Programming Assignment 3

Due: May 28, 2009

Multi-Scale Edge Detection

We saw in class that edges can occur at different scales. In this assignment we will do multi-scale edge detection.

Step 1: *Generate the second order derivative images* at different scales (or resolution) using a Laplacian operator given below.

-1/8	**-1/8**	**-1/8**
-1/8	**1**	**-1/8**
-1/8	**-1/8**	**-1/8**

Use two different approaches for this.

A. Apply the Laplacian operator to every level of the Gaussian pyramid generated in the previous assignment. (Use the images generated using Approach B in last assignment).
B. In approach B to generate the Gaussian pyramid in the previous assignment, different sized filters were used. Convolve the Laplacian operator with each of those filters and apply the combined filter on the original image (at level 1 of the Gaussian pyramid) to generate multi-scale second order derivative images.

Step 2: *Segment the second order derivative image* by assigning value 1 to all pixels of magnitude greater than 0 and value 0 to all pixels of magnitude less than or equal to zero.

Step 3: *Detect the zero crossing in the segmented image.* This is done by tagging any pixel which has at least one neighbor who is of different value than the pixel itself.

Step 4: *Examine the pixels surrounding the zero crossing pixels in the second order derivative image.* Calculate the local variance using Equations discussed in class and mark it as an edge pixel if this value is greater than a certain threshold. This completes the edge detection.

Contrast Enhancement

Implement a histogram equalization method for achieving global contrast enhancement.

Median Filter for Noise Removal

Write a program to implement a median filter. Again, your program should be able to change the size of the filter. The image gallery contains images with Gaussian and salt-and-pepper noise. Apply the filter to both and see the effect. Also find out the effect of varying the size of the filter.