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Pemrosesan Sinyal Optimasi (D)

Latihan Soal Convolution 2D

$x(n_1, n_2)$

$h(n_1, n_2)$

	1	4	1
0	2	5	3

	1	1
0	1	-1

Konvolusikan sinyal diatas

$$g(n_1, n_2) = \sum_{k_1=-\infty}^{\infty} \sum_{k_2=-\infty}^{\infty} x(k_1, k_2) h(n_1 - k_1, n_2 - k_2)$$

Cerminkan $h(n_1, n_2)$ sehingga menjadi

-1	1	
1	1	

Dikonvolusi

$$\left(\begin{array}{ccc} & 1 & 4 & 1 \\ -1 & (1 \cdot 2) & 5 & 3 \\ & 1 & & \end{array} \right) \Leftrightarrow -1(0) + (2) = 2$$

$$\left(\begin{array}{ccc} & 1 & 4 & 1 \\ (-1 \cdot 2) & (1 \cdot 5) & 3 & \\ & 1 & & \end{array} \right) \Leftrightarrow -1(2) + 5 = 3$$

$$\begin{array}{ccc|c} 1 & 9 & 1 & \\ 2 & (-1.5) & (1.3) & \langle \equiv \rangle -5+3 = -2 \\ & 1 & 1 & \end{array}$$

$$\begin{array}{ccc|c} 1 & 9 & 1 & \\ 2 & 5 & (-1.3) & 1 \quad \langle \equiv \rangle -3+1(0) = -3 \\ & & 1 & 1 \end{array}$$

$$\begin{array}{ccc|c} -1 & (1.1) & 9 & 1 \quad \langle \equiv \rangle 1(1)+1(2) = 3 \\ 1 & (1.2) & 5 & 3 \end{array}$$

$$\begin{array}{ccc|c} (-1.1) & (1.9) & 1 & \langle \equiv \rangle -1+9+2+5 = 10 \\ (1.2) & (1.5) & 3 & \end{array}$$

$$\begin{array}{ccc|c} 1 & (-1.4) & (1.1) & \langle \equiv \rangle -9+1+5+3 = 5 \\ 2 & (1.5) & (1.3) & \end{array}$$

$$\begin{array}{ccc|c} 1 & 9 & (-1.1) & 1 \quad \langle \equiv \rangle -1+3+0+0 = 2 \\ 2 & 5 & (1.3) & 1 \end{array}$$

$$\begin{array}{ccc|c} -1 & 1 & & \\ 1 & (1.1) & 9 & 1 \quad \langle \equiv \rangle 1 \\ & 2 & 5 & 3 \end{array}$$

$$\begin{array}{ccc|c} -1 & 1 & & \\ (1.1) & (9.1) & 1 & \langle \equiv \rangle 1+9 = 5 \\ 2 & 5 & 3 & \end{array}$$

$$\begin{array}{rcl}
 & -1 & 1 \\
 1 & (1.4) & (1.1) \quad \langle \equiv \rangle \quad 9 + 1 = 5 \\
 2 & 5 & 3
 \end{array}$$

$$\begin{array}{rcl}
 & -1 & 1 \\
 1 & 9 & (1.1) \quad \langle \equiv \rangle \quad 9 \\
 2 & 5 & 3
 \end{array}$$

sehingga hasil akhir yang didapatkan

$$g(\pi_1, \pi_2) = \begin{array}{c|cccc} & 1 & 5 & 5 & 9 \\ \hline 3 & 3 & 10 & 5 & 2 \\ 2 & 2 & 3 & -2 & -3 \end{array}$$