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Tugas : Pengolahan Citra Digital (Deteksi Tepi)

Pengolahan Citra Digital

Operator Robert

Ridayanti Wardani 152023168

Operasi Robert

• Keakalan tepi operasi Robert

$$G[f(x,y)] = |R_+| - |R_-|$$

Soal Contoh deteksi tepi Operasi Robert

3	4	2	5	1
2	1	6	4	2
3	5	7	1	3
4	2	5	7	1
2	5	1	3	2

(i) Citra Semula

4	3	3	6	*
5	7	8	2	*
2	5	4	4	*
1	1	8	7	*
*	*	*	*	*

(ii) Hasil konvolusi

Diketahui

Kernel konvolusi Operasi Robert

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

Baris 1

$$\begin{bmatrix} 3 & 4 \\ 2 & 1 \end{bmatrix} (0,0)$$

$$R_+ = (3 \cdot 1) + (4 \cdot 0) + (2 \cdot 0) + (1 \cdot (-1)) = 2$$

$$R_- = (3 \cdot 0) + (4 \cdot 1) + (2 \cdot (-1)) + (1 \cdot 0) = 2$$

$$G = |2| + |2| = 4$$

$$\begin{bmatrix} 4 & 2 \\ 1 & 6 \end{bmatrix} (0,1)$$

$$R_+ = (4 \cdot 1) + (2 \cdot 0) + (1 \cdot 0) + (6 \cdot (-1)) = -2$$

$$R_- = (4 \cdot 0) + (2 \cdot 1) + (1 \cdot (-1)) + (6 \cdot 0) = 1$$

$$G = |-2| + |1| = 2 + 1 = 3$$

$$\begin{bmatrix} 2 & 5 \\ 6 & 4 \end{bmatrix} (0, 2)$$

$$R_+ = (2 \cdot 1) + (5 \cdot 0) + (6 \cdot 0) + (4 \cdot (-1)) = -2$$

$$R_- = (2 \cdot 0) + (5 \cdot 1) + (6 \cdot (-1)) + (4 \cdot 0) = -1$$

$$G = |-2| + |-1| = 2 + 1 = 3$$

$$\begin{bmatrix} 5 & 1 \\ 4 & 2 \end{bmatrix} (0, 3)$$

$$R_+ = (5 \cdot 1) + (1 \cdot 0) + (4 \cdot 0) + (2 \cdot (-1)) = 3$$

$$R_- = (5 \cdot 0) + (1 \cdot 1) + (4 \cdot (-1)) + (2 \cdot 0) = -3$$

$$G = |3| + |-3| = 3 + 3 = 6$$

Baris 2

$$\begin{bmatrix} 2 & 1 \\ 3 & 5 \end{bmatrix} (1, 0)$$

$$R_+ = (2 \cdot 1) + (1 \cdot 0) + (3 \cdot 0) + (5 \cdot (-1)) = -3$$

$$R_- = (3 \cdot 0) + (1 \cdot 1) + (3 \cdot (-1)) + (5 \cdot 0) = -2$$

$$G = |-3| + |-2| = 3 + 2 = 5$$

$$\begin{bmatrix} 1 & 6 \\ 5 & 7 \end{bmatrix} (1, 1)$$

$$R_+ = (1 \cdot 1) + (6 \cdot 0) + (5 \cdot 0) + (7 \cdot (-1)) = -6$$

$$R_- = (1 \cdot 0) + (6 \cdot 1) + (5 \cdot (-1)) + (7 \cdot 0) = 1$$

$$G = |-6| + |1| = 6 + 1 = 7$$

$$\begin{bmatrix} 6 & 4 \\ 7 & 1 \end{bmatrix} (1, 2)$$

$$R_+ = (6 \cdot 1) + (4 \cdot 0) + (7 \cdot 0) + (1 \cdot (-1)) = 5$$

$$R_- = (6 \cdot 0) + (4 \cdot 1) + (7 \cdot (-1)) + (1 \cdot 0) = -3$$

$$G = |5| + |-3| = 5 + 3 = 8$$

$$\begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix} (1, 3)$$

$$R_+ = (4 \cdot 1) + (2 \cdot 0) + (1 \cdot 0) + (3 \cdot (-1)) = 1$$

$$R_- = (4 \cdot 0) + (2 \cdot 1) + (1 \cdot (-1)) + (3 \cdot 0) = 1$$

$$G = |1| + |1| = 2$$

Baris 3

$$\begin{bmatrix} 3 & 5 \\ 4 & 2 \end{bmatrix} (2,0)$$

$$R_+ = (3 \cdot 1) + (5 \cdot 0) + (4 \cdot 0) + (2 \cdot (-1)) = 1$$

$$R_- = (3 \cdot 0) + (5 \cdot 1) + (4 \cdot (-1)) + (2 \cdot 0) = 1$$

$$G = |1| + |1| = 2$$

$$\begin{bmatrix} 5 & 7 \\ 2 & 5 \end{bmatrix} (2,1)$$

$$R_+ = (5 \cdot 1) + (7 \cdot 0) + (2 \cdot 0) + (5 \cdot (-1)) = 0$$

$$R_- = (5 \cdot 0) + (7 \cdot 1) + (2 \cdot (-1)) + (5 \cdot 0) = 5$$

$$G = |0| + |5| = 5$$

$$\begin{bmatrix} 7 & 1 \\ 5 & 7 \end{bmatrix} (2,2)$$

$$R_+ = (7 \cdot 1) + (1 \cdot 0) + (5 \cdot 0) + (7 \cdot (-1)) = 0$$

$$R_- = (7 \cdot 0) + (1 \cdot 1) + (5 \cdot (-1)) + (7 \cdot 0) = -4$$

$$G = |0| + |-4| = 0 + 4 = 4$$

$$\begin{bmatrix} 1 & 3 \\ 7 & 1 \end{bmatrix} (2,3)$$

$$R_+ = (1 \cdot 1) + (3 \cdot 0) + (7 \cdot 0) + (1 \cdot (-1)) = 0$$

$$R_- = (1 \cdot 0) + (3 \cdot 1) + (7 \cdot (-1)) + (1 \cdot 0) = -4$$

$$G = |0| + |-4| = 0 + 4 = 4$$

Baris 4

$$\begin{bmatrix} 4 & 2 \\ 2 & 5 \end{bmatrix} (3,0)$$

$$R_+ = (4 \cdot 1) + (2 \cdot 0) + (2 \cdot 0) + (5 \cdot (-1)) = -1$$

$$R_- = (4 \cdot 0) + (2 \cdot 1) + (2 \cdot (-1)) + (5 \cdot 0) = 0$$

$$G = |-1| + |0| = 1 + 0 = 1$$

$$(3,1) \begin{bmatrix} 2 & 5 \\ 5 & 1 \end{bmatrix} \quad R_+ = (2 \cdot 1) + (5 \cdot 0) + (5 \cdot 0) + (1 \cdot (-1)) = 1$$

$$R_- = (2 \cdot 0) + (5 \cdot 1) + (5 \cdot (-1)) + (1 \cdot 0) = 0$$

$$G = |1| + |0| = 1$$

$$\begin{bmatrix} 5 & 7 \\ 1 & 3 \end{bmatrix} (3,2)$$

$$R_+ = (5 \cdot 1) + (7 \cdot 0) + (1 \cdot 0) + (3 \cdot (-1)) = 2$$

$$R_- = (5 \cdot 0) + (7 \cdot 1) + (1 \cdot (-1)) + (3 \cdot 0) = 6$$

$$G = |2| + |6| = 8$$

$$\begin{bmatrix} 7 & 1 \\ 3 & 2 \end{bmatrix} (3,3)$$

$$R_+ = (7 \cdot 1) + (1 \cdot 0) + (3 \cdot 0) + (2 \cdot (-1)) = 5$$

$$R_- = (7 \cdot 0) + (7 \cdot 1) + (3 \cdot (-1)) + (2 \cdot 0) = -2$$

$$G = |5| + |-2| = 5 + 2 = 7$$

Hasil Konvolusi

$\begin{bmatrix} 4 & 3 & 3 & 6 \\ 5 & 7 & 8 & 2 \\ 2 & 5 & 4 & 4 \\ 1 & 1 & 8 & 7 \end{bmatrix}$	Baris 1	$\begin{bmatrix} 4 & 3 & 3 & 6 & * \\ 5 & 7 & 8 & 2 & * \\ 2 & 5 & 4 & 4 & * \\ 1 & 1 & 8 & 7 & * \\ * & * & * & * & * \end{bmatrix}$
	Baris 2	
	Baris 3	
	Baris 4	