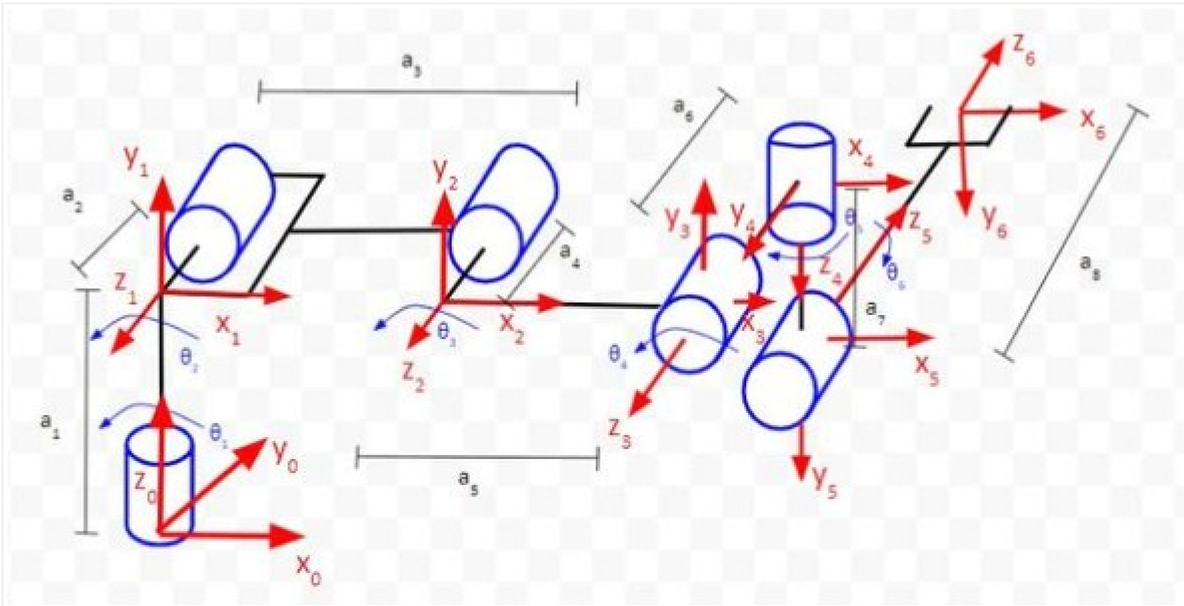
Denavit–Hartenberg matrix for six degree of freedom collaborative robot



Denavit-Hartenberg parameter table

Joint i	θ_i (deg)	α_i (deg)	r_i (cm)	d_i (cm)
1	θ_1	90	0	a_1
2	θ_2	0	a_3	0
3	θ_3	0	a_5	0
4	θ_4	90	0	$-a_6$
5	$-\theta_5$	90	0	a_7
6	$-\theta_6$	0	0	a_8

Denavit–Hartenberg matrix

$$\left[\begin{array}{ccc|c} \cos\theta_n & -\sin\theta_n\cos\alpha_n & \sin\theta_n\sin\alpha_n & r_n\cos\theta_n \\ \sin\theta_n & \cos\theta_n\cos\alpha_n & -\cos\theta_n\sin\alpha_n & r_n\sin\theta_n \\ 0 & \sin\alpha_n & \cos\alpha_n & d_n \\ \hline 0 & 0 & 0 & 1 \end{array}\right] = \left[\begin{array}{ccc|c} & R & & T \\ \hline 0 & 0 & 0 & 1 \end{array}\right]$$

Plug the values from each row of the table into the Denavit–Hartenberg matrix, then multiply the resulting matrices to create the homogenous transformation matrix for the specific robot. T part of the matrix represents the displacement from frame n-1 to frame n.
For a distance sensor, the parameter a8 is the length of the last joint in addition to the measured distance.
The distance from base to measured point can be calculated simply by taking the T displacement vector from the homogenous transformation matrix and finding its distance using this formula:

$$\sqrt{x^2+y^2+z^2}$$

The robot schematic and Denavit–Hartenberg table were referenced from this blog post:
https://automaticaddison.com/homogeneous-transformation-matrices-using-denavit-hartenberg/
#Example_4_-_Six_Degree_of_Freedom_Collaborative_Robot