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Experiment 3: Image Edge detection

Aim: To perform edge detection operation using various operators.

Apparatus: PC/Laptop, MATLAB software and few Images.

Theory: The sudden changes of discontinuities in an image are called as edges. Significant transitions in an image are called as edges.

These edges can be broadly classified into three types:

- ① Horizontal edges
- ② Vertical edges
- ③ Diagonal edges

Most of the shape information of an image is enclosed in edges. So first we detect these edges in an image using filters and then by enhancing those areas of image which contains edges, sharpness of the image will increase and image will become clearer.

Some of the masks for edge detection are:

- ① Prewitt Operator
- ② Sobel Operator
- ③ Robert's Operator
- ④ Canny Operator
- ⑤ Laplacian Operator

Prewitt Operator: Prewitt operator is used for detecting edges horizontally and vertically.

Sobel Operator: The sobel operator is very similar to prewitt operator. It is also a derivate mask and is used for edge detection. It also calculates edges in both horizontal and vertical direction.

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Robert's Operator: Robert's operator is used to perform 2-D spatial gradient measurement on an image. which is simple and quick to compute. At each point pixel values represents the absolute magnitude of the input image at that point. It consists of 2×2 convolutional kernels.

Canny Operator: The Canny edge detector is an edge detection operator that uses a multi-stage algorithm to detect wide range of edges in images. Noise reduction, gradient calculation, non-maximum suppression, double threshold and edge tracking by hysteresis are the steps involved in the algorithm.

Laplacian Operator: Laplacian operator is also a derivative operator which is used to find edges in an image. It is a second order derivative mask. It can be further divided into positive laplacian and negative laplacian. All these masks find edges. Some find horizontally and vertically, some find in one direction only and some find in all the directions.

Algorithm & Flowchart:

Input Image

RGB to Gray

Operator

subplot

Output Image

(In MATLAB, `sobel`, `robert`, `prewitt` and `canny` are preexisting under functions)

Each time when we need to perform some function on an image, we store it inside a variable. Further we used preexisting function to convert it to gray image and apply the mask we need and store it inside a new variable. For display we use `imshow()` and `subplot` function.

Coding and Output:

```
Editor - E:\SEM 6 ASSN & NOTES\Image Processing and Machine Vision\EdgeOP.m
EdgeOP.m
1 % Vighnesh Vikas Salgaonkar
2 % DIV / Roll No: B-21
3 mycolourimage = imread('IPMV1.jpg');
4 myimage = rgb2gray(mycolourimage);
5 subplot(3,3,1);
6 imshow(myimage); title('Original Image');
7
8 % Apply Sobel Operator
9 % Display only the horizontal Edges
10 sobelhz = edge(myimage, 'sobel', 'horizontal');
11 subplot(3,3,2);
12 imshow(sobelhz, []); title('Sobel - Horizontal Edges');
13
14 % Apply Sobel Operator
15 % Display only the vertical Edges
16 sobelvrt = edge(myimage, 'sobel', 'vertical');
17 subplot(3,3,3);
18 imshow(sobelvrt, []); title('Sobel - Vertical Edges');
19
20 % Apply Sobel Operator
21 % Display both horizontal and vertical Edges
22 sobelvrthz = edge(myimage, 'sobel', 'both');
23 subplot(3,3,4);
24 imshow(sobelvrthz, []); title('Sobel - All edges');
25
26 % Apply Roberts Operator
27 % Display both horizontal and vertical Edges
28 robertsedg = edge(myimage, 'roberts');
29 subplot(3,3,5);
30
31
32 % Apply Prewitt Operator
33 % Display both horizontal and vertical Edges
34 robertsedg = edge(myimage, 'prewitt');
35 subplot(3,3,6);
36 imshow(robertsedg, []); title('Prewitt - Edges');
37
38 % Apply Laplacian Filter
39 f=fspecial('laplacian');
40 lapedg = imfilter(myimage, f, 'symmetric');
41 subplot(3,3,7);
42 imshow(lapedg, []); title('Laplacian Filter');
43
44 % Apply Canny edge detection
45 cannyedg = edge(myimage, 'canny');
46 subplot(3,3,8);
47 imshow(cannyedg, []); title('Canny Edge');
```

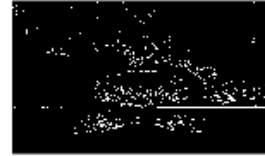

Original Image



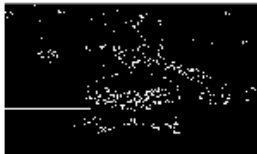
Sobel - Horizontal Edges



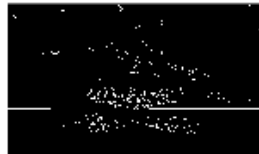
Sobel - Vertical Edges



Sobel - All edges



Roberts - Edges



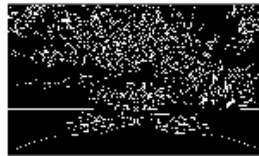
Prewitt - Edges



Laplacian Filter



Canny Edge



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Conclusion: Thus, I conclude that I have studied, understood and performed the experiment based on various edge detecting operators and even understood the working of these operators.