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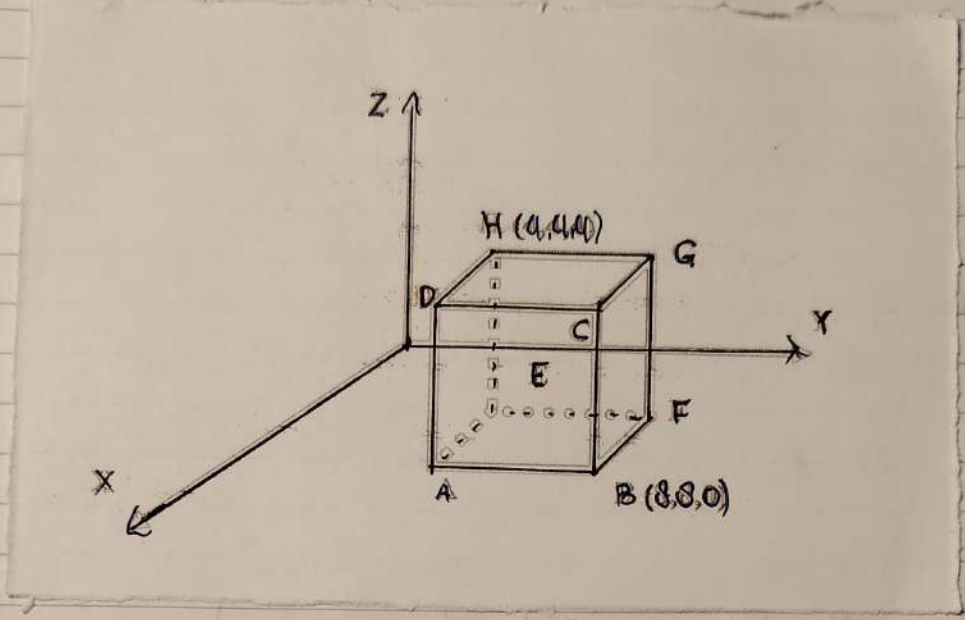
No. 1
Date 5/12/2024

Tugas M9



Diketahui suatu kubus ABCD - EFGH sebagaimana tampak pada Gambar diatas, dilakukan transformasi secara berkesinambungan dengan urutan sebagai berikut :

- Diputar 90° searah jarum jam sepanjang sumbu Y, kemudian
- Digeser 4 satuan kebawah dan 4 satuan ke kiri, lalu
- Dilakukan perbesaran 2 kali keatas

maka tentukanlah

A. Matriks Rotasi, Translasi, Dilatasi dan komposisinya
B. Titik - titik sudut dari bangun hasil akhir proses transformasi berdasarkan perhitungan matriks komposisinya
C. Gambarkan bangun dari hasil akhir transformasi tersebut

A (8,4,0)
B (8,8,0)
C (8,8,4)
D (8,4,4)
E (4,4,0)
F (4,8,0)
G (4,8,4)
H (4,4,4)

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A :

M. Rotasi $R = \begin{bmatrix} \cos 90 & 0 & -\sin 90 \\ 0 & 1 & 0 \\ \sin 90 & 0 & \cos 90 \end{bmatrix} = \begin{bmatrix} 0 & 0 & -1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

M. Translasi $T = \begin{bmatrix} 1 & 0 & 0 & T_x \\ 0 & 1 & 0 & T_y \\ 0 & 0 & 1 & T_z \\ 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -4 \\ 0 & 0 & 1 & -4 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

M. Dilatasi $D = \begin{bmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & S_z \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

Komposisi

D. T. R

$$K = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -4 \\ 0 & 0 & 1 & -4 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$K = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -4 \\ 0 & 0 & 2 & -8 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & -4 \\ 2 & 0 & 0 & -8 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

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$$A' = \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & -4 \\ 2 & 0 & 0 & -8 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 8 \\ 4 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 8 \\ 1 \end{bmatrix} = (0,0,8)$$

$$B' = \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & -4 \\ 2 & 0 & 0 & -8 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 8 \\ 8 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 4 \\ 8 \\ 1 \end{bmatrix} = (0,4,8)$$

$$C' = \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & -4 \\ 2 & 0 & 0 & -8 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 8 \\ 8 \\ 4 \\ 1 \end{bmatrix} = \begin{bmatrix} -4 \\ 4 \\ 8 \\ 1 \end{bmatrix} = (-4,4,8)$$

$$D' = \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & -4 \\ 2 & 0 & 0 & -8 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 8 \\ 4 \\ 4 \\ 1 \end{bmatrix} = \begin{bmatrix} -4 \\ 0 \\ 8 \\ 1 \end{bmatrix} = (-4,0,8)$$

$$E' = \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & -4 \\ 2 & 0 & 0 & -8 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 4 \\ 4 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} = (0,0,0)$$

$$F' = \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & -4 \\ 2 & 0 & 0 & -8 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 4 \\ 8 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 4 \\ 0 \\ 1 \end{bmatrix} = (0,4,0)$$

$$G = \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & -4 \\ 2 & 0 & 0 & -8 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 4 \\ 8 \\ 4 \\ 1 \end{bmatrix} = \begin{bmatrix} -4 \\ 4 \\ 0 \\ 1 \end{bmatrix} = (-4,4,0)$$

$$H = \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & -4 \\ 2 & 0 & 0 & -8 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 4 \\ 4 \\ 4 \\ 1 \end{bmatrix} = \begin{bmatrix} -4 \\ 0 \\ 0 \\ 1 \end{bmatrix} = (-4,0,0)$$

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