

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

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

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