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 ${}^{n}_{e}R \neq {}^{n}_{e}P \rightarrow {}^{n}_{e}H$

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

Step 4: Multiply the matrices together

Denavit-Hartenberg Table

Columns = no. of parameters

Rows = no. of frames - 1

n	θ	α	r	d
${}^{0}_{1}H$ → 1				
${}^{1}_{2}H$ → 2				
${}^{2}_{3}H$ → 3				
${}^{3}_{4}H$ → 4				

Denavit Hartenberg Parameters

4 Parameters

Θ → Rotation/Orientation

α

d → Position/Translation

r

Denavit Hartenberg Parameters

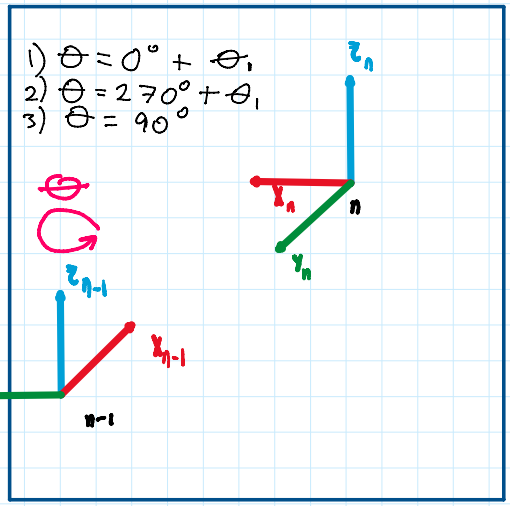
4 Parameters

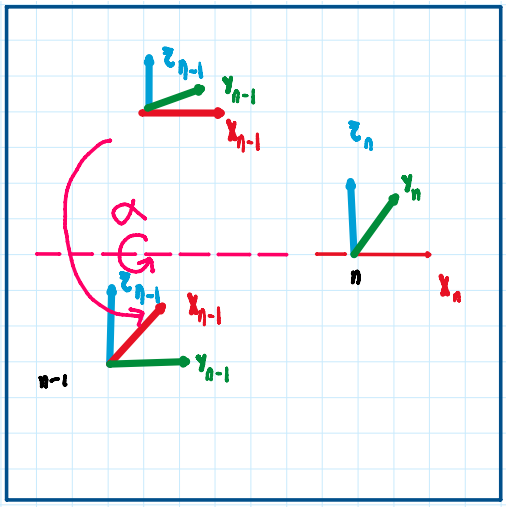
Θ	α
Rotation around z_{n-1} that it is required to get x_{n-1} to match x_n, with the joint variable Θ if joint is revolute/twisting/ joint.	Rotation around x_n that is required to match z_{n-1} to z_n.

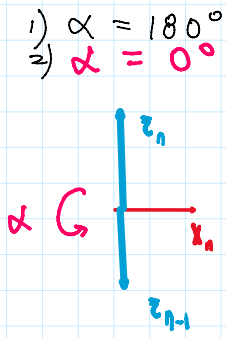
Denavit Hartenberg Parameters

4 Parameters

Θ	α
Rotation around z_{n-1} that it is required to get x_{n-1} to match x_n, with the joint variable Θ if joint is revolute/twisting/ joint.	Rotation around x_n that is required to match z_{n-1} to z_n.







Denavit Hartenberg Parameters

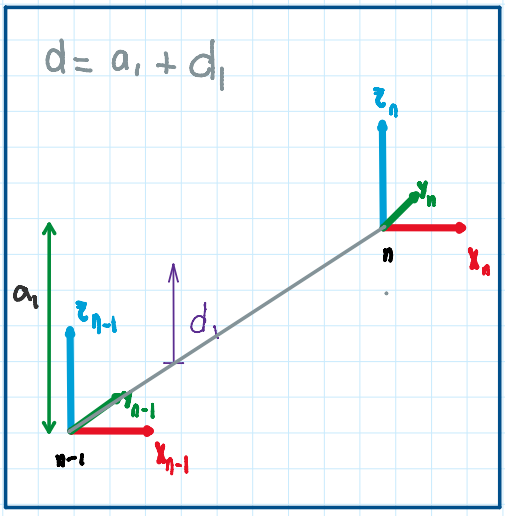
4 Parameters

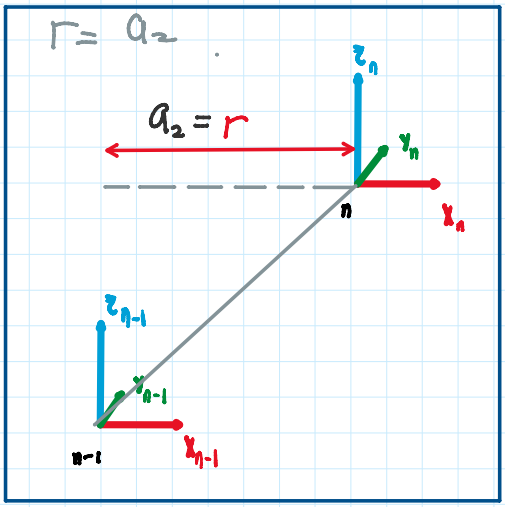
d	r
The distance from the origin of n-1and n frames along the z_{n-1} direction, with joint variable if joint is prismatic.	The distance from the origin of n-1 and n frames along the x_n direction.

Denavit Hartenberg Parameters

4 Parameters

d	r
The distance from the origin of n-1and n frames along the z_{n-1} direction, with joint variable if joint is prismatic.	The distance from the origin of n-1 and n frames along the x_n direction.

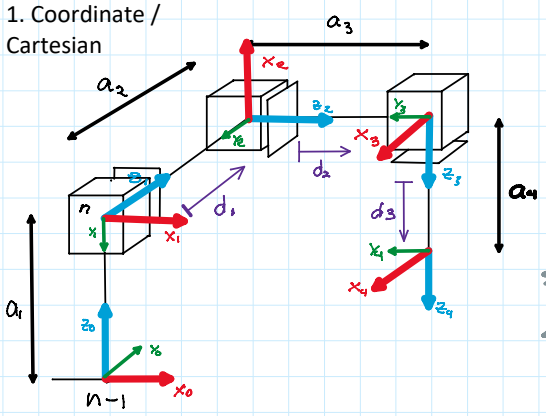




1. Coordinate /

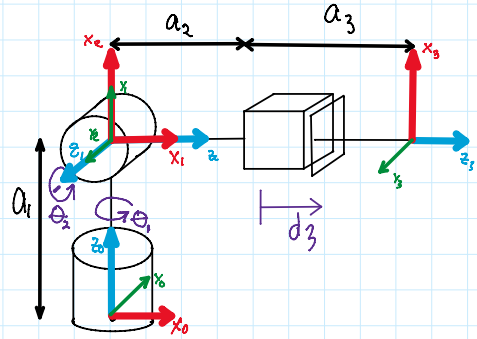
a_3

1. Coordinate / Cartesian



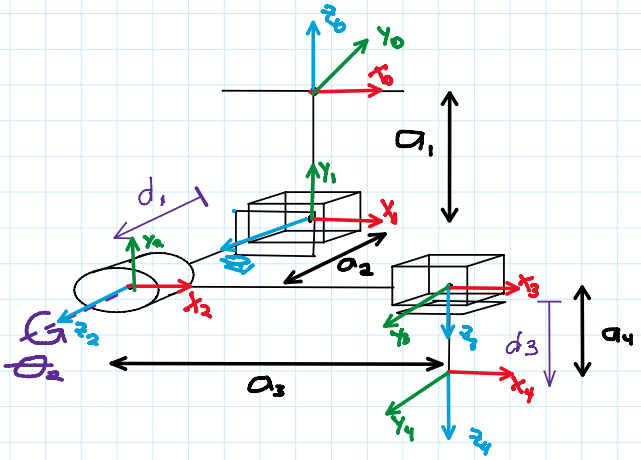
	n	θ	α	r	d
${}^0_1H$ →	1	0°	270°	0	a_1
${}^1_2H$ →	2	270°	270°	0	$a_2 + d_1$
${}^2_3H$ →	3	90°	270°	0	$a_3 + d_2$
${}^3_4H$ →	4	0°	0°	0	$a_4 + d_3$

3. Spherical



n	θ	α	r	d
1	$0^\circ + \theta_1$	90°	0	a_1
2	$90^\circ + \theta_2$	90°	0	0
3	0°	0°	0	$a_2 + a_3 + d_3$

7. Midterm Exam Test 3 (2022-2023)



	n	θ	α	r	d
${}^0_1H$ →	1	0°	90°	0	$-a_1$
${}^1_2H$ →	2	0°	0°	0	$a_2 + d_1$
${}^2_3H$ →	3	$0^\circ + \theta_2$	90°	a_3	0
	4	0°	0°	0	$a_4 + d_3$