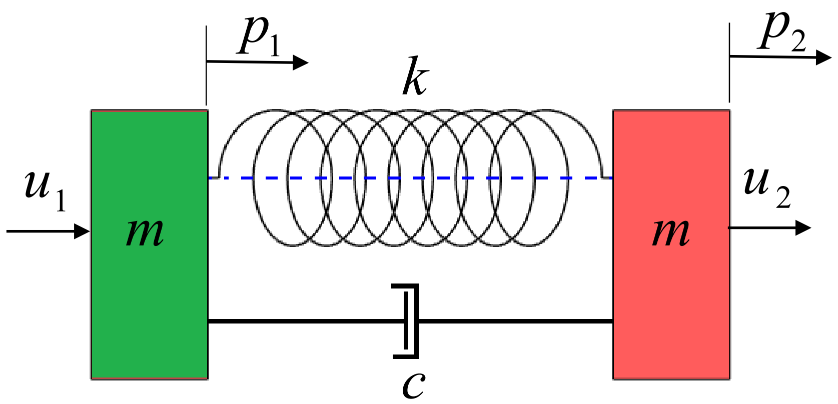

$$x = [p_1, p_2, \dot{p}_1, \dot{p}_2]^T$$

$$m = 10$$

$$c = 0.1$$

$$k = 1$$

$$A = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -\frac{k}{m} & \frac{k}{m} & -\frac{c}{m} & 0 \\ \frac{k}{m} & -\frac{k}{m} & 0 & -\frac{c}{m} \end{bmatrix}, B = \begin{bmatrix} 0 & 0 \\ 0 & 0 \\ \frac{1}{m} & 0 \\ 0 & \frac{1}{m} \end{bmatrix} \longrightarrow \begin{array}{c} T_s = 0.05\,\mathrm{sec} \\ \text{Discretization in Time} \end{array} \longrightarrow A_m, B_m, C_m$$

$$C = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

$$J(x,u)=\sum_{i=t}^{t+N}\left(C_m\times x_i-r_i\right)^T Q\left(C_m\times x_i-r_i\right)+u_i^T R u_i$$

$$\min \qquad J(x,u)$$

$$sbj: \quad \begin{cases} x_{i+1} = A_m\times x_i + B_m\times u_i \\ \mathrm{LB}u \le u_i \le \mathrm{UB}u \\ \mathrm{LB}x \le x_i \le \mathrm{UB}x \end{cases}$$

$$LBu=-\begin{bmatrix}5 & 5\end{bmatrix}^T (N)$$

$$UBu=\begin{bmatrix}5 & 5\end{bmatrix}^T (N)$$

$$LBx=-\begin{bmatrix}6 & 6 & 6 & 6\end{bmatrix}^T (m)$$

$$UBx=\begin{bmatrix}6 & 6 & 6 & 6\end{bmatrix}^T (m)$$

YALMIP & quadprog is utilized to solve the optimization problem