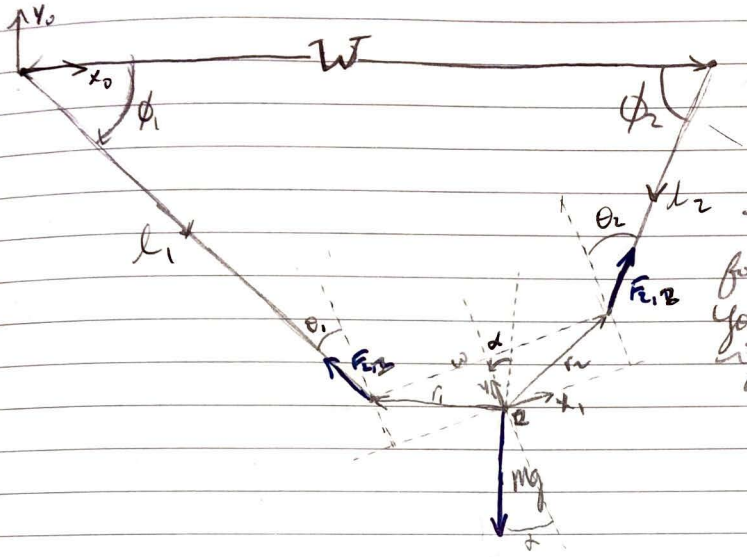
Full Model



$\vec{r}$ = point from COM (O) to tangent point of string w/ pulley. $\vec{r}$ depends on θ.

There is a fixed solution for fixed $\phi_1, \theta_2, l_1, l_2$, but you'll have to minimize P.E. if you only lock l_1 and l_2

Equations:

① $[\Sigma F = 0]^0$

② $[\Sigma T = 0]^0$

Constraints:

① $F_2 > 0$

② $W = l_1 \cos(\phi_1) + w \cos(\alpha) + l_2 \cos(\phi_2)$

③ ?

Transformations

$R_0' = Rot(\alpha)$

$T_0' = \vec{l}_1 + R_0'\left[-\vec{r}_1\right] = \vec{l}_2 + R_0'\left[-\vec{r}_2\right]_1$

E1: $\left[\Sigma F = 0\right]^0$

$F_{2,1}\{-\cos(\phi_1), \sin(\phi_1)\} + F_{2,2}\{\cos(\phi_2), \sin(\phi_2)\} + \{0, -mg\} = 0$

E2: $\left[\Sigma T = 0\right]^0$

$R_0'\left(\left[\vec{r}_1\right]_1\right) \times \left[F_{2,1}\right]_0 + R_0'\left(\left[\vec{r}_2\right]_1\right) \times \left[F_{2,2}\right]_0 = 0$

E3: C_2

E4: C_3