour for comparison. The image coordinates of the final contour should be provided in a list or table.

Submit your C-code and report to Canvas. The submission is due by midnight of the due date.