Transformation Assignment

Tahmina Akhtar

ID: UG02-47-18-033

Course Code: CSE-0313

Course Title: Computer Graphics

(1)

Here, P(75, 50, 110, 5) or (15, 10, 22, 1)

(i)

$$\begin{bmatrix} x' \\ y' \\ z' \\ \omega' \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 10 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 13 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 15 \\ 10 \\ 22 \\ 1 \end{bmatrix} = \begin{bmatrix} 15+10 \\ 5+10 \\ 22+13 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 25 \\ 15 \\ 35 \\ 1 \end{bmatrix}$$

∴ After translation the point (25, 15, 35, 1).

(ii)

$$\begin{bmatrix} x'' \\ y'' \\ z'' \\ \omega'' \end{bmatrix} = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 0.5 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 25 \\ 15 \\ 35 \\ 1 \end{bmatrix} = \begin{bmatrix} 50 \\ 7.5 \\ 105 \\ 1 \end{bmatrix}$$

∴ After scale the point is (50, 7.5, 105, 1)

(iii)

$$\begin{bmatrix} x''' \\ y''' \\ z''' \\ w''' \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos 60 & -\sin 60 & 0 \\ 0 & \sin 60 & \cos 60 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 50 \\ 7.5 \\ 105 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 50 \\ 3.75 - 90.933 \\ 6.495 + 52.5 \\ 1 \end{bmatrix} = \begin{bmatrix} 50 \\ -87.183 \\ 58.995 \\ 1 \end{bmatrix}$$

∴ After rotate the point is (50, -87.183, 58.995, 1)

(2)

(i)

Here, P(9, 18, 27, 3) or, (3, 6, 9, 1)

$$\begin{bmatrix} x' \\ y' \\ z' \\ w' \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 4 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 3 \\ 6 \\ 9 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 7 \\ 8 \\ 12 \\ 1 \end{bmatrix}$$

∴ After translation the point is (7, 8, 12, 1)

(ii)

$$\begin{bmatrix} x'' \\ y'' \\ z'' \\ w'' \end{bmatrix} = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 0.5 & 0 & 0 \\ 0 & 0 & 4 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 7 \\ 8 \\ 12 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 14 \\ 4 \\ 48 \\ 1 \end{bmatrix}$$

∴ After scale the point is (14, 4, 48, 1)

(iii)

$$\begin{bmatrix} x''' \\ y''' \\ z''' \\ w''' \end{bmatrix} = \begin{bmatrix} \cos 30 & \sin 30 & 0 & 0 \\ \sin 30 & \cos 30 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 14 \\ 4 \\ 48 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 10.12 \\ 10.46 \\ 48 \\ 1 \end{bmatrix}$$

∴ After rotate the point is (10.12, 10.46, 48, 1)

3

(I)

∴ Here (12, 36, 24, 4) or (3, 9, 6, 1)

$$\begin{bmatrix} x' \\ y' \\ z' \\ w' \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 3 \\ 9 \\ 6 \\ 1 \end{bmatrix} = \begin{bmatrix} 3+2 \\ 9+3 \\ 6+1 \\ 1 \end{bmatrix} = \begin{bmatrix} 5 \\ 12 \\ 7 \\ 1 \end{bmatrix}$$

∴ After translate the point is (5, 12, 7, 1)

(II)

$$\begin{bmatrix} x'' \\ y'' \\ z'' \\ w'' \end{bmatrix} = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 0.5 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 5 \\ 12 \\ 7 \\ 1 \end{bmatrix} = \begin{bmatrix} 10 \\ 6 \\ 21 \\ 1 \end{bmatrix}$$

∴ After scale the point is (10, 6, 21, 1)

(III)

$$\begin{bmatrix} x''' \\ y''' \\ z''' \\ w''' \end{bmatrix} = \begin{bmatrix} \cos 60 & 0 & -\sin 60 & 0 \\ 0 & 1 & 0 & 0 \\ \sin 60 & 0 & \cos 60 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 10 \\ 6 \\ 21 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 5 - 18.187 \\ 6 \\ 8.66 + 10.5 \\ 1 \end{bmatrix} = \begin{bmatrix} -13.187 \\ 6 \\ 19.16 \\ 1 \end{bmatrix}$$

∴ After rotate the point is (-13.187, 6, 19.16, 1)

Ans

4

(i)

Here, P(63, 99, 117, 9) or (7, 11, 13, 1)

$$\begin{bmatrix} x' \\ y' \\ z' \\ w' \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 8 \\ 0 & 1 & 0 & 49 \\ 0 & 0 & 1 & 32 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 7 \\ 11 \\ 13 \\ 1 \end{bmatrix} = \begin{bmatrix} 7+8 \\ 49+11 \\ 32+13 \\ 1 \end{bmatrix} = \begin{bmatrix} 15 \\ 60 \\ 45 \\ 1 \end{bmatrix}$$

∴ After translation the point is (15, 60, 45, 1)

(ii)

$$\begin{bmatrix} x'' \\ y'' \\ z'' \\ \omega'' \end{bmatrix} = \begin{bmatrix} 3 & 0 & 0 & 0 \\ 0 & 0.5 & 0 & 0 \\ 0 & 0 & 5 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 15 \\ 60 \\ 45 \\ 1 \end{bmatrix} = \begin{bmatrix} 45 \\ 30 \\ 225 \\ 1 \end{bmatrix}$$

∴ After the scale the point is (45, 30, 225, 1)

(iii)

$$\begin{bmatrix} x''' \\ y''' \\ z''' \\ \omega''' \end{bmatrix} = \begin{bmatrix} \cos 30 & 0 & -\sin 30 & 0 \\ 0 & 1 & 0 & 0 \\ \sin 30 & 0 & \cos 30 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 45 \\ 30 \\ 225 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 98.97 + (-112.5) \\ 22.53 + 194.86 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} -73.53 \\ 30 \\ 217.36 \\ 1 \end{bmatrix}$$

∴ After the rotate the point is (−73.53, 30, 217.36, 1)

—— o ——