

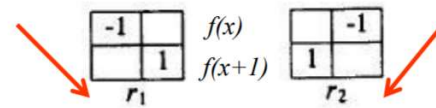
Report

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Robert's Operator: 12



$$f'(x) \approx f(x+1) - f(x)$$



$$\text{gradient magnitude: } \sqrt{r_1^2 + r_2^2}$$

```
void Roberts_operator(Mat &img, Mat src, int threshold)
```

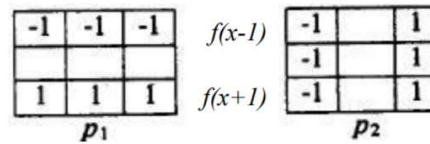
Use the above way to count and threshold is 12.

Prewitt's Edge Detector: 24



$$f'(x) \approx f(x+1) - f(x-1)$$

Threshold=24



$$\text{gradient magnitude: } \sqrt{p_1^2 + p_2^2}$$

```
void Prewitt_operator(Mat &img, Mat src, int threshold)
```

Use the above way to count and threshold is 24

Sobel's Edge Detector: 38



Sobel operator (ppt p.84)

Threshold=38

$$f'(x) \approx f(x+1) - f(x-1)$$

-1	-2	-1
1	2	1

s_1

$f(x-1)$

-1		1
-2		2
-1		1

s_2

gradient magnitude: $\sqrt{s_1^2 + s_2^2}$

```
void Sobel_operator(Mat &img, Mat src, int threshold)
```

Like Prewitt's Edge Detector just only change the matrix. Threshold is 38.

Frei and Chen's Gradient Operator: 30



(ppt p.87) Threshold=30

$f(x-1)$	-1	$-\sqrt{2}$	-1
$f(x+1)$	1	$\sqrt{2}$	1

f_1

-1		1
$-\sqrt{2}$		$\sqrt{2}$
-1		1

f_2

gradient magnitude: $\sqrt{f_1^2 + f_2^2}$ $f'(x) \approx f(x+1) - f(x-1)$

```
void FreiChen_operator(Mat &img, Mat src, int threshold)
```

Like Prewitt's Edge Detector and Sobel's Edge Detector.

Also change the 3X3matrix. Threshold is 30.

Kirsch's Compass Operator: 135



Kirsch compass operator (ppt p.91)
Threshold=13

k_0	k_1	k_2	k_3
$\begin{bmatrix} -3 & -3 & 5 \\ -3 & & 5 \\ -3 & -3 & 5 \end{bmatrix}$	$\begin{bmatrix} -3 & 5 & 5 \\ -3 & & 5 \\ -3 & -3 & -3 \end{bmatrix}$	$\begin{bmatrix} 5 & 5 & 5 \\ -3 & & -3 \\ -3 & -3 & -3 \end{bmatrix}$	$\begin{bmatrix} 5 & 5 & -3 \\ 5 & & -3 \\ -3 & -3 & -3 \end{bmatrix}$
k_4	k_5	k_6	k_7
$\begin{bmatrix} 5 & -3 & -3 \\ 5 & & -3 \\ 5 & -3 & -3 \end{bmatrix}$	$\begin{bmatrix} -3 & -3 & -3 \\ 5 & & -3 \\ 5 & 5 & -3 \end{bmatrix}$	$\begin{bmatrix} -3 & -3 & -3 \\ -3 & & -3 \\ 5 & 5 & 5 \end{bmatrix}$	$\begin{bmatrix} -3 & -3 & -3 \\ -3 & & 5 \\ -3 & 5 & 5 \end{bmatrix}$

gradient magnitude: $\max_{n,n=0,\dots,7} k_n$

169	169	146
169	169	146
104	104	104

```
void Kirsch_operator(Mat &img, Mat src, int threshold)
```

The 3x3 matrix to find max, this function is force to count the 3x3 matrix and find the max result. Threshold is 135.

Robinson's Compass Operator: 43



Thre

r_0	r_1	r_2	r_3
$\begin{bmatrix} -1 & & 1 \\ -2 & & 2 \\ -1 & & 1 \end{bmatrix}$	$\begin{bmatrix} & 1 & 2 \\ -1 & & 1 \\ -2 & -1 & \end{bmatrix}$	$\begin{bmatrix} 1 & 2 & 1 \\ & & \\ -1 & -2 & -1 \end{bmatrix}$	$\begin{bmatrix} 2 & 1 & \\ 1 & & -1 \\ & -1 & -2 \end{bmatrix}$
r_4	r_5	r_6	r_7
$\begin{bmatrix} 1 & & -1 \\ 2 & & -2 \\ 1 & & -1 \end{bmatrix}$	$\begin{bmatrix} & -1 & -2 \\ 1 & & -1 \\ 2 & 1 & \end{bmatrix}$	$\begin{bmatrix} -1 & -2 & -1 \\ & & \\ 1 & 2 & 1 \end{bmatrix}$	$\begin{bmatrix} -2 & -1 & \\ -1 & & 1 \\ & 1 & 2 \end{bmatrix}$

gradient magnitude: $\max_{n,n=0,\dots,7} r_n$

```
void Robinson_operator(Mat &img, Mat src, int threshold)
```

The 3x3 matrix to find max, this function I use following way.

```
int r[8] = { 0, 0, 0, 1, 2, 2, 2, 1 };
int c[8] = { 0, 1, 2, 2, 2, 1, 0, 0 };
```

And then use a loop to count max. Threshold is 43.

Nevatia-Babu 5x5 Operator: 12500



(PP, PP) Threshold 12500

100	100	100	100	100
100	100	100	100	100
0	0	0	0	0
-100	-100	-100	-100	-100
-100	-100	-100	-100	-100

0°

100	100	100	100	100
100	100	100	78	-32
100	92	0	-92	-100
32	-78	-100	-100	-100
-100	-100	-100	-100	-100

30°

100	100	100	32	-100
100	100	92	-78	-100
100	100	0	-100	-100
100	78	-92	-100	-100
100	-32	-100	-100	-100

60°

-100	-100	0	100	100
-100	-100	0	100	100
-100	-100	0	100	100
-100	-100	0	100	100
-100	-100	0	100	100

90°

-100	32	100	100	100
-100	-78	92	100	100
-100	-100	0	100	100
-100	-100	-92	78	100
-100	-100	-100	-32	100

120°

100	100	100	100	100
-32	78	100	100	100
-100	-92	0	92	100
-100	-100	-100	-78	32
-100	-100	-100	-100	-100

150°

```
void NevatiaBabu_operator(Mat &img, Mat src, int threshold)
```

The 5x5 matrix I use 6 arrays to store and the image's 5x5 matrix I force to count by following way.

169	169	169	146	153
169	169	169	146	153
169	169	169	146	153
104	104	104	104	97
130	130	130	120	95

Threshold is 12500.