Lab Sheet 2

Edge Detection

Aim:

To understand and implement basic edge operators and Canny's edge detection algorithm.

Tasks

Implement and apply the following edge operators on an input image and interpret the results.

- Prewitt Operator
- Sobel Operator
- Robinson Compass Masks
- Kirsch Compass Masks
- Laplacian Operator

Implement Canny's edge detection algorithm from scratch and plot the intermediate results.

- Create a 5x5 Gaussian kernel with a standard deviation (σ) of 1.0.
- Convolve this kernel with the input image to produce a smoothed image.
- Define Sobel operator kernels for both vertical and horizontal gradient detection.
- Convolve these kernels separately with the smoothed image to obtain the gradient images, Gx and Gy.
- Calculate the gradient magnitude.
- Determine the gradient direction.
- Perform non-maximal suppression for each pixel.
- Finally perform hysteresis thresholding and classify the pixels using the threshold values.