

CEG790-2 Medical Image Analysis

(20 points)

Assignment 1

January 17, 2008

A small package to read and display a volumetric image is provided. The package contains a program to smooth the loaded image with a Gaussian of standard deviation σ , to be provided by the user. Add a segmentation program to this package to segment the loaded image using the 3-D Laplacian of Gaussian (LoG) operator. The LoG operator can be approximated by a difference of two Gaussians. For instance, finding the LoG of an image when standard deviation of Gaussian is σ can be approximated by smoothing the image once with a Gaussian of standard deviation σ and another time with a Gaussian of standard deviation 1.6σ and subtracting the two smoothed images.

1. Implement the LoG operator by this approximation. Read the value for σ from input. Then, find the LoG of the loaded image. Replace negative values with 0 and positive values with 255. Display the obtained binary image. (10 points)
2. Find the boundary between 0 and 255 voxels and set the boundary voxels to 255 and the background voxels to 0. Then merge the obtained boundary image with the original intensity image and display the merged image. The displayed image should show the boundary voxels with 255 and non-boundary voxels with the original image intensities. (5 points)
3. Find the gradient of the original image and remove boundary voxels that have gradient magnitudes below a threshold value. The threshold value will be provided by the user. Merge the edges with the image intensities and display the merged image. (5 points)

Compress all your program files into a single zip-file and attached the compressed file to an e-mail and send to agoshtas@wright.edu by the date and time below.

Alternative project: Study the paper by M. Bomans, et al., “3-D Segmentation of MR Images of the Head for 3-D Display,” *IEEE Transactions on Medical Imaging*, vol. 9, no. 2, 1990, pp 177-183, and write a report summarizing the contents of the paper. Your report should describe the formulations behind the Laplacian of Gaussian edge detector and the steps to be followed to implement it.

Due February 5, 2:00 PM