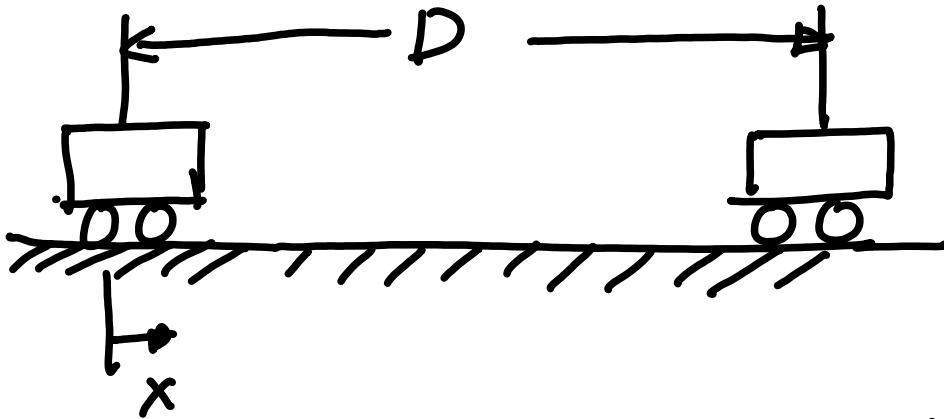


# Trajectory Optimization



$$\begin{cases} x(t=0) = 0 \\ \dot{x}(t=0) = 0 \end{cases}$$

$$\begin{cases} x(t=T) = D \\ \dot{x}(t=T) = 0 \end{cases}$$

Model:  $\ddot{x} = u$

$u$  - control ?

$$-5 \leq \underline{u} \leq 5$$

Goal: minimize  $T$

Formulation:

$$\min_{T, u}$$

$T$

$$\begin{array}{l} \ddot{x} = u \\ \dot{x}_1 = x_2 \\ \dot{x}_2 = u \end{array} \quad \begin{array}{l} x_1 = x \\ x_2 = \dot{x} \end{array}$$

subject to:  $\left. \begin{array}{l} \dot{x}_1 = x_2 \\ \dot{x}_2 = u \end{array} \right\} \begin{array}{l} \checkmark \\ \checkmark \end{array} \begin{array}{l} \text{equality} \\ \text{constraint} \end{array}$

$$\underline{-5 \leq u \leq 5}$$

Bounds

$$\left. \begin{array}{l} x_1(t=0) = 0 \\ x_1(t=T) = D \\ x_2(t=0) = 0 \\ x_2(t=T) = 0 \end{array} \right\} \begin{array}{l} \text{equality} \\ \text{constraints} \end{array}$$

$$\underline{0 \leq T \leq \infty}$$

Bound.

Write this as a parameter optimization problem