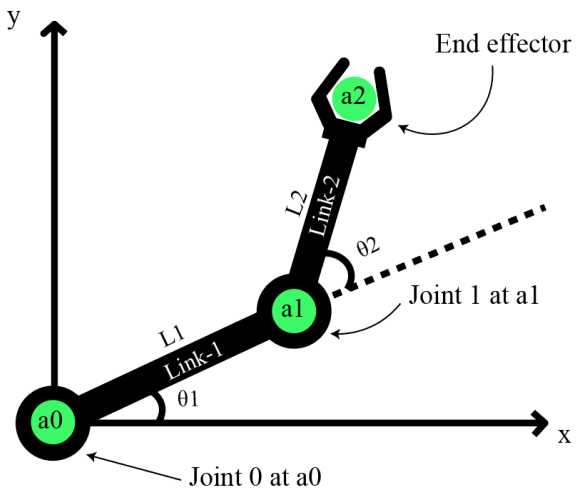
ROBOTIC ARM TASK 1

Note: YOU ARE FREE TO USE ANY PROGRAMMING LANGUAGE OF YOUR CHOICE. (The most common ones are python, MATLAB)

Q1) We have provided you with a 2 Degree of freedom(DOF) Robotic Arm. The position of the base of the arm (a0 below) is located at the origin (0, 0). There are 2 links attached with it with a joint (a1) in between them. The links are free to rotate about both a0 and a1.

Take link lengths (L1, L2) and the angles (θ1, θ2) between them as input and output the final position (x, y) of the end effector.



Q2)

i) Following are the Denavit-Hartenberg parameters of a 2 link Robotic Arm. Output the end-effector position using transformation matrices. Show all the transformation matrices in your code.

Link	a_i (metres)	α_i	d_i	θ_i (degrees)
1	1.2	0	0	34
2	1.6	0	0	22

ii) Starting from the x-axis, simulate (using the same language) the links to reach their final positions in a time interval of 5 sec -(θ1 varies from 0 degrees to 34 degrees,θ2 from 0 degrees to 22 degrees).
Sample simulation (not to time) -
https://drive.google.com/file/d/1PFnAwp4meTnxlCSqiEA0q7uutLWWdJW4/view?usp=sharing

Resources

Denavit-Hartenberg convention-

https://youtu.be/JSEPoylypHQ
https://robotacademy.net.au/lesson/denavit-hartenberg-notation/

Mathematical modelling-

https://www.ijeert.org/papers/v6-i11/3.pdf

Python-

https://www.geeksforgeeks.org/python-programming-language/
https://www.w3schools.com/python/

MATLAB-

https://in.mathworks.com/learn/tutorials/matlab-onramp.html

Overview of Robotics-

https://www.youtube.com/watch?v=lUBD9JRYpzc&list=PLjx2FAhpTe3FGbcjBbxlhf56qVR0XbVNQ
(Rotation Matrices, Transformation Matrices, DH Parameter, Forward Kinematics, Inverse Kinematics)

Deep dive into robotics (Mathematically intense, not really needed right now)-

https://see.stanford.edu/Course/CS223A

SAR videos (2020)-

https://www.youtube.com/watch?v=sX_j-rXieeE&list=PLdPXMBV9SaMoP2EnJLIJ2HZFd8el51q1B
(carefully observe the robotic arm from ATLEAST 10 videos - will be really helpful for upcoming tasks)