

Exercise 3.1

Consider a UR5 robot, with only the first three links. Use DH parameters to setup a kinematic model of the robot and find the following (the model will be used in the exercise in the next lecture)

1. Homogeneous transformation matrices T_1^0, T_2^1, T_3^2
2. Jacobian matrix to the end-effector (end of link 3)

Exercise 3.2

Consider a motion planning problem in a 6 m by 6 m workspace, a round robot with radius 0.5 m and an obstacle with radius of 1 m in the middle of the workspace as shown in Figure 1. Complete the exercise by following the steps

1. Write an inequality constraint that ensures no collision.
2. Add the collision to the cost function.
3. Solve the optimization problem for minimal path length

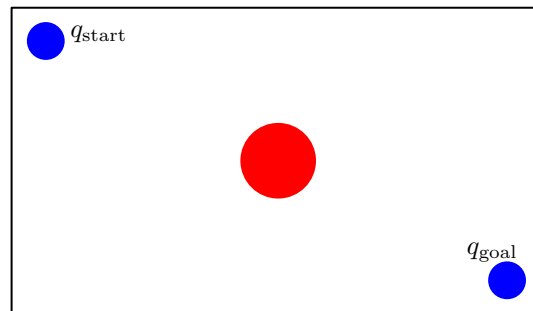


Figure 1: Setup for optimization-based motion planning.