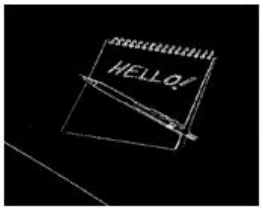
Edge Detection on Techniques

Edge detection is a technique for finding boundaries of objects on images. It helps to make the image clearer by increasing the sharpness of the these edges. Main 3 steps in edge detection are Enhancement, Detection, Localization.

1.Sobel method



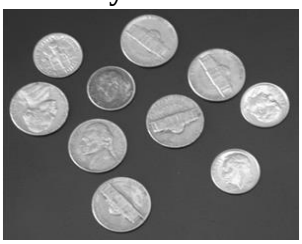
-1	0	1
-2	0	2
-1	0	1

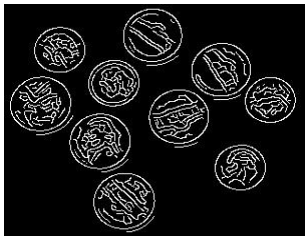
1	2	1
0	0	0
-2	-1	-1

Matlab Code

```
BW1 = edge(I,'sobel');
imshow(BW1);
```

2. Canny Method





$$\mathbf{B} = \frac{1}{159}\begin{bmatrix} 2 & 4 & 5 & 4 & 2 \\ 4 & 9 & 12 & 9 & 4 \\ 5 & 12 & 15 & 12 & 5 \\ 4 & 9 & 12 & 9 & 4 \\ 2 & 4 & 5 & 4 & 2 \end{bmatrix} * \mathbf{A}.$$

Matlab Code

```
BW2 = edge(I,'canny');
Imshow(BW2);
```

3.Prewitt Method

$$h_1 = \begin{bmatrix} -1 & -1 & -1 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix} \qquad h_2 = \begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix}$$

Matlab Code

```
BW3 = edge(I,'prewitt)
imshow(BW3);
```

4.Roberts Method

$$h_1 = \begin{bmatrix} 0 & 0 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix} \qquad h_2 = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -1 & 0 \end{bmatrix}$$

Matlab Code

```
BW4= edge(I,'roberts');
Imshow(BW4);
```

Comparison of edge detection techniques

Grayscale test image of brick wall and bike rack

Gradient magnitude from Roberts cross operator

Gradient magnitude from Sobel operator

Gradient magnitude from Scharr operator

Gradient magnitude from Prewitt operator

References:

- https://www.math.washington.edu/~morrow/336_13/papers/debosmit.pdf
- http://www.cse.usf.edu/~r1k/MachineVisionBook/MachineVision.files/MachineVision_Chapter5.pdf
- https://www.mathworks.com/help/images/examples/detecting-a-cell-using-image-segmentation.html