D-H Notation - 3202

Sunday, 28 January 2024 | 1:29 pm

Denavit-Hartenberg Notation

Step 1: Assign Frames according to the 4 D-H Frame Rules

Step 2: Fill out the D-H Parametric Table → Short-cut ${}^{n}_{e}R \times {}^{n}_{e}P \rightarrow {}^{m}_{e}H$

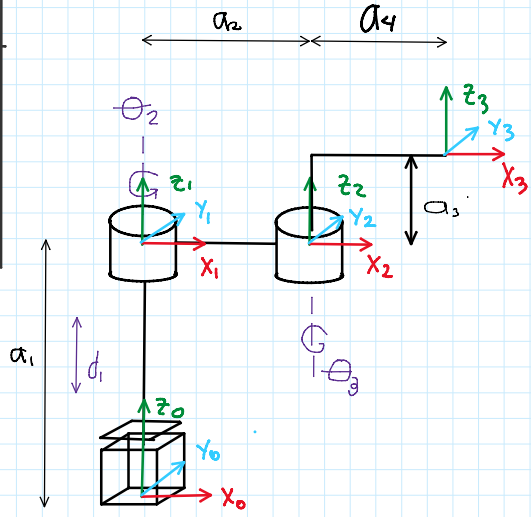
Step 3: Plug the table into the Homogeneous Transformation Matrix formula.

Step 4: Multiply the matrices together

$a_1 = 5 \quad a_2 = 10$

$a_3 = 5 \quad a_4 = 10$

n	θ	α	r	d
${}^{0}_{1}H \rightarrow 1$	0°	0°	0	$a_1 + d_1$
${}^{1}_{2}H \rightarrow 2$	$0^\circ + \theta_2$	0°	a_2	0
${}^{2}_{3}H \rightarrow 3$	$0^\circ + \theta_3$	0°	a_4	a_3



$${}^{n-1}_{n}T = {}^{n-1}_{n}H = \begin{vmatrix} C\theta_n & -S\theta_n C\alpha_n & S\theta_n S\alpha_n & r_n C\theta_n \\ S\theta_n & C\theta_n C\alpha_n & -C\theta_n S\alpha_n & r_n S\theta_n \\ 0 & S\alpha_n & C\alpha_n & d_n \\ 0 & 0 & 0 & 1 \end{vmatrix}$$

$${}^{0}_{1}H = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 5+d_1 \\ 0 & 0 & 0 & 1 \end{vmatrix}$$

$${}^{1}_{2}H = \begin{vmatrix} C\theta_2 & -S\theta_2 & 0 & 10C\theta_2 \\ S\theta_2 & C\theta_2 & 0 & 10S\theta_2 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{vmatrix}$$

$${}^{2}_{3}H = \begin{vmatrix} C\theta_3 & -S\theta_3 & 0 & 10C\theta_3 \\ S\theta_3 & C\theta_3 & 0 & 10S\theta_3 \\ 0 & 0 & 1 & 5 \\ 0 & 0 & 0 & 1 \end{vmatrix}$$

$${}^{0}_{3}H = {}^{0}_{1}H \; {}^{1}_{2}H \; {}^{2}_{3}H$$