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20180261 (1)

(1)

Average filter

$$\begin{matrix} 2 & 2 & 2 \\ 1 & 7 & 3 \\ 1 & 2 & 1 \end{matrix} \Rightarrow \frac{1}{9} \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

$$= \frac{1}{9} (2+2+2+1+7+3+1+2+1) =$$

$$= \frac{21}{9} = 2$$

B) Sorted pixels

1 1 1 2 2 2 2 3 7

Median = 2

C) Sorted pixels

1 1 1 2 2 2 2 3 7

Output = 1

(2)

D. Sorted array

1 1 1 2 2 2 2 3 7

Output = 2

(2) per witt

$$\frac{\partial F}{\partial x} = \begin{vmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{vmatrix} \begin{vmatrix} 6 & 6 & 7 \\ 5 & 7 & 5 \\ 6 & 6 & 8 \end{vmatrix}$$

$$= (-6) + (7) + (-5) + (5) + (-6) + (6) = 1$$

$$\frac{\partial F}{\partial y} = \begin{vmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{vmatrix} \begin{vmatrix} 6 & 6 & 7 \\ 5 & 7 & 5 \\ 6 & 6 & 8 \end{vmatrix} = 1$$

$$\text{mag} = \sqrt{\left(\frac{\partial F}{\partial x}\right)^2 + \left(\frac{\partial F}{\partial y}\right)^2} = \sqrt{2}$$

$$\frac{\frac{\partial F}{\partial y}}{\frac{\partial F}{\partial x}} = \frac{1}{1} = 45^\circ$$

(3) 3

Date _____ No _____
Sobel

$$\frac{\partial f}{\partial x} = \begin{vmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{vmatrix} \begin{vmatrix} 6 & 6 & 7 \\ 5 & 7 & 5 \\ 6 & 6 & 6 \end{vmatrix}$$

$$= (-6) + (6) + (-1 \cdot 0) + (1 \cdot 0) + (-6) + (6)$$

$$= 0$$

$$\frac{\partial f}{\partial y} = \begin{vmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{vmatrix} \begin{vmatrix} 6 & 6 & 7 \\ 5 & 7 & 5 \\ 6 & 6 & 6 \end{vmatrix} = 1$$

$$\text{mag} = \sqrt{\left(\frac{\partial f}{\partial x}\right)^2 + \left(\frac{\partial f}{\partial y}\right)^2} = \sqrt{1} = 1$$

$$\text{Phase} = \tan^{-1} \frac{\frac{\partial f}{\partial y}}{\frac{\partial f}{\partial x}} = \frac{1}{0}$$

unknown

5

4

Date _____ No _____
Laplace

$$\begin{vmatrix} 0 & 1 & 6 \\ 1 & -4 & 1 \\ 0 & 1 & 6 \end{vmatrix} \begin{vmatrix} 6 & 6 & 7 \\ 5 & 7 & 5 \\ 8 & 6 & 0 \end{vmatrix}$$

$$= (0)(15) + (-28)(5) + (5) + (6)$$

$$\boxed{-6}$$