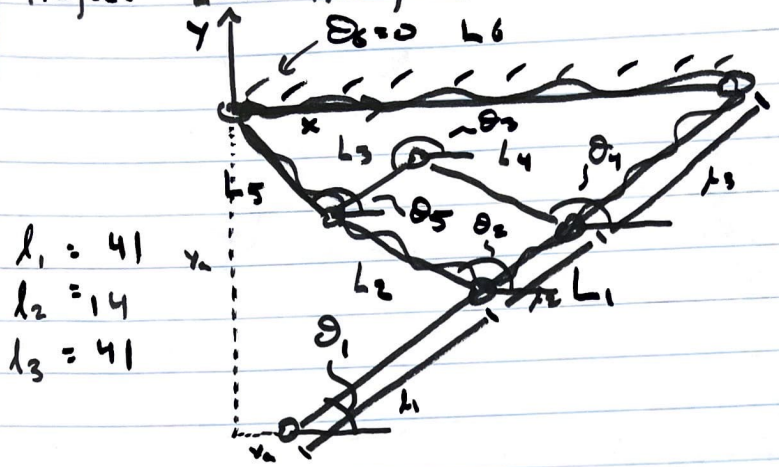
Project Link Analysis



$l_1 = 41$
$l_2 = 14$
$l_3 = 41$

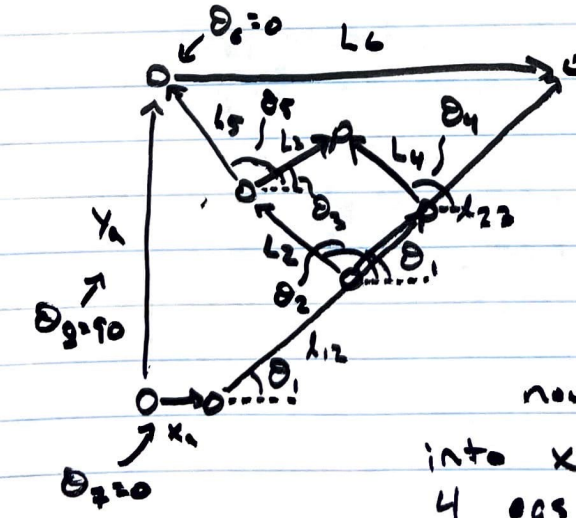
$L_1 = 96$
$L_2 = 38$
$L_3 = 23$
$L_4 = 29$
$L_5 = 27$
$L_6 = 76$

let's normalize everything s.t. $L_2 = 1$ ...

$\Rightarrow$ $L_1 = 6.86$
$L_2 = 2.71$
$L_3 = 1.64$
$L_4 = 2.07$
$L_5 = 1.93$
$L_6 = 5.43$

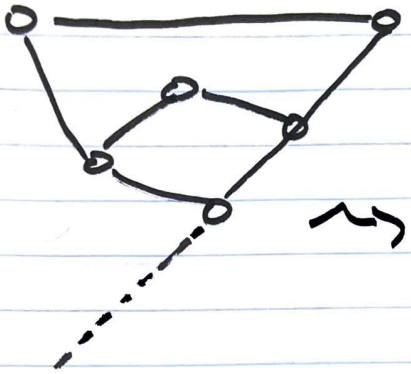
$l_1 = 2.93$
$l_2 = 1$
$l_3 = 2.93$

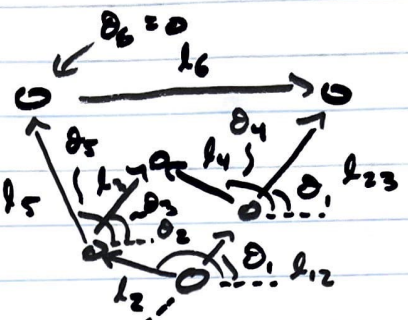
$$\begin{cases} \vec{L_6} + \vec{l_{23}} + \vec{L_2} + \vec{L_5} = 0 \\ \vec{l_{12}} + \vec{L_4} + \vec{L_3} + \vec{L_5} + \vec{y_a} + \vec{x_a} = 0 \end{cases}$$



1. $L_6 - l_{23} + L_2 + L_5 = 0$
2. $l_{12} + L_4 - L_3 + L_5 - y_a + x_a = 0$

now break up eq. 1 & 2 into x & y components to get 4 eqs w/ 5 unknown angles (however I can specify 1 as input)





$$\vec{l}_6 + \vec{l}_{23} + \vec{l}_4 + \vec{l}_3 + \vec{l}_5 = 0 \quad \& \quad \vec{l}_2 + \vec{l}_{12} + \vec{l}_4 + \vec{l}_3 = 0$$

So, all lengths are known... once I split into x & y components, I'll have 4 eqs. & 5 unknowns ... however, I can make 1 angle an input → 4 eqs. 4 unknowns and it's solved...

$$\text{Eq 1 x}: \; l_6 \cos\theta_6 - l_{23}\cos\theta_1 + l_4\cos\theta_4 - l_3\cos\theta_3 + l_5\cos\theta_5 = 0$$
$$\text{Eq 1 y}: \; l_6 \sin\theta_6 - l_{23}\sin\theta_1 + l_4\sin\theta_4 - l_3\sin\theta_3 + l_5\sin\theta_5 = 0$$

$$\text{Eq 1 x}: \; l_6 - l_{23}\cos\theta_1 + l_4\cos\theta_4 - l_3\cos\theta_3 + l_5\cos\theta_5 = 0$$
$$\text{Eq 1 y}: \; -l_{23}\sin\theta_1 + l_4\sin\theta_4 - l_3\sin\theta_3 + l_5\sin\theta_5 = 0$$

$$\text{Eq 2 x}: \; l_3\cos\theta_3 - l_4\cos\theta_4 - l_{12}\cos\theta_1 + l_2\cos\theta_2 = 0$$
$$\text{Eq 2 y}: \; l_3\sin\theta_3 - l_4\sin\theta_4 - l_{12}\sin\theta_1 + l_2\sin\theta_2 = 0$$