



INSTITUT BISNIS
DAN INFORMATIKA

stikom
SURABAYA

HEART & MIND TOWARDS EXCELLENCE

Matriks dan Transformasi Linier

S1 Sistem Komputer
Musayyanah, S.ST, MT

Prestasi bukanlah suatu kebetulan,
dan **impian** tidak akan pernah menjadi kenyataan
tanpa **kerja keras.**



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Buat apa belajar Matriks?


Kriptografi Citra Digital

KRIPTOGRAFI CITRA DIGITAL

SEBELUM



SETELAH



ENKRIPSI

DESKRIPSI

Membuka File : IMG_20140114_085721.jpg

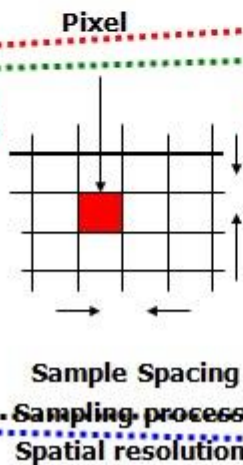
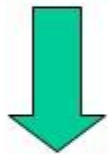
CARI

SIMPAN

KELUAR

The image shows a software interface for digital image cryptography. It features two side-by-side image displays. The left display, labeled 'SEBELUM' (Before), shows a photograph of a person wearing a cap and a dark shirt, crouching in a field of tall grass. The right display, labeled 'SETELAH' (After), shows the same image after encryption, where the colors are completely distorted and unrecognizable. Between the two images are two buttons: 'ENKRIPSI' (Encrypt) and 'DESKRIPSI' (Decrypt). At the bottom, there is a file path 'Membuka File : IMG_20140114_085721.jpg' and a 'CARI' (Search) button. On the right side, there are 'SIMPAN' (Save) and 'KELUAR' (Exit) buttons. The window title is 'Kriptografi Citra Digital'.

Menghitung Pixel Citra dengan Matriks



Line Spacing

$f(x,y)$

$f(0,0)$	$f(0,1)$	$f(0,2)$	$f(0,3)$	$f(0,n-1)$
$f(1,0)$	$f(1,1)$	$f(1,2)$	$f(1,3)$	$f(1,n-1)$
$f(2,0)$	$f(2,1)$	$f(2,2)$	$f(2,3)$	$f(2,n-1)$
...
...
...
$f(m-1,0)$	$f(m-1,1)$	$f(m-1,2)$	$f(m-1,3)$	$f(m-1,n-1)$

List of Content

- Pengertian Invers Matriks
- Invers Matriks ordo 2×2
- Invers Matriks Ordo $n \times n \rightarrow$ KOFAKTOR
- Invers Matriks Ordo $n \times n \rightarrow$ TBE

Pengertian Invers

- Jika A dan B masing-masing merupakan matriks persegi atau bujur sangkar berordo sama dan berlaku

$$A \cdot B = B \cdot A = I$$

- $A = B^{-1} \rightarrow B^{-1}$ adalah invers dari A
- $B = A^{-1} \rightarrow A^{-1}$ adalah invers dari B
- Berarti A dan B saling invers

Sifat- Sifat Invers Matriks

- $(AB)^{-1} = B^{-1}A^{-1}$
- $(A^T)^{-1} = (A^{-1})^T$
- $(A^{-1})^{-1} = A$
- $(A^n)^{-1} = (A^{-1})^n$, dimana $n = 0,1,2,\dots$
- $(kA)^{-1} = \frac{1}{k}A^{-1}$, dimana $k = \text{scalar } (k \neq 0)$

Menentukan Invers Matriks Ordo 2x2

- Jika $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, maka

$$A^{-1} = \frac{1}{\det(A)} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$$A^{-1} = \frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

Dimana $\det(A) = ad-bc \neq 0$

- Apabila nilai $\det = 0$, maka matriks itu adalah matriks tunggal (singular)

Menentukan Invers Matriks Ordo $n \times n$ dengan Matriks Adjoint

$$A^{-1} = \frac{1}{\det(A)} \text{adj } A$$

- Dimana :
- $\det(A) \neq 0$
- $\text{adj } A = (C_A)^T$
- Matriks kofaktor = $C_A = \begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{21} & C_{22} & C_{23} \\ C_{31} & C_{32} & C_{33} \end{bmatrix}$
- Dimana $C_{ij} = (-1)^{i+j} M_{ij}$

Menentukan Invers Matriks Ordo $n \times n$ dengan TBE

- Hitung $\det(A) \neq 0$
- Ubahlah bentuk :
- $(A|I) \xrightarrow{\text{TBE}} (I|A^{-1})$
- Dimana :
- A = matriks bujur sangkar yang berordo $n \times n$
- I = matriks identitas
- A^{-1} = invers matriks

Contoh Soal

- 1. $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

- $|A| = -2$

- Ubah bentuk :

- $(A|I) \xrightarrow{\text{TBE}} (I|A^{-1})$

- $$\left[\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 3 & 4 & 0 & 1 \end{array} \right] \xrightarrow[R_2 = R_2 + (-3)R_1]{R_{21}(-3)} \left[\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 0 & -1 & -3 & 1 \end{array} \right]$$

$$\left[\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 0 & -1 & -3 & 1 \end{array} \right] \xrightarrow{\left(-\frac{1}{2} \right) R_2} \left[\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 0 & 1 & 3/2 & -1/2 \end{array} \right]$$

$$\left[\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 0 & 1 & 3/2 & -1/2 \end{array} \right] \xrightarrow[\begin{array}{l} R_{12} (-2) \\ R_1 = R_1 + (-2) R_2 \end{array}]{\hspace{1cm}} \left[\begin{array}{cc|cc} 1 & 0 & -2 & 1 \\ 0 & 1 & 3/2 & -1/2 \end{array} \right]$$

Karena matriks sebelah kiri sudah berubah menjadi matriks identitas, maka invers matriks A adalah :

$$A^{-1} = \begin{bmatrix} -2 & 1 \\ 3/2 & -1/2 \end{bmatrix}$$

Thank You