Mechanical Energy and Work Equations

Mechanical energy of kth segment:

$$E_k = m_k g y_k + \tfrac{1}{2} m_k v_k^2 + \tfrac{1}{2} I_k \omega_k^2$$

Total body mechanical energy:

$$E_T = \sum_{k=1}^{S} E_k$$

Absolute work equations

External work:

$$W_{ext} = \sum_{i=1}^{N} (\Delta E_{T_i}) = E_{T_N} - E_{T_O}$$

Internal work:

$$W_{wb} = \left(\sum_{i=1}^{N} |\Delta E_{T_i}| \right) - W_{ext}$$

$$W_{int} = \left(\sum_{i=1}^{N} \sum_{j=1}^{J} |M_{i_j} \omega_{i_j}| \Delta t \right) - W'_{ext}$$

Absolute power equations

$$W'_{ext} = \sum_{i=1}^{N} \sum_{j=1}^{J} M_{i_j} \omega_{i_j} \Delta t$$