

Syracuse University
Department of Electrical Engineering and Computer Science

CSE/ELE 400/691 Image and Video Processing
Spring 2020

Assignment IV

1) Active Contours (60%)

Implement the Greedy Algorithm described by Williams and Shah to evolve active contours. Your code should:

- a) Read an image.
- b) Compute the smoothed gradient of the image, and find the gradient magnitude at each pixel.
- c) Obtain the initial position of a contour from the user (you can use the `getline` function of the MATLAB for this purpose), and round the positions obtained from the `getline` function to integers.
- d) If the distance between the points in the user input is large, interpolate to add extra points. The distance between the points should be around 5 pixels.
- e) Implement the rest of the Greedy Algorithm according to the paper by Williams and Shah.

2) Experiments, evaluation and comments (30%)

There are several parameters in the above algorithm. These parameters are:

- The width of the Gaussian used in the smoothed gradient computation.
- The size of the neighborhood that is searched to move a point p .
- α , β and γ terms.
- The minimum fraction of points that must move in each iteration before convergence.

- a) [8%] Start with the following set of parameters, and test your code on images “Image1.jpg” **through** “Image8.jpg”:

The width of Gaussian used for smoothing: 3 pixels, the neighborhood size: 3x3, $\alpha = 1$, $\beta = 1$, $\gamma = 1$, the fraction: 10%. Please show the initial contour, the final contour, and also two intermediate steps during the evolving of each active contour. In addition, please mark the points where the corners are allowed.

Note: For parts (b) through (g) below, use “Image1.jpg”, “Image3.jpg” and “Image6.jpg” to test the effect of changing each parameter.

- b) [5%] Vary the width of Gaussian used for smoothing and comment on the effects.
- c) [5%] Vary the size of the search neighborhood and comment on the effects.
- d) [3%] Vary α and comment on the effects.
- e) [3%] Vary β and comment on the effects.
- f) [3%] Vary γ and comment on the effects.
- g) [3%] Vary the fraction and comment on the effects.

3) Image Sequences (10%)

Use the images under the “Sequence1” and “Sequence2” folders to test your code on moving images. First, run your code on the first image of a sequence by manually entering the initial contour (by using the `getline` function of the MATLAB). Then, run your code on the rest of the images in that sequence by using the final contour you obtain from the previous step as the initial contour for the next image. Show the final contour you obtain for each image of each sequence.