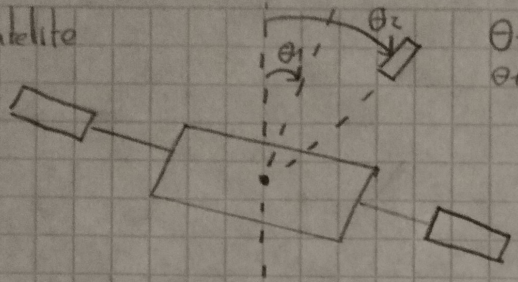
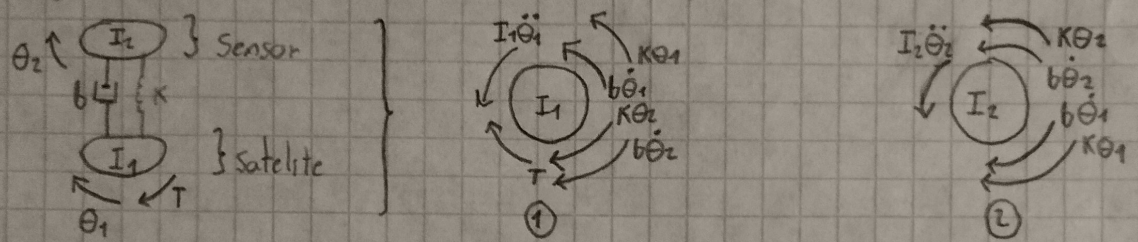
Problema Satelite



θ_2: Con respecto al sensor
θ_1: Con respecto a la masa inercial

Diagrama del problema



Ecuaciones

1 $\quad T = I_1\ddot{\theta}_1 + K\theta_1 + b\dot{\theta}_1 - K\theta_2 - b\dot{\theta}_2 \qquad \ddot{\theta}_1 = \frac{1}{I_1}\left(T - K\theta_1 - b\dot{\theta}_1 + K\theta_2 + b\dot{\theta}_2\right)$

2 $\quad I_2\ddot{\theta}_2 + b\dot{\theta}_2 + K\theta_2 - b\dot{\theta}_1 - K\theta_1 = 0 \qquad \ddot{\theta}_2 = \frac{1}{I_2}\left(b\dot{\theta}_1 + K\theta_1 - K\theta_2 - b\dot{\theta}_2\right)$

Tenemos $\quad q_1 = \theta_1 \quad q_2 = \dot{\theta}_1 = \dot{q}_1 \quad q_3 = \theta_2 \quad q_4 = \dot{\theta}_2 = \dot{q}_3 \quad y_1 = \theta_1 = q_1$

$\dot{q}_2 = \ddot{\theta}_1 \quad \dot{q}_4 = \ddot{\theta}_2 \quad y_2 = \theta_2 = q_3$

Reemplazando

1 $\quad \dot{q}_2 = \frac{1}{I_1}\left(T - Kq_1 - bq_2 + Kq_3 + bq_4\right)$ $\qquad$ 2 $\quad \dot{q}_4 = \frac{1}{I_2}\left(bq_2 + Kq_1 - Kq_3 - bq_4\right)$

Representación en espacio de estados

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \\ \dot{q}_4 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ -K/I_1 & -b/I_1 & K/I_1 & b/I_1 \\ 0 & 0 & 0 & 1 \\ K/I_2 & b/I_2 & -K/I_2 & -b/I_2 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix} + \begin{bmatrix} 0 \\ 1/I_1 \\ 0 \\ 0 \end{bmatrix} T$$

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix}$$