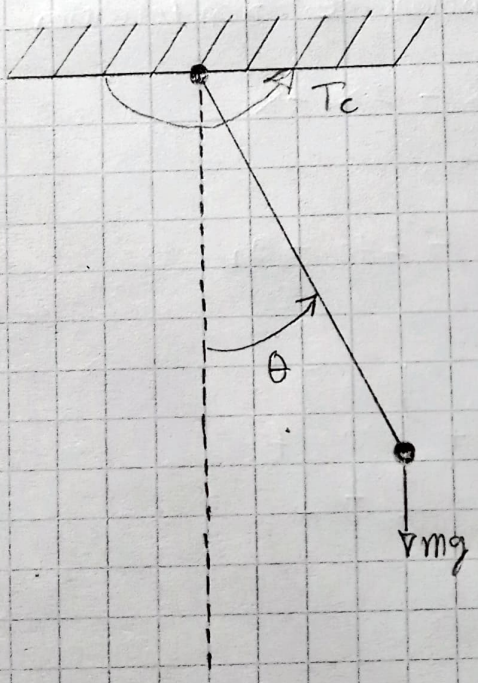
Pendulo invertido - espacio de estados

Haider santiago Calderón Rodríguez 2021100 5075



$$I = m\ell^2$$

$$\Sigma F: \quad T_c - mg\ell \operatorname{sen}\theta = I\ddot{\theta}$$

$$T_c - mg\ell \operatorname{sen}\theta = m\ell^2\ddot{\theta}$$

$$\ddot{\theta} = \frac{T_c}{m\ell^2} - \frac{mg\ell \operatorname{sen}\theta}{m\ell^2}$$

$$\boxed{\ddot{\theta} = \frac{T_c}{m\ell^2} - \frac{g}{\ell}\operatorname{sen}\theta}$$

$$q_1 = \theta$$

$$q_2 = q_1 = \dot{\theta}$$

$$\dot{q_2} = \ddot{\theta}$$

$$\dot{q_2} = \frac{T_c}{m\ell^2} - \frac{g}{\ell}\operatorname{sen} q_1$$

Como linealizamos en torno al punto con $\theta = 0° \rightarrow \operatorname{sen}\theta = 0$

$$\dot{q_2} = \frac{T_c}{m\ell^2} - \frac{g}{\ell} q_1$$

$$\begin{bmatrix} \dot{q_1} \\ \dot{q_2} \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -g/\ell & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1/m\ell^2 \end{bmatrix} T_c$$

$$\begin{bmatrix} \theta \end{bmatrix} = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \end{bmatrix}$$