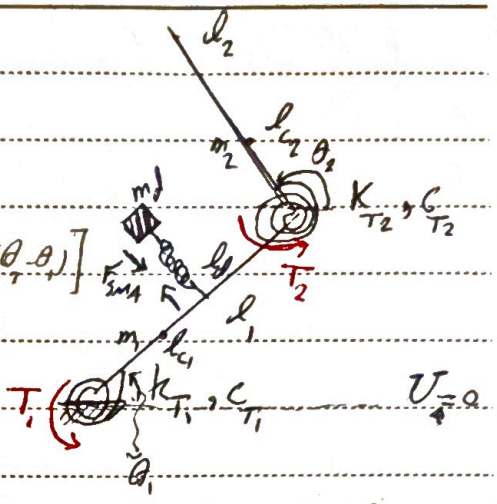
Subject:

Year. Month. Date. ( )

4-DoF hand model + SMA absorber

+ joint springs and dampers.



$$T = \frac{1}{2} m_1 (l_{c_1}\dot{\theta}_1)^2 + \frac{1}{2} m_2 \left[(l_1\dot{\theta}_1)^2 + (l_{c_2}\dot{\theta}_2)^2 + 2 l_1 l_{c_2} \dot{\theta}_1 \dot{\theta}_2 \cos(\theta_2 - \theta_1) \right]$$

$$+ \frac{1}{2} m_d \left[(l_d\dot{\theta}_1) + \dot{x}_d \right]^2 \qquad V = 0$$

$$V = m_1 g l_{c_1} \sin(\theta_1) + m_2 g \left(l_1 \sin(\theta_1) + l_{c_2} \sin(\theta_2) \right) + m_d \left(l_d \sin(\theta_1) + x_d \cos(\theta_1) \right) + \frac{1}{2} k_{T_1} \theta_1^2 + \frac{1}{2} k_{T_2} \theta_2^2$$

$Q_1 \Rightarrow \delta\theta_1 Q_1 = T_1 \delta\theta_1 \Rightarrow Q_1 = T_1$ $\quad$ $Q_2 \Rightarrow \delta\theta_2 Q_2 = T_2 \delta\theta_2 \Rightarrow Q_2 = T_2$

$Q_3 \Rightarrow \delta x_d F_{SMA} = Q_3 \delta x_d \Rightarrow Q_3 = F_{SMA}$

$D = \frac{1}{2} \rho_2 \left[c_1 \dot{\theta}_1^2 + c_2 \dot{\theta}_2^2 \right]$, $L = T - V$

Ti1 = ti1+ti2

ti1 = The torque that muscles excert to the joint

ti2 = The torque that counters ti1