



MATRICES DE ROTACION

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8°B T/M

Ing. Mecatrónica

Cinemática de robots

1) $x=60^\circ$ $y=70^\circ$ $z=10^\circ$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(60) & -\sin(60) \\ 0 & \sin(60) & \cos(60) \end{bmatrix} \cdot \begin{bmatrix} \cos(70) & 0 & \sin(70) \\ 0 & 1 & 0 \\ -\sin(70) & 0 & \cos(70) \end{bmatrix} = \begin{bmatrix} 0.342 & 0 & 0.94 \\ 0.814 & 0.5 & -0.296 \\ -0.47 & 0.866 & 0.171 \end{bmatrix}$$

$$\begin{bmatrix} 0.342 & 0 & 0.94 \\ 0.814 & 0.5 & -0.296 \\ -0.47 & 0.866 & 0.171 \end{bmatrix} \cdot \begin{bmatrix} \cos(10) & -\sin(10) & 0 \\ \sin(10) & \cos(10) & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0.336 & -0.6 & 0.94 \\ 0.888 & 0.351 & -0.296 \\ -0.312 & 0.934 & 0.171 \end{bmatrix}$$

2) $x=40^\circ$ $y=10^\circ$ $z=50^\circ$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(40) & -\sin(40) \\ 0 & \sin(40) & \cos(40) \end{bmatrix} \cdot \begin{bmatrix} \cos(10) & 0 & \sin(10) \\ 0 & 1 & 0 \\ -\sin(10) & 0 & \cos(10) \end{bmatrix} = \begin{bmatrix} 0.985 & 0 & 0.173 \\ 0.111 & 0.733 & -0.633 \\ -0.133 & 0.642 & 0.754 \end{bmatrix}$$

$$\begin{bmatrix} 0.985 & 0 & 0.173 \\ 0.111 & 0.733 & -0.633 \\ -0.133 & 0.642 & 0.754 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(50) & -\sin(50) \\ 0 & \sin(50) & \cos(50) \end{bmatrix} = \begin{bmatrix} 0.985 & 0.132 & 0.111 \\ 0.111 & 0.0074 & -0.933 \\ -0.133 & 0.99 & -0.0071 \end{bmatrix}$$

3) $x=20^\circ$ $z=18^\circ$ $y=30^\circ$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(20) & -\sin(20) \\ 0 & \sin(20) & \cos(20) \end{bmatrix} \cdot \begin{bmatrix} \cos(18) & -\sin(18) & 0 \\ \sin(18) & \cos(18) & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0.951 & -0.309 & 0 \\ 0.29 & 0.893 & -0.342 \\ 0.105 & 0.325 & 0.939 \end{bmatrix}$$

$$\begin{bmatrix} 0.951 & -0.309 & 0 \\ 0.29 & 0.893 & -0.342 \\ 0.105 & 0.325 & 0.939 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(30) & -\sin(30) \\ 0 & \sin(30) & \cos(30) \end{bmatrix} = \begin{bmatrix} 0.951 & -0.267 & 0.1545 \\ 0.29 & 0.602 & -0.742 \\ 0.105 & 0.7509 & 0.650 \end{bmatrix}$$

4) $x=30^\circ$ $z=10^\circ$ $y=30^\circ$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(30) & -\sin(30) \\ 0 & \sin(30) & \cos(30) \end{bmatrix} \cdot \begin{bmatrix} \cos(10) & -\sin(10) & 0 \\ \sin(10) & \cos(10) & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0.984 & -0.173 & 0 \\ 0.150 & 0.852 & -0.5 \\ 0.086 & 0.492 & 0.866 \end{bmatrix}$$

$$\begin{bmatrix} 0.984 & -0.173 & 0 \\ 0.150 & 0.852 & -0.5 \\ 0.086 & 0.492 & 0.866 \end{bmatrix} \cdot \begin{bmatrix} \cos(30) & 0 & \sin(30) \\ 0 & 1 & 0 \\ -\sin(30) & 0 & \cos(30) \end{bmatrix} = \begin{bmatrix} 0.852 & -0.173 & 0.492 \\ 0.379 & 0.852 & -0.358 \\ 0.358 & 0.492 & 0.792 \end{bmatrix}$$

5) $y=30^\circ$ $z=10^\circ$ $x=30^\circ$

$$\begin{bmatrix} \cos(30) & 0 & \sin(30) \\ 0 & 1 & 0 \\ -\sin(30) & 0 & \cos(30) \end{bmatrix} \cdot \begin{bmatrix} \cos(10) & -\sin(10) & 0 \\ \sin(10) & \cos(10) & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0.852 & -0.150 & 0.5 \\ 0.173 & 0.984 & 0 \\ -0.492 & 0.0868 & 0.866 \end{bmatrix}$$

$$\begin{bmatrix} 0.852 & -0.150 & 0.5 \\ 0.173 & 0.984 & 0 \\ -0.492 & 0.0868 & 0.866 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(30) & -\sin(30) \\ 0 & \sin(30) & \cos(30) \end{bmatrix} = \begin{bmatrix} 0.852 & 0.120 & 0.508 \\ 0.173 & 0.852 & -0.492 \\ -0.492 & 0.508 & 0.706 \end{bmatrix}$$

TEMA Navarrete Carvajal Jose
Matrices Homogeneas.

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1) $x \rightarrow 60^\circ$ $y \rightarrow 70^\circ$ $z \rightarrow 10^\circ$

X Y Z

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos 60^\circ & -\sin 60^\circ \\ 0 & \sin 60^\circ & \cos 60^\circ \end{bmatrix} \cdot \begin{bmatrix} \cos 70^\circ & 0 & \sin 70^\circ \\ 0 & 1 & 0 \\ -\sin 70^\circ & 0 & \cos 70^\circ \end{bmatrix} = \begin{bmatrix} 0.940 & 0 & 0.94 \\ 0.834 & 0.5 & -0.296 \\ -0.147 & 0.866 & 0.171 \end{bmatrix} \cdot \begin{bmatrix} \cos 10^\circ & -\sin 10^\circ & 0 \\ \sin 10^\circ & \cos 10^\circ & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$X Y Z$

$$\begin{bmatrix} 0.834 & -0.6 & 0.94 \\ 0.866 & 0.351 & -0.296 \\ -0.147 & 0.934 & 0.171 \end{bmatrix}$$

2) $x \rightarrow 10^\circ$ $y \rightarrow 10^\circ$ $z \rightarrow 50^\circ$

X Y Z

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos 10^\circ & -\sin 10^\circ \\ 0 & \sin 10^\circ & \cos 10^\circ \end{bmatrix} \cdot \begin{bmatrix} \cos 50^\circ & 0 & \sin 50^\circ \\ 0 & 1 & 0 \\ -\sin 50^\circ & 0 & \cos 50^\circ \end{bmatrix} = \begin{bmatrix} 0.485 & 0 & 0.173 \\ 0.331 & 0.766 & -0.633 \\ -0.073 & 0.642 & 0.754 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos 10^\circ & -\sin 10^\circ \\ 0 & \sin 10^\circ & \cos 10^\circ \end{bmatrix}$$

$X Y Z$

$$\begin{bmatrix} 0.485 & 0.332 & 0.101 \\ 0.331 & 0.602 & -0.443 \\ -0.073 & 0.94 & -0.067 \end{bmatrix}$$

3) $x \rightarrow 20^\circ$ $z \rightarrow 38^\circ$ $x \rightarrow 30^\circ$

X Z X

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos 20^\circ & -\sin 20^\circ \\ 0 & \sin 20^\circ & \cos 20^\circ \end{bmatrix} \cdot \begin{bmatrix} \cos 38^\circ & -\sin 38^\circ & 0 \\ \sin 38^\circ & \cos 38^\circ & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0.951 & -0.609 & 0 \\ 0.29 & 0.802 & -0.342 \\ 0.165 & 0.285 & 0.934 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos 30^\circ & -\sin 30^\circ \\ 0 & \sin 30^\circ & \cos 30^\circ \end{bmatrix}$$

$X Z X$

$$\begin{bmatrix} 0.951 & -0.267 & 0.1915 \\ 0.29 & 0.602 & -0.712 \\ 0.165 & 0.7509 & 0.650 \end{bmatrix}$$