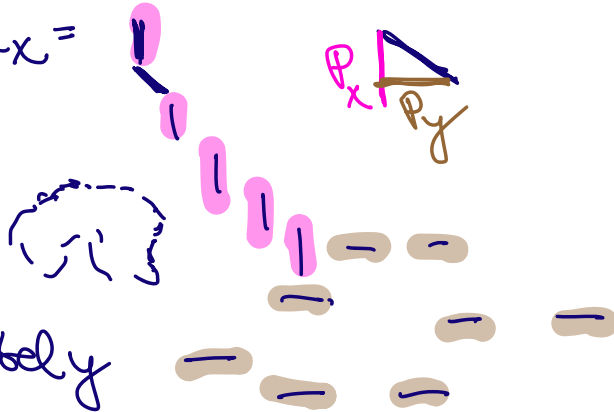


Coh - Filter spatiale pg. 33-ef
mai jos cos/ tot

Sobel: provine din derivata de ordinul 2, $I(x,y)''$

$$R_x(x,y) = I(x,y) * \text{Sobel}_x =$$

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



$$R_y(x,y) = I(x,y) * \text{Sobel}_y$$

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

$$[1 \ -2 \ 1] \text{ derivata }''$$

$$I(x,y) = \begin{bmatrix} 10 & 10 & 10 \\ 200 & 200 & 200 \\ 50 & 10 & 50 \end{bmatrix}$$

$$(-160)^2 + (-160)^2 + (-160)^2$$

///

$$10 \cdot 1 + 10 \cdot 2 + 10 \cdot 1 + 200 \cdot 0 + 200 \cdot 0 + 200 \cdot 0 + 50 \cdot 1 + 50 \cdot 2 + 50 \cdot 1$$

$$= 10(1+2+1) - 50(1+2+1) = -40 \cdot 4 = -160$$

$$\sqrt{R_x(x,y)^2 + R_y(x,y)^2}$$

Filter de detectare a muchilor

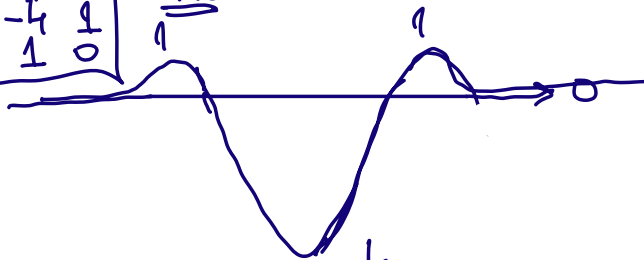
Pe imagine grayscale

1. Sobel

2. Laplacian $\nabla(\text{mappa}) = \nabla^2 I(x,y) = \frac{\partial^2 I}{\partial x^2} + \frac{\partial^2 I}{\partial y^2}$

0	1	0
1	-4	1
0	1	0

3x3



3. Cross: Prewitt

+1	0	-1
+1	0	-1
+1	0	-1

verticale

+1	+1	+1
0	0	0
-1	-1	-1

4. Robert cross

$$\begin{bmatrix} +1 & 0 \\ 0 & -1 \end{bmatrix}$$

$$\begin{bmatrix} 0 & +1 \\ -1 & 0 \end{bmatrix}$$



5. Log Transform de Gaussien \rightarrow Laplacien de Gaussien

$$\begin{bmatrix} 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 2 & 1 & 0 \\ 1 & 2 & -16 & 2 & 1 \\ 0 & 1 & 2 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

7. Canny Edge Detector

1. metizarea imaginii cu filtru Gaussien 5x5.



eliminare zgomot
estimat ef. secundar
dupa meterie

Coz Filtru de meterie : mediere

$$\frac{1}{sum} \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 2 & 1 & 0 & 0 \\ 0 & 1 & 2 & 4 & 2 & 1 & 0 \\ 0 & 0 & 1 & 2 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

$$g_{\theta} = \frac{100}{90} \frac{200}{90}$$

2. Contraste / Filtru Sobel

$$\begin{bmatrix} +1 & +2 & +1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix} S_y$$

$$\begin{bmatrix} +1 & 0 & -1 \\ +2 & 0 & -2 \\ +1 & 0 & -1 \end{bmatrix} S_x$$

$$G = \sqrt{G_x^2 + G_y^2}$$

magnitudine
vector

$$G_x = I(x,y) * S_x$$

$$G_y = I(x,y) * S_y$$

$$\theta (\text{unghi de gradient}) = \arctg \frac{G_y}{G_x}$$

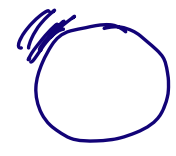
unghiul vectorului

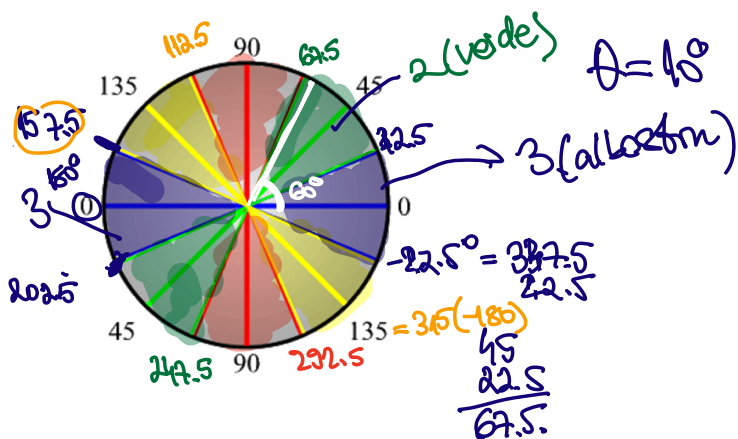


3. Non Maximum Suppression

θ unghiul gradientului

Gamtrarea unghiului





$$\begin{array}{r}
 157.5 \\
 22.5 \\
 \hline
 180 \\
 22.5 \\
 \hline
 202.5 \\
 22.5 \\
 \hline
 225 \\
 22.5 \\
 \hline
 247.5 \\
 45 \\
 \hline
 292.5
 \end{array}$$

Pentru fiecare pixel s-a calculat magnitudinea Sobel Gr.
orientarea Sobel θ

din unghi de obținere tonă

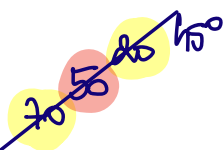
20	140	-5	0	30	20
10	60	-20	0	50	10
30	50	-20	70	60	10
Direction		Magnitude			
Grade					

Punct $G(x,y) = 50$ magnitudine

$\theta(x,y) = 60^\circ \Rightarrow$ de obține tonă

- 3: muchii orizontale aprox.
- 2: muchii 45° aprox.
- 1: muchii verticale aprox.
- 4: muchii 135° aprox. (-45°)

$60^\circ \Rightarrow 2$ tonă



50 se păstrează dacă ar fi muchie maximă $\max(50, 20, 70)$

50 nu e maxim \Rightarrow nu se păstrează

k. Eliminarea muchiilor slabe prin histeretă

Histeretă formată $\pm 0.1^\circ C$ ✓

$t = 20.0^\circ C$



Muchii puternice $G(x,y) \geq \max Val$ se păstrează oricum
Muchii slabe $G(x,y) < \min Val$ se elimină $G(x,y) = 0$.
Între $(\min Val, \max Val)$ se păstrează doar dacă este
Continuarea unei muchii puternice.

$$\maxVal = 2 * \minVal$$
$$3 * \minVal$$

Musouri: Csh 1-32 pg. notatie, translatie, impingere
Cp6