Medical Image Analysis Exercises: Session 07

Contents

36: k-means threshold selection

input: `rice.png` from MATLAB

a: k-means threshold selection

- take all image corners as the initial background and the rest as the initial object with the corner size of 10
- calculate the mean values of both regions
- estimate the threshold of two clusters by the mean of the two mean values
- cluster the pixels according to the estimated threshold
- iteratively calculate the mean values, cluster the pixels and estimate the threshold
- stop the loop when the new threshold doesn't change by more than 1

b: display

- display 2 axes in one figure, including the original image and the thresholded image
- show the final threshold and the number of loops in the axes title

32: livewire

input: `pout.tif` from MATLAB

a: gradient approximation

- approximate the gradient magnitude G by Sobel filter

b: livewire

- take two pixel locations as inputs, one as the start point and one as the end point
- calculate the local edge weight between neighbor pixels (p, q): $f(p, q) = (\max(G) - G(q))/(\max(G) - \min(G)) \cdot \text{distance}(p, q)/\sqrt{2}$
- search the path on the 8-connected neighborhood per pixel
- find the path between the selected two pixel locations with the minimum sum of edge weights using the Dijkstra's algorithm

c: display

- display the results in 2 different figures
- display 4 axes in the first figure, including the original image, the gradient image, the image showing the start and end points, and the image showing the result path
- display 4 axes in the second figure, including the image showing the result path, the distance map corresponding to the start point, the binary image with the visited pixels as 1, and the image showing the index map of previous visited pixels

d: notes for the Dijkstra's algorithm

- implement: http://en.wikipedia.org/wiki/Dijkstra%27s_algorithm#Pseudocode
- use images to store the help variables of the algorithm: including `dist`, `visited`, `previous`, `Q`