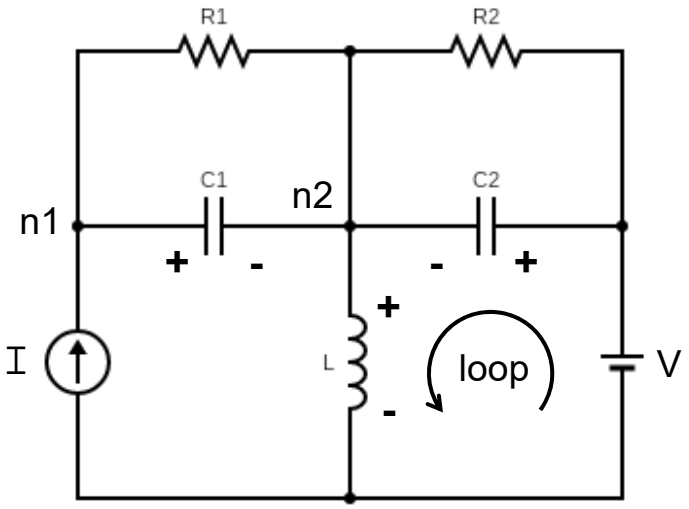
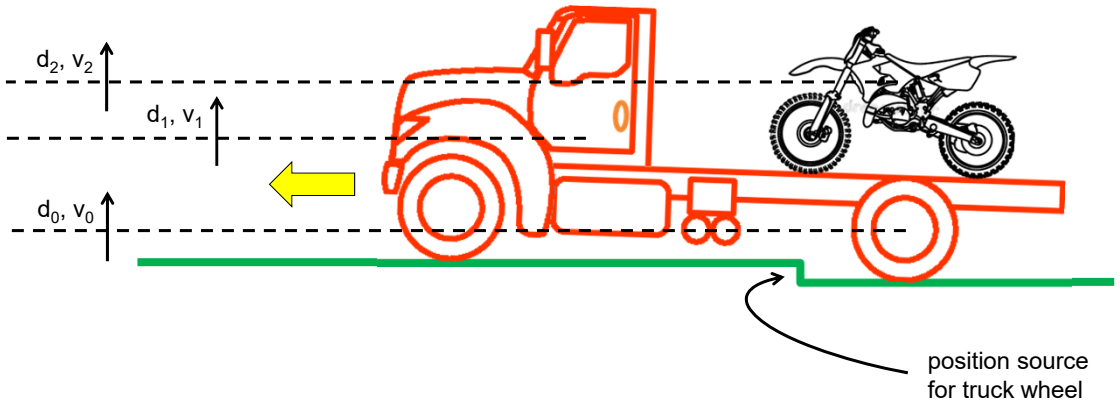
State-Space Example (Elec)



$$s\begin{bmatrix} v_1 \\ v_2 \\ i \end{bmatrix} = \begin{bmatrix} \frac{-1}{R_1 C_1} & 0 & 0 \\ 0 & \frac{-1}{R_2 C_2} & \frac{1}{C_2} \\ 0 & \frac{-1}{L} & 0 \end{bmatrix}\begin{bmatrix} v_1 \\ v_2 \\ i \end{bmatrix} + \begin{bmatrix} 0 & \frac{1}{C_1} \\ 0 & \frac{-1}{C_2} \\ \frac{1}{L} & 0 \end{bmatrix}\begin{bmatrix} V \\ I \end{bmatrix}$$

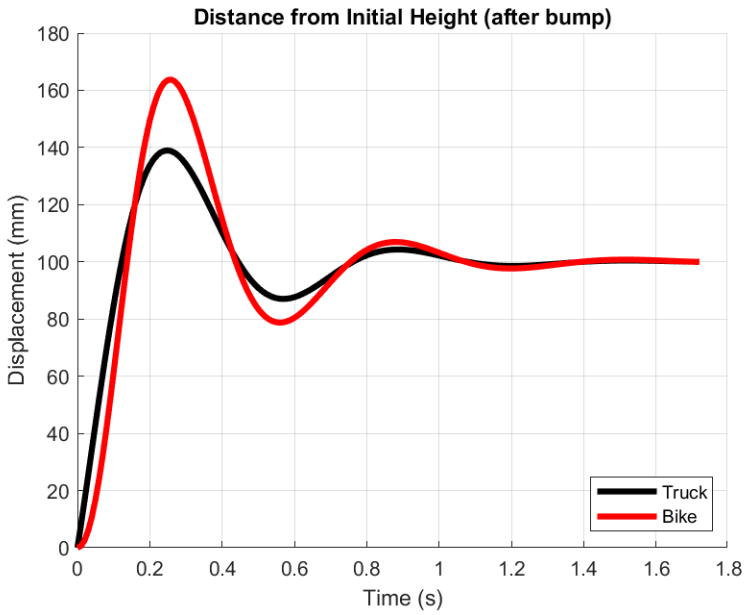
$$\begin{bmatrix} v_{n1} \\ i_{C2} \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 \\ 0 & \frac{-1}{R_2} & 1 \end{bmatrix}\begin{bmatrix} v_1 \\ v_2 \\ i \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}\begin{bmatrix} V \\ I \end{bmatrix}$$

State-Space Example (Mech)



$$s\begin{bmatrix} d_1 \\ d_2 \\ v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ \frac{-K_1 - K_2}{M_1} & \frac{K_2}{M_1} & \frac{-B_1 - B_2}{M_1} & \frac{B_2}{M_1} \\ \frac{K_2}{M_2} & \frac{-K_2}{M_2} & \frac{B_2}{M_2} & \frac{-B_2}{M_2} \end{bmatrix} \begin{bmatrix} d_1 \\ d_2 \\ v_1 \\ v_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ \frac{K_1 + sB_1}{M_1} \end{bmatrix} d_0$$

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} d_1 \\ d_2 \\ v_1 \\ v_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \end{bmatrix} d_0$$



Parameters (realistic values)

Curb height =	100 mm
Truck mass =	1000 Kg
Bike mass =	90 Kg
Truck B =	8 KNs/m
Bike B =	1.44 KNs/m
Truck K =	125 KN/m
Bike K =	27.7 KN/m