UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA

FACULTY OF TELECOMMUNICATION AND INFORMATION ENGINEERING

Computer Engineering Department

DIGITAL IMAGE PROCESSING

LAB MANUAL 8

Sharpening Spatial Filtering

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Spatial Filtering

LAB OBJECTIVE:

The objective of this lab is to understand & implement

1) Use of Second Derivate for Image Enhancement: The Laplacian
2) Use of First Derivate for Image Enhancement: The Gradient

TASK 1

Write a program to implement "The Laplacian" and note the effects on given images.

$$\nabla^2 f = [f(x+1, y) + f(x-1, y) + f(x, y+1) + f(x, y-1)] - 4f(x, y). \quad ($$

$$g(x, y) = \begin{cases} f(x, y) - \nabla^2 f(x, y) & \text{if the center coefficient of the Laplacian mask is negative} \\ f(x, y) + \nabla^2 f(x, y) & \text{if the center coefficient of the Laplacian mask is positive.} \end{cases}$$

TASK 2

Use "The Laplacian" to exercise "High Boost Filtering" and write down your observations.

TASK 3

Write a program to implement "Robert Cross Gradient Operator" and observe the changes on image.

z_1	z_2	z_3
z_4	z_5	z_6
z_7	z_8	z_9

$$\nabla f \approx |z_9 - z_5| + |z_8 - z_6|.$$

TASK 4

Write a program to implement "Sobel Operators" and observe the changes on image.

$$\nabla f \approx |(z_7 + 2z_8 + z_9) - (z_1 + 2z_2 + z_3)| + |(z_3 + 2z_6 + z_9) - (z_1 + 2z_4 + z_7)|.$$