



$$x = -l_f \cos \theta_s - l_t \cos(\theta_t + \theta_f)$$

$$y = -l_s \cos \theta_s + (l_f \sin \theta_f + l_t \sin(\theta_t + \theta_f)) \sin \theta_s$$

$$z = -l_s \sin \theta_s - (l_f \sin \theta_f + l_t \sin(\theta_t + \theta_f)) \cos \theta_s$$