MATRICES HOMOGENEAS

CINEMATICA DE ROBOTS

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MATRICES

CON X

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & COS\,0 & -SEN\,0 \\ 0 & SEN\,0 & COS\,0 \end{pmatrix}$$

CON Y

$$\begin{pmatrix} COS\,0 & 0 & SEN\,0 \\ 0 & 1 & 0 \\ -SEN\,0 & 0 & COS\,0 \end{pmatrix}$$

CON Z

$$\begin{pmatrix} COS\,0 & -SEN\,0 & 0 \\ SEN\,0 & COS\,0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

1. X→60º

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0.5 & -0.866 \\ 0 & 0.866 & 0.5 \end{pmatrix}$$

Y→70º

$$\begin{pmatrix} 0.342 & 0 & 0.939 \\ 0 & 1 & 0 \\ -0.939 & 0 & 0.342 \end{pmatrix}$$

XY

$$\begin{pmatrix} 0.342 & 0 & 0.939 \\ 0.813 & 0.5 & -0.296 \\ -0.469 & 0.866 & 0.171 \end{pmatrix}$$

XY

$$\begin{pmatrix} 0.342 & 0 & 0.939 \\ 0.813 & 0.5 & -0.296 \\ -0.469 & 0.866 & 0.171 \end{pmatrix}$$

Z→10º

$$\begin{pmatrix} 0.984 & -0.173 & 0 \\ 0.173 & 0.984 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

=

XYZ

$$\begin{pmatrix} 0.336 & -0.059 & 0.939 \\ 0.886 & 0.351 & -0.296 \\ -0.311 & 0.933 & 0.171 \end{pmatrix}$$

2. X→40º

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0.766 & -0.642 \\ 0 & 0.642 & 0.766 \end{pmatrix}$$

Z→10º

$$\begin{pmatrix} 0.984 & -0.173 & 0 \\ 0.173 & 0.984 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

XZ

$$\begin{pmatrix} 0.984 & -0.173 & 0 \\ 0.132 & 0.754 & -0.642 \\ 0.111 & 0.632 & 0.766 \end{pmatrix}$$

XZ

$$\begin{pmatrix} 0.984 & -0.173 & 0 \\ 0.132 & 0.754 & -0.642 \\ 0.111 & 0.632 & 0.766 \end{pmatrix}$$

X→30º

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0.866 & -0.5 \\ 0 & 0.5 & 0.866 \end{pmatrix}$$

=

XYZ

$$\begin{pmatrix} 0.984 & -0.149 & 0.086 \\ 0.132 & 0.331 & -0.932 \\ 0.111 & 0.930 & 0.347 \end{pmatrix}$$

3. X→20º

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0.939 & -0.342 \\ 0 & 0.342 & 0.939 \end{pmatrix}$$

Y→18º

$$\begin{pmatrix} 0.951 & 0 & 0.309 \\ 0 & 1 & 0 \\ -0.309 & 0 & 0.951 \end{pmatrix}$$

XY

$$\begin{pmatrix} 0.951 & 0 & 0.309 \\ 0.105 & 0.939 & -0.325 \\ -0.290 & 0.342 & 0.893 \end{pmatrix}$$

XY

$$\begin{pmatrix} 0.951 & 0 & 0.309 \\ 0.105 & 0.939 & -0.325 \\ -0.290 & 0.342 & 0.893 \end{pmatrix}$$

X→30º

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0.866 & -0.5 \\ 0 & 0.5 & 0.866 \end{pmatrix}$$

=

XYX

$$\begin{pmatrix} 0.951 & -0.154 & 0.267 \\ 0.105 & 0.651 & -0.751 \\ -0.290 & 0.742 & 0.602 \end{pmatrix}$$

4. X→30º

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0.939 & -0.342 \\ 0 & 0.342 & 0.939 \end{pmatrix}$$

Z→10º

$$\begin{pmatrix} 0.984 & -0.173 & 0 \\ 0.173 & 0.984 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

XZ

$$\begin{pmatrix} 0.984 & -0.173 & 0 \\ 0.150 & 0.852 & -0.5 \\ 0.868 & 0.492 & 0.866 \end{pmatrix}$$

XZ X→30º XZX

$$\begin{pmatrix} 0.984 & -0.173 & 0 \\ 0.150 & 0.852 & -0.5 \\ 0.868 & 0.492 & 0.866 \end{pmatrix} \quad \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0.866 & -0.5 \\ 0 & 0.5 & 0.866 \end{pmatrix} = \begin{pmatrix} 0.999 & 0 & 0 \\ 0.296 & 0.454 & -0.839 \\ -0.170 & 0.839 & 0.515 \end{pmatrix}$$

5. Y→30º Z→10º YZ

$$\begin{pmatrix} 0.866 & 0 & 0.5 \\ 0 & 1 & 0 \\ -0.5 & 0 & 0.866 \end{pmatrix} \quad \begin{pmatrix} 0.984 & -0.173 & 0 \\ 0.173 & 0.984 & 0 \\ 0 & 0 & 1 \end{pmatrix} \quad \begin{pmatrix} 0.852 & -0.150 & 0.5 \\ 0.173 & 0.984 & 0 \\ -0.492 & 0.868 & 0.866 \end{pmatrix}$$

XZ X→30º YZX

$$\begin{pmatrix} 0.852 & -0.150 & 0.5 \\ 0.173 & 0.984 & 0 \\ -0.492 & 0.868 & 0.866 \end{pmatrix} \quad \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0.866 & -0.5 \\ 0 & 0.5 & 0.866 \end{pmatrix} = \begin{pmatrix} 0.852 & 0.119 & 0.508 \\ 0.173 & 0.852 & -0.492 \\ -0.492 & 0.508 & 0.706 \end{pmatrix}$$