

Forward Kinematics

Sunday, January 23, 2022 12:39 PM

Z1 define angulo azimutal
Z2,3,4 definen distancia desde el centro y angulo de elevacion

#ALPHA A TITA D

```
DH = [ [0, 0, t1, l1],
        [pi/2, 0, t2, 0],
        [0, l3, t3, 0],
        [0, l4, t4, 0],
        [0, l5, 0, 0] ]
```

T01:

```
cos(t1); -sin(t1); 0; 0;
sin(t1); cos(t1); 0; 0;
0; 0; 1; l1;
0; 0; 0; 1;
```

T12:

```
cos(t2); -sin(t2); 0; 0;
0; 0; -1; 0;
sin(t2); cos(t2); 0; 0;
0; 0; 0; 1;
```

T23:

```
cos(t3); -sin(t3); 0; l3;
sin(t3); cos(t3); 0; 0;
0; 0; 1; 0;
0; 0; 0; 1;
```

T34:

```
cos(t4); -sin(t4); 0; l4;
sin(t4); cos(t4); 0; 0;
0; 0; 1; 0;
0; 0; 0; 1;
```

T4EE:

```
1; 0; 0; l5;
0; 1; 0; 0;
0; 0; 1; 0;
0; 0; 0; 1;
```

TOEE:

```
cos(t1)*cos(t2 + t3 + t4); -sin(t2 + t3 + t4)*cos(t1); sin(t1); (l3*cos(t2) + l4*cos(t2 + t3) + l5*cos(t2 + t3 + t4))*cos(t1);
sin(t1)*cos(t2 + t3 + t4); -sin(t1)*sin(t2 + t3 + t4); -cos(t1); (l3*cos(t2) + l4*cos(t2 + t3) + l5*cos(t2 + t3 + t4))*sin(t1);
sin(t2 + t3 + t4); cos(t2 + t3 + t4); 0; l1 + l3*sin(t2) + l4*sin(t2 + t3) + l5*sin(t2 + t3 + t4);
0; 0; 0; 1;
```

$${}^0_T{}^{EE} = \begin{pmatrix} C_1 \cdot C_{234} & -C_1 \cdot S_{234} & S_1 & (L_3 C_2 + L_4 C_{23} + L_5 C_{234}) C_1 \\ S_1 \cdot C_{234} & -S_1 \cdot S_{234} & -C_1 & (L_3 C_2 + L_4 C_{23} + L_5 C_{234}) S_1 \\ S_{234} & C_{234} & 0 & L_1 + L_3 S_2 + L_4 S_{23} + L_5 S_{234} \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$${}^0_P{}^{EE} = \begin{pmatrix} (L_1 C_2 + L_4 C_{23} + L_5 C_{234}) C_1 \\ (L_1 C_2 + L_4 C_{23} + L_5 C_{234}) S_1 \\ L_1 + L_1' S_2 + L_4 S_{23} + L_5 S_{234} \end{pmatrix}$$

$${}^0_R{}^{EE} = \begin{pmatrix} C_1 \cdot C_{234} & -C_1 \cdot S_{234} & S_1 \\ S_1 \cdot C_{234} & -S_1 \cdot S_{234} & -C_1 \\ S_{234} & C_{234} & 0 \end{pmatrix}$$