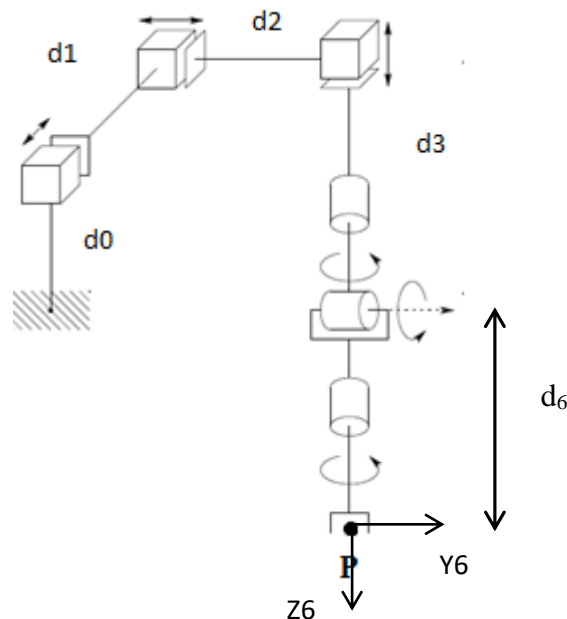


INTRODUCTION TO ROBOTICS – ASSIGNMENT 1

To be submitted through Moodle by 18th March 11:59 PM

Question 1: Figure 1 shows a 3 link Cartesian manipulator fitted with a spherical wrist at its end.



- Complete the coordinate frame assignment and write down the Denavit-Hartenberg parameters for the manipulator
- Determine the global homogenous transformation matrix from frame 6 to frame 0, T_0^6 .
- For the position of the manipulator shown in Figure, find the position of point 'P' (tool tip) w.r.t. the base frame if $d_1=2$; $d_2=2$; $d_3=3$ and $d_6=3$.

Question 2:

Write a computer program to solve the forward kinematics of a manipulator. Specifically, given the joint variables and DH parameters, your program should be able to:

- Calculate a T_{i-1}^i matrix;
- Calculate the manipulator transformation matrix, i.e., T_0^n ;
- Calculate the Cartesian space coordinates of the end-effector, i.e., the position vector and the orientation relative to the base of the manipulator.

Your program should be written in a generic way independent of specific manipulators. Use C / C++ / Python programming language.

Use the data from the PUMA manipulator to test your program.

Assume non-zero joint angles for the arm.

Submit your source codes (well-documented) and the output of calculation for the PUMA.