

Project Ideas

1. Write a software module that produces as its output symbolic transformation matrices corresponding to the 6 modules below. All operations should be performed symbolically on a generic D-H parameter table.

Module 1: Forward Kinematics

Module 2: Inverse Kinematics

Module 3: Forward Velocities

Module 4: Inverse Velocities

Module 5: Forward Accelerations

Module 6: Inverse Accelerations

2. Consider the following problem: a particular robotic manipulator is available, however its D-H parameter table is unknown. The tool can be moved to any specified xyz coordinates, and at any given moment the angles at all links can be read (both functions are embedded in the hardware of the robot and are transparent to the user).

Devise a method to derive the D-H parameter table from the information that can be extracted from the robot as described above.

3. Manipulator Calibration

Think of a way to calibrate a RRR robot w/o a known D-H parameter table.

Specific problem:

This problem can be applied to the calibration of the Mitsubishi manipulator we have in the lab (this is a RRR:RRR problem). The known inputs are θ 's and you can read the x , y , and z .

Note:

Move to 3-4 different points and try to relate the inputs and outputs. Also, if approaching the problem from a mathematical point of view, try to solve the problem for many degrees of freedom. That way you can impose restrictions on the 3 links. You can also try to impose ranges for θ 's instead of using fixed angles and try to solve the problem symbolically.