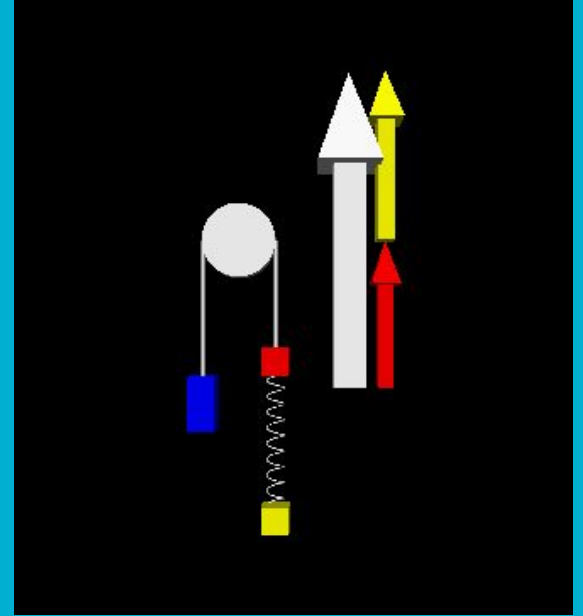


Atwood Machine Dynamic Equilibrium with VPython

Katherine Kireeva

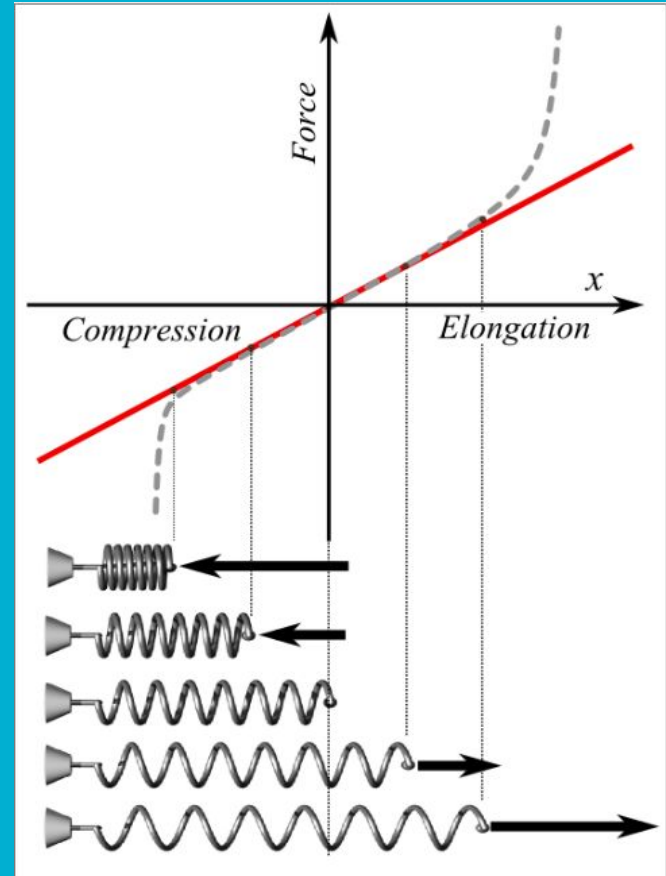


Overview of the Variables

- L - the natural length of the spring
- k - the spring constant
- g - acceleration due to gravity per unit of mass
- T - Tension
- F_S - Spring force
- x_A, x_B, x_C - positions of the blocks

Spring Force

$$F_S = -k * (L - (x_B - x_C))$$

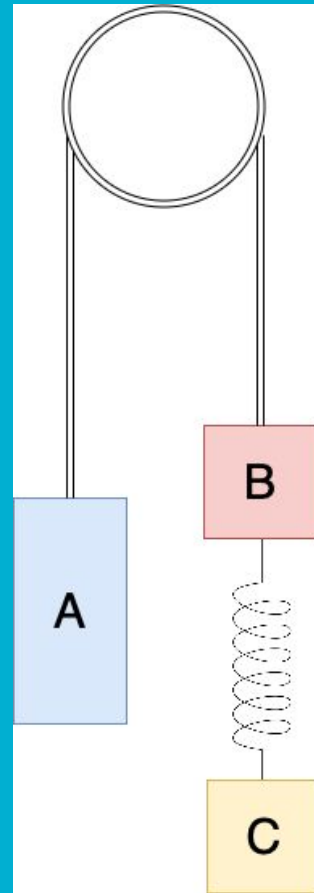


Equations of Motion

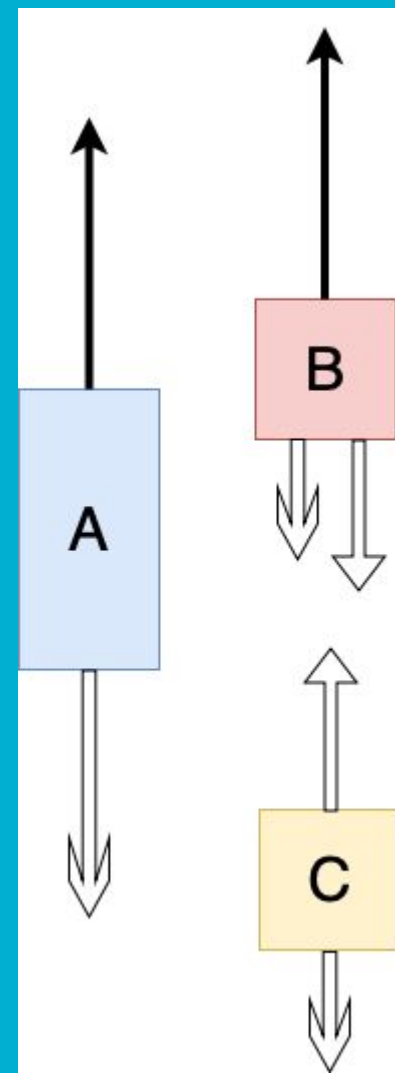
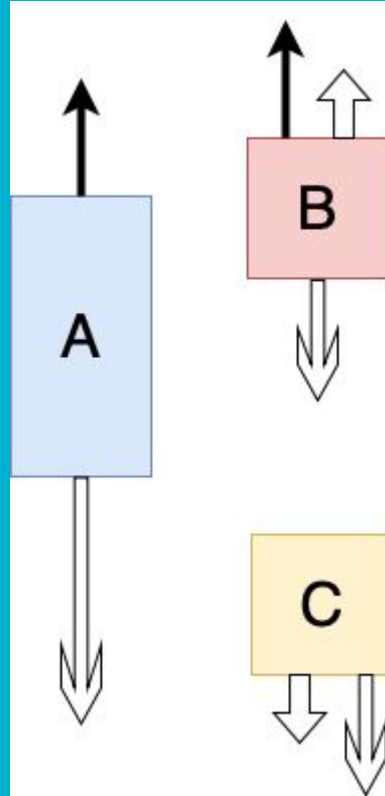
$$m_A x''_A = T - m_A g$$

$$m_B x''_B = T - m_B g - F_S$$

$$m_C x''_C = F_S - m_C g$$



Free Body Diagrams



Calculating Tension

$$x''_A = -x''_B$$

$$\frac{T}{m_A} - g = \frac{-T}{m_B} + g + \frac{F_S}{m_B}$$

$$\frac{(m_A + m_B) * T}{m_A m_B} = 2g + \frac{F_S}{m_B}$$

$$T = \frac{2 * m_A m_B * g}{(m_A + m_B)} + \frac{m_A}{(m_A + m_B)} F_S$$

Code Demonstration