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Pemroseson Sinyal Optimasi / D

Latihan Soal Convolusi 2D

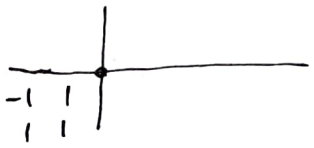
Diberikan ....

$x(n_1, n_2)$ $\quad$ $h(n_1, n_2)$

Konvolusikan sinyal di atas ....

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

Langkah pertama, cerminkan $h(n_1, n_2)$ terhadap origin sehingga didapatkan ....



sehingga konvolusikan sinyal sebagai berikut.

- $\begin{matrix} & & 1 & 4 & 1 \\ -1 & (1\cdot 2) & 5 & 3 & \end{matrix} \Leftrightarrow -1(0) + (2) \equiv 2$
  $\quad 1 \quad 1$

- $\begin{matrix} & & 1 & 4 & 1 \\ (-1\cdot 2) & (1\cdot 5) & 3 & & \end{matrix} \Leftrightarrow -1(2) + 5 \equiv 3$
  $\quad 1 \quad 1$

- $\begin{matrix} 1 & 4 & 1 \\ 2 & (-1\cdot 5) & (1\cdot 3) \end{matrix} \Leftrightarrow -5 + 3 \equiv -2$
  $\quad 1 \quad 1$

Lanjutan
hadirnya sebelumnya

- 1 4 1
  2 5 (-3) 1 $\Leftrightarrow$ $-3+1(0) \equiv -3$
  1 1

- -1 (1·1) 4 1 $\Leftrightarrow$ $1(1)+1(2) \equiv 3$
  1 (1·2) 5 3

- (-1·1) (1·4) 1 $\Leftrightarrow$ $-1+4+2+5 \equiv 10$
  (1·2) (1·5) 3

- 1 (+4) (1·1) $\Leftrightarrow$ $-4+1+5+3 \equiv 5$
  2 (15) (1·3)

- 1 4 (-1·4) 1 $\Leftrightarrow$ $-1+3+0+0 \equiv 2$
  2 5 (1·3) 1

- -1 1
  1 (1·1) 4 1 $\Leftrightarrow$ 1
  2 5 3

- -1 1
  (1·1) (4·1) 1 $\Leftrightarrow$ $1+4 \equiv 5$
  2 5 3

- -1 1
  1 (1·4) (1·1) $\Leftrightarrow$ $4+1 \equiv 5$
  2 5 3

- -1 1
  1 4 (1·1) 1 $\Leftrightarrow$ 4
  2 5 3

Sehingga, hasil akhir yang didapatkan adalah

$$\mathcal{I}(\pi_1, \pi_2) = \begin{vmatrix} 1 & 5 & 5 & 4 \\ 3 & 10 & 5 & 2 \\ 2 & 3 & -2 & -3 \end{vmatrix}$$