

Computing the Lagrangian

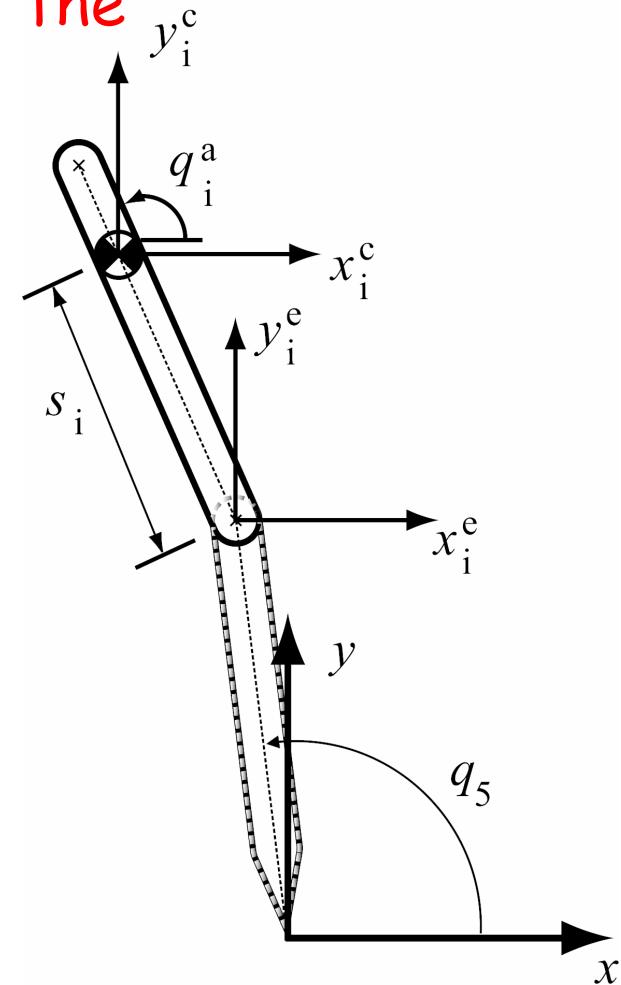
What if the data is given in terms of the inertia of the link about the joint?

Kinetic Energy of i-th Link

$$\begin{aligned} K_i &= \frac{1}{2}m_i((\dot{x}_i^e)^2 + (\dot{y}_i^e)^2) + \\ &m_i \left[\begin{array}{c} \dot{x}_i^e \\ \dot{y}_i^e \end{array} \right]^T \left[\begin{array}{cc} \cos(q_i^a) & \sin(q_i^a) \\ -\sin(q_i^a) & \cos(q_i^a) \end{array} \right] \left[\begin{array}{c} s_i \\ 0 \end{array} \right] \dot{q}_i^a \\ &+ \frac{1}{2}J_i(\dot{q}_i^a)^2 \end{aligned}$$

J_i = inertia about joint axis

$$K_i = \frac{1}{2}\dot{q}^T D_i(q)\dot{q}$$



Computing the Lagrangian

What if the center of mass is off-axis?

Kinetic Energy of i-th Link

$$K_i = \frac{1}{2}m_i((\dot{x}_i^e)^2 + (\dot{y}_i^e)^2) + m_i \begin{bmatrix} \dot{x}_i^e \\ \dot{y}_i^e \end{bmatrix}^T \begin{bmatrix} \cos(q_i^a) & \sin(q_i^a) \\ -\sin(q_i^a) & \cos(q_i^a) \end{bmatrix} \begin{bmatrix} s_i \\ t_i \end{bmatrix} \dot{q}_i^a + \frac{1}{2}J_i(\dot{q}_i^a)^2$$

J_i = inertia about joint axis

$$K_i = \frac{1}{2}\dot{q}^T D_i(q)\dot{q}$$

