# Parameters

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## 1 Introduction

For assessing the performances of LMPC sampled data control and H2 optimal control, we compared the quadratic costs of them. The constraints for the cost function include:

### 1.1 Parameters

- Total Time (T): $T = 10\,\mathrm{s}$
- State Weight Matrix (Q): $\mathbf{Q} = \mathrm{diag}([1, 1, 1])$
- Control Weight Matrix (R): $\mathbf{R} = \mathrm{diag}([0.1, 0.1])$
- Sampling Time (gamma): $\gamma = 0.1\,\mathrm{s}$
- LMPC Control Input Limits:
  - $v_{\max} = 0.3$ , $v_{\min} = 0.0$
  - $\omega_{\max} = \frac{\pi}{4}$, $\omega_{\min} = -\frac{\pi}{4}$
- Gain Matrix (k):

$$\mathbf{k} = \begin{bmatrix} 0.4662 & 0.2978 & 0.2067 \\ 0.8341 & 1.2165 & 1.3492 \end{bmatrix}$$

### 1.2 Quadratic Cost Function

The quadratic cost function for a single timestep is given by:

$$J_{\text{total}} = \sum_{k=1}^{N} (\mathbf{x}_k^T \mathbf{Q} \mathbf{x}_k + \mathbf{u}_k^T \mathbf{R} \mathbf{u}_k)$$

Where $N = 2$.

## 2 Results

Total Cost Value for LMPC (J=10): 8.98516268901749
Total Cost Value for H2: 18.775862036811883