NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS

School of Science

Information Technologies in Medicine and Biology

Direction: *Bioinformatics*

Image Processing and Analysis

Postgraduate Student: *Begetis Nikolaos* Professor: *Sangriotis Manolis*

Deadline Date: *29/03/2013*

Assignment 2

Task 1

In the first task of our assignment we were asked to run the program for the derivative computing (derivative_evaluation.m) and to observe and note the commands that are relevant with the input and output of data, and moreover with the commands of the image convolution with the mask.

So we did, the commands were:

- I8=imread('AIRPORT.tif');'
- imwrite(Gx,'AIRPORT_x-der.tif');
- imwrite(Gy,'AIRPORT_y-der.tif');
- imwrite(Gxy,'AIRPORT_xy-der.tif');

where the first one reads an image and places it in an array and the second one writes arrays of pixels in image files.

The convolution of the image signal with the masks

$$masky = \begin{pmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{pmatrix}$$

$$maskx = \begin{pmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{pmatrix}$$

was done with the commands:

- Gx=conv2(I64,maskx,'same');
- Gy=conv2(I64,masky,'same');
- Gxy=Gx+Gy;

The three resulted images after normalization can be found in folder “Output_images”.

Task 2

As a second task of our assignment we were asked to construct two programs that would detect image edges using the Sobel tilt operators and Kirsh orientation operators, and at follow apply them in the images given in the "Images" folder. All the output image results are shown in the folder "Output_images" and proper names are given so that to be found easier when searched.

Task 3-4

Using the Sobel and Kirsh operators we detected all the edges of the images given. The edges are found in regions where there exist big variations in luminosity. So, they are usually found in the limit between the depicted interface and the background area.

In more depth, sobel operators are preferred to be used in images with noise, because in their derivation masks they also include noise filtering.

Kirsh operators, on the other hand, use a variety of derivation masks which in every pixel of the image do an evaluation of the derivative in all the orientations. For instance, in a 3x3 image derivation can be done in 8 different orientations differing with each other for 45^0.

As a result to the above definitions we have the following two tables, in respect to the best thresholds of every image given and presented in "Output_images" folder:

Table 1: Resulted alignment of the best threshold to be used for each image using Sobel operator

Image	*Best Threshold*
AIRPORT.tif	*90*
AIRPORT_with_noise_10.tif	*110*
Clown.tif	*90*
MONUMENT.tif	*90*
WOMAN.tif	*100*
WOMAN_WITH_NOISE.tif	*110*

Table 2: Resulted alignment of the best threshold to be used for each image using Kirsh operator

Image	*Best Threshold*
AIRPORT.tif	*100*
AIRPORT_with_noise_10.tif	*110*
Clown.tif	*110*
MONUMENT.tif	*100*
WOMAN.tif	*100*
WOMAN_WITH_NOISE.tif	*80*