Robotics: Homework Assignment #10

Fig. 2. Robot and Obstacles' location
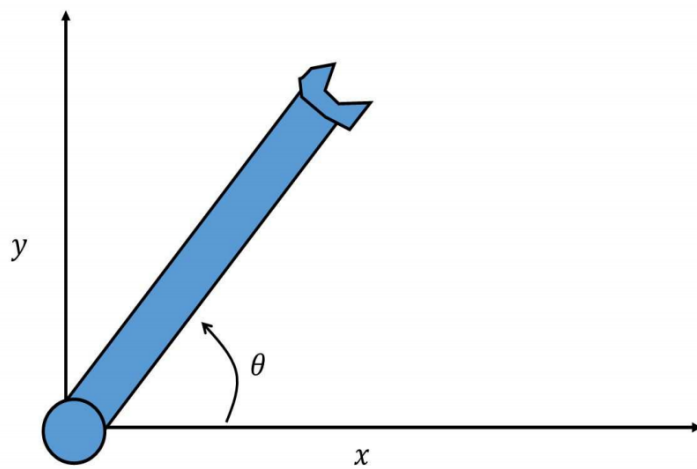

Fig. 3. Robotic manipulator

Problem 3

We consider the manipulator of figure 3. We want to plan the trajectory of the robot so that

$$\theta_0 = 0rad \tag{5}$$
$$\theta_f = \pi/2rad \tag{6}$$
$$\dot{\theta}_0 = 0rad/s \tag{7}$$
$$\dot{\theta}_f = 0rad/s \tag{8}$$

The initial and final times are $t_0 = 0s$, and $t_f = 5s$.

1) Based on the desired constraints, what is the degree of the polynomial?
2) Write code to obtain the coefficients of the polynomial
3) Plot the time evolution of $\theta(t)$
4) Plot the time evolution of $\dot{\theta}(t)$

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HOMEWORK 10

$$\theta_0 = 0 = a_0 + a_1 t_0 + a_2 t_0^2 + a_3 t_0^3 = a_0 \longrightarrow a_0 = 0$$

$$\dot{\theta}_0 = 0 = 0 + a_1 + 2a_2 t_0 + 3a_3 t_0^2 = a_1 \longrightarrow a_1 = 0$$

$$\theta_f = \pi/2 = a_0 + a_1 t_f + a_2 t_f^2 + a_3 t_f^3 = 25a_2 + 125a_3 \quad \rbrack a_2 = 3\pi/50 \approx 0.1885$$

$$\dot{\theta}_f = 0 = 0 + a_1 + 2a_2 t_f + 3a_3 t_f^2 = 10a_2 + 75a_3 \quad \rbrack a_3 = -\pi/125 \approx -0.02513$$

$$\theta = 3\pi/50 \; t^2 - \pi/125 \; t^3$$

$$\dot{\theta} = 3\pi/25 \, t - 3\pi/125 \, t^2$$

θ vs t

θ̇ vs t