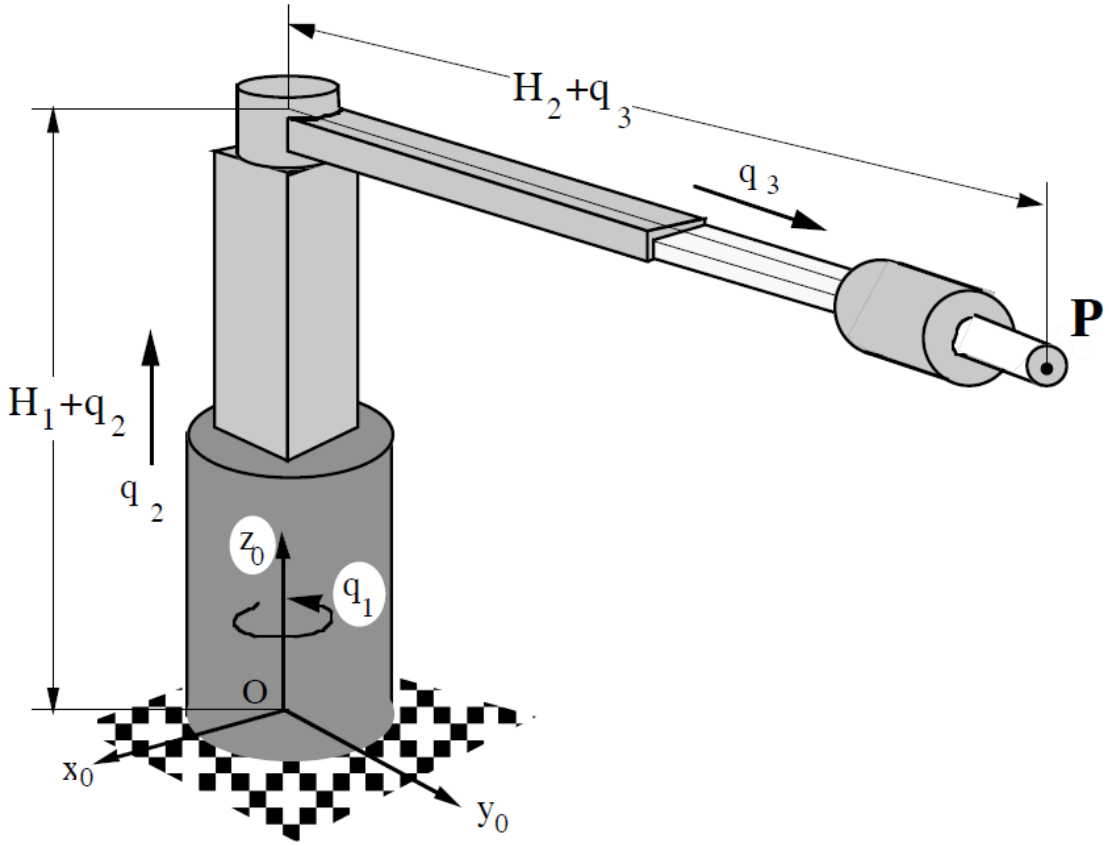
Forward Kinematics – DH exercise:

The manipulator shown in the figure has one revolute and two prismatic joints, with variables q_1, q_2 and q_3 correspondingly, which are also shown in the figure.



a. Place frames on each joint of the manipulator according to the DH convention.
b. Find the DH parameters of the manipulator and the homogeneous transformations that connect each link to the previous one.
c. Find the orientation R and position of the tip $[p_x \quad p_y \quad p_z]^T$ of the manipulator w.r.t. the world frame (base).
d. Calculate the transformation matrix of the tip w.r.t. the base when $q_1 = 90°$.