

Assignment B

Write a set of software modules that compute, for a 6-degrees-of-freedom robotic arm with rotational links, the following transformation matrices (the general input is the (known) D-H parameter table).

1. Forward Kinematics

- a. Inputs: θ_1 - θ_6
- b. Outputs: x, y, z coordinates of the tool

2. Inverse Kinematics

- a. Inputs: x, y, z destination coordinates of the tool
- b. Outputs: θ_1 - θ_6

3. Forward Velocity

- a. Inputs: θ_1 - θ_6 , θ_1' - θ_6' (θ_n' is the angular velocity at link n)
- b. Outputs: v_x , v_y , v_z (linear speeds of the tool on each axis)

4. Inverse Velocity

- a. Inputs: θ_1 - θ_6 , v_x , v_y , v_z
- b. Outputs: θ_1' - θ_6'

5. Forward Acceleration

- a. Inputs: θ_1 - θ_6 , θ_1' - θ_6' , θ_1'' - θ_6'' (θ_n'' is the angular acceleration at link n)
- b. Outputs: a_x , a_y , a_z

6. Inverse Acceleration

- a. Inputs: θ_1 - θ_6 , θ_1' - θ_6' , a_x , a_y , a_z
- b. Outputs: θ_1'' - θ_6''