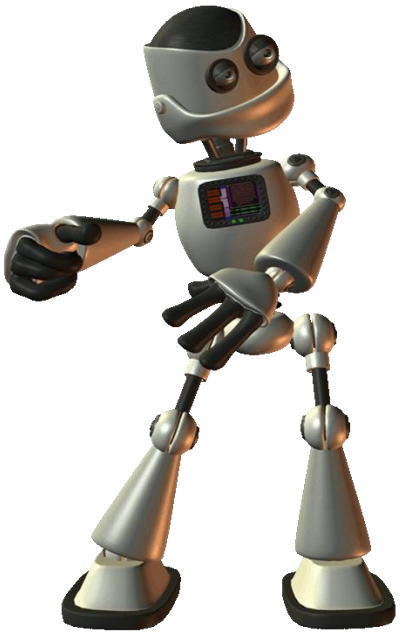
UNIVERSIDAD POLITECNICA DE LA ZONA METROPOLITANA DE GUADALAJARA

CINEMATICA DE ROBOTS



INGENIERIA MECATRONICA 8°B

TAREA #5

MAESTRO:

CARLOS ENRIQUE MORAN GARABITO

ALUMNO:

ALEXIS ISRAEL VIORATO ARAMBULA

Robot 1

$$T_1^0 = \begin{bmatrix} C\theta_1 & -S\theta_1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -S\theta_1 & -C\theta_1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad T_2^1 = \begin{bmatrix} C\theta_2 & -S\theta_2 & 0 & L_1 \\ S\theta_2 & C\theta_2 & 0 & 0 \\ 0 & C\theta_2 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$T_3^2 = \begin{bmatrix} C\theta_3 & -S\theta_3 & 0 & L_2 \\ S\theta_3 & C\theta_3 & 0 & 0 \\ 0 & C\theta_3 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$T = T_3^0$

$$= \begin{bmatrix} C\theta_3(C\theta_1C\theta_2 - S\theta_1S\theta_2 - S\theta_2(C\theta_1C\theta_2 + C\theta_2S\theta_1, & -C\theta_3(C\theta_1S\theta_2 - C\theta_2S\theta_1) - S\theta_3(C\theta_1S\theta_2 - S\theta_1S\theta_2, & 0, & L_2(C\theta_1C\theta_2 - S\theta_1S\theta_2) + L_1C\theta_1 \\ C\theta_2S\theta_3, & C\theta_3 + C\theta_2C\theta_3, & 0, & 0 \\ -C\theta_3(C\theta_1S\theta_2 + C\theta_2S\theta_1) - S\theta_3(C\theta_1C\theta_2 - S\theta_1S\theta_2), & S\theta_3(C\theta_1S\theta_2 + C\theta_2S\theta_1) - C\theta_3(C\theta_1C\theta_2 - S\theta_1S\theta_2), & 0, & -L_2(C\theta_1S\theta_2 + C\theta_2S\theta_1) - L_1S\theta_1 \\ 0, & 0, & 0, & 1 \end{bmatrix}$$

Robot 2

$$T_1^0 = \begin{bmatrix} C\theta_1 & -S\theta_1 & 0 & 0 \\ S\theta_1 & C\theta_1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad T_2^1 = \begin{bmatrix} C\theta_2 & -S\theta_2 & 0 & L_1 \\ 0 & 0 & 1 & 0 \\ -S\theta_2 & -C\theta_2 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$T_3^2 = \begin{bmatrix} C\theta_3 & -S\theta_3 & 0 & L_2 \\ S\theta_3 & C\theta_3 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$T = T_3^0$

$$= \begin{bmatrix} C\theta_1C\theta_2C\theta_3 - C\theta_1S\theta_2S\theta_3, & -C\theta_1C\theta_2S\theta_3 - C\theta_1C\theta_3S\theta_2, & -S\theta_1, & L_1C\theta_1 + L_2C\theta_1C\theta_2 \\ C\theta_2C\theta_3S\theta_1 - S\theta_1S\theta_2S\theta_3, & -C\theta_2S\theta_1S\theta_3 - C\theta_3S\theta_1S\theta_2, & C\theta_1, & L_1S\theta_1 + L_2C\theta_2S\theta_1 \\ -C\theta_2S\theta_3 - C\theta_3S\theta_2, & S\theta_2S\theta_3 - C\theta_2C\theta_3, & 0, & -L_2S\theta_2 \\ 0, & 0, & 0, & 1 \end{bmatrix}$$

Robot 3

$$T_1^0 = \begin{bmatrix} C\theta_1 & -S\theta_1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -S\theta_1 & -C\theta_1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad T_2^1 = \begin{bmatrix} C\theta_2 & -S\theta_2 & 0 & L_1 \\ 0 & 0 & -1 & -d_2 \\ S\theta_2 & C\theta_2 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$T_3^2 = \begin{bmatrix} C\theta_3 & -S\theta_3 & 0 & L_2 \\ 0 & 0 & 1 & d_2 \\ -S\theta_2 & -C\theta_3 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$T = T_3^0$

$$= \begin{bmatrix} C\theta_1C\theta_2C\theta_3 - S\theta_1S\theta_3, & -C\theta_3S\theta_1 - C\theta_1C\theta_2S\theta_3, & -C\theta_1S\theta_2, & L_2C\theta_1 + d_2S\theta_1 + L_2C\theta_1C\theta_2 - d_2C\theta_1S\theta_2 \\ C\theta_3S\theta_2, & -S\theta_3S\theta_3, & C\theta_2, & L_2S\theta_2 + d_2C\theta_2 \\ -C\theta_1S\theta_3 - C\theta_2C\theta_3, & C\theta_2S\theta_1S\theta_3 - C\theta_1C\theta_3, & S\theta_1S\theta_2, & d_2C\theta_2S\theta_1 - L_1S\theta_1 - L_2C\theta_2S\theta_1 + d_2S\theta_1S\theta_2 \\ 0, & 0, & 0, & 1 \end{bmatrix}$$

Robot 4

$$T_1^0 = \begin{bmatrix} C\theta_1 & -S\theta_1 & 0 & 0 \\ S\theta_1 & C\theta_1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad T_2^1 = \begin{bmatrix} C\theta_2 & -S\theta_2 & 0 & {}^3/_4\,L_1 \\ S\theta_2 & C\theta_2 & 0 & 0 \\ 0 & 0 & 1 & d_1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$T_3^2 = \begin{bmatrix} C\theta_3 & -S\theta_3 & 0 & L_2 \\ S\theta_2 & C\theta_2 & 0 & 0 \\ 0 & 0 & 1 & d_3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$T = T_3^0$

$$= \begin{bmatrix} C\theta_3(C\theta_1C\theta_2 - S\theta_1S\theta_2) - S\theta_3(C\theta_1S\theta_2 + C\theta_2S\theta_1), & -C\theta_3(C\theta_1S\theta_2 + C\theta_2S\theta_1) - S\theta_3(C\theta_1C\theta_2 - S\theta_1S\theta_2), & 0, & L_2(C\theta_1C\theta_2 - S\theta_1S\theta_2) + {}^3/_4\,L_1C\theta_1 \\ C\theta_3(C\theta_1S\theta_2 + C\theta_2S\theta_1) + S\theta_3(C\theta_1C\theta_2 - S\theta_1S\theta_2), & C\theta_3(C\theta_1C\theta_2 - S\theta_1S\theta_2) - S\theta_3(C\theta_1S\theta_2 + C\theta_2S\theta_1), & 0, & L_2(C\theta_1S\theta_2 + C\theta_2S\theta_1) + {}^3/_4\,L_1S\theta_1 \\ 0, & 0, & 1, & d_1 + d_3 \\ 0, & 0, & 0, & 1 \end{bmatrix}$$

Robot 5

$$T_1^0 = \begin{bmatrix} C\theta_1 & -S\theta_1 & 0 & 0 \\ S\theta_1 & -C\theta_1 & 0 & 0 \\ 0 & 0 & 1 & d1 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad T_2^1 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & -d2 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$T_3^2 = \begin{bmatrix} C\theta_3 & -S\theta_3 & 0 & L1 \\ S\theta_3 & -C\theta_3 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$T = T_3^0 = \begin{bmatrix} C\theta 1C\theta 3 & -(C\theta 1S\theta 3) & S\theta 1 & L3C\theta 1 + d2S\theta 1 \\ C\theta 3S\theta 1 & -(S\theta 1S\theta 3) & C\theta 1 & d2C\theta 1 + L3S\theta 1\theta \\ S\theta 3 & -C\theta 3 & 0 & d1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Robot 6

$$T_1^0 = \begin{bmatrix} C\theta_1 & -S\theta_1 & 0 & 0 \\ S\theta_1 & -C\theta_1 & 0 & 0 \\ 0 & 0 & 1 & d1 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad T_2^1 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & -d2 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$T_3^2 = \begin{bmatrix} C\theta_3 & -S\theta_3 & 0 & L3 \\ 0 & 0 & 1 & 0 \\ -S\theta_3 & -C\theta_3 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$T = T_3^0$$

$$= \begin{bmatrix} (C\theta 1C\theta 3) - (S\theta 1S\theta 3) & -(C\theta 1S\theta 3) - (C\theta 3S\theta 1) & 0 & L3C\theta 1 + d2S\theta 1 \\ (C\theta 3S\theta 1) - (C\theta 1S\theta 3) & -(C\theta 1C\theta 3) - (S\theta 1S\theta 3) & 0 & d2C\theta 1 + L3S\theta 1 \\ 0 & 0 & 1 & d1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

TEMA

Alexis Israel Vrorato Arombula

FECHA

04/Marzo/2019

Homogenea Robot #2

$$[c\theta_1 * c\theta_2 * c\theta_3 - c\theta_1 * s\theta_2 * s\theta_3 - c\theta_1 * c\theta_2 * s\theta_3 - c\theta_1 * c\theta_3 * s\theta_2 - s\theta_1 L_1 * c\theta_1 + L_2 * c\theta_1 * c\theta_2]$$
$$[c\theta_2 * c\theta_3 * s\theta_1 - s\theta_1 * s\theta_2 * s\theta_3 - c\theta_2 * s\theta_1 * s\theta_3 - c\theta_3 * s\theta_1 * s\theta_2 \; c\theta_1 L_1 * s\theta_1 + L_2 * c\theta_2 * s\theta_1]$$
$$[-c\theta_2 * s\theta_3 - c\theta_3 * s\theta_2, s\theta_2 * s\theta_3 - c\theta_2 * c\theta_3, 0, -L_2 * s\theta_2]$$
$$[0, 0, 0, 1]$$

Homogenea Robot #3

$$[c\theta_1 * c\theta_2 * c\theta_3 - s\theta_1 * s\theta_3 - c\theta_3 * s\theta_1 - c\theta_1 * c\theta_2 * s\theta_3 - c\theta_1 * s\theta_2 L_1 * c\theta_1 + d_2 * s\theta_1 + L_2 * c\theta_1 * c\theta_2]$$
$$[-c\theta_3 * s\theta_2, s\theta_2 * s\theta_3 - c\theta_2, -L_2 * s\theta_2]$$
$$[-c\theta_1 * s\theta_3 - c\theta_2 * c\theta_3 * s\theta_1, c\theta_2 * s\theta_1 * s\theta_3 - c\theta_1 * c\theta_3, s\theta_1 * s\theta_2, d_2 * (\theta_1 - L_1 * s\theta_1 - L_2 * c\theta_2 * s\theta_1]$$
$$[0, 0, 0, 1]$$

Homogenea Robot #4

$$[c\theta_3 (c\theta_1 c\theta_2 - s\theta_1 s\theta_2) - s\theta_3 (c\theta_1 s\theta_2 + c\theta_2 s\theta_1), -c\theta_3 (c\theta_1 s\theta_2 + c\theta_2 s\theta_1) - s\theta_3 (c\theta_1 c\theta_2 - s\theta_1 s\theta_2), 0, L_2 (c\theta_1 c\theta_2 - s\theta_1 s\theta_2) + 3/4 L_1 c\theta_1$$
$$c\theta_3 (c\theta_1 s\theta_2 + c\theta_2 s\theta_1) + s\theta_3 (c\theta_1 c\theta_2 - s\theta_1 s\theta_2), c\theta_3 (c\theta_1 c\theta_2 - s\theta_1 s\theta_2) - s\theta_3 (c\theta_1 s\theta_2 + c\theta_2 s\theta_1), 0, L_2 (c\theta_1 s\theta_2 + c\theta_2 s\theta_1) + 3/4 L_1 s\theta_1$$
$$[0, 0, 1, d_1 + d_3]$$
$$[0, 0, 0, 1]$$