$F_{rxm} = F_{m2} + F_{m3} - F_{m1} - F_{m4}, F_{rxo} = 0$

$F_{rym} = F_{m1} + F_{m2} + F_{m3} + F_{m4}, F_{ryo} = F_{o1} + F_{o2}$

$\theta F_{rm} = \tan^- 1\left(\frac{F_{rym}}{F_{rxm}}\right), \theta F_{ro} = 0$

$F_{rx} = F_{rxm}, F_{ry} = F_{rym} + F_{ryo}, \theta F_r = \tan^{-1}\left(\frac{F_{ry}}{F_{rx}}\right)$

$$F_{rx} = F_{m2} + F_{m3} - F_{m1} - F_{m4}$$

$$F_{ry} = F_{m1} + F_{m2} + F_{m3} + F_{m4} + F_{o1} + F_{o2}$$

$$\theta F_r = \tan^{-1}\left(\frac{F_{m1} + F_{m2} + F_{m3} + F_{m4} + F_{o1} + F_{o2}}{F_{m2} + F_{m3} - F_{m1} - F_{m4}}\right)$$

$F_{rim} = F_{m2} + F_{m4}$

$F_{lm} = F_{m1} + F_{m3}$

$\tau_{rm} = \frac{L+W}{4}(F_{rim} - F_{lm})$

$\tau_{ro} = \frac{W}{2}(F_{o2} - F_{o1})$

$\tau_r = \tau_{rm} + \tau_{ro}$

$\tau_r = \frac{L+W}{4}(F_{rim} - F_{lm}) + \frac{W}{2}(F_{o2} - F_{o1})$

$$\tau_r = \frac{L+W}{4}(F_{m2} + F_{m4} - F_{m1} - F_{m3}) + \frac{W}{2}(F_{o2} - F_{o1})$$

Let $T = \{m, o\}$, $N_m = \{1, 2, 3, 4\}$ and $N_o = \{1, 2\}$. For all $t \in T$ and $n \in N_t$, we have

$$k_{\{tn\}}^{\min} \leq F_{\{tn\}} \leq k_{\{tn\}}^{\max}$$

Now we want to make some way to input θF_r, τ_r, and for all $t \in T$ and $n \in N_t$: $k_{\{tn\}}^{\min}$ and $k_{\{tn\}}^{\max}$ and then somehow get out for all $t \in T$ and $n \in N_t$: $F_{\{tn\}}$ that maximizes $F_{rx} + F_{ry}$

First let's find the "objective functionz". Substituting we get

$$F_{m2} + F_{m3} - F_{m1} - F_{m4} + F_{m1} + F_{m2} + F_{m3} + F_{m4} + F_{o1} + F_{o2}$$

Simplifying we then get

$$2F_{m2} + 2F_{m3} + F_{o1} + F_{o2}$$

We can then use the simplex algorithm to solve this. It says to maximize c^T x subject to $Ax \leq b$ and $x \geq 0$ where

- A is an $m \times n$ matrix
- $b \in \mathbb{R}^m$
- $c \in \mathbb{R}^n$
- $x \in \mathbb{R}^n$ are the decision variables

In this case the decision variables or x vector would be $F_{m1}, F_{m2}, F_{m3}, F_{m4}, F_{o1}, F_{o2}$

Now we need to linearize θF_r.

First we flip around the trig function to get

$\tan(\theta F_r) = \frac{F_{m1}+F_{m2}+F_{m3}+F_{m4}+F_{o1}+F_{o2}}{F_{m2}+F_{m3}-F_{m1}-F_{m4}}$

Then simplifying we get

$$F_{m1} + F_{m2} + F_{m3} + F_{m4} + F_{o1} + F_{o2} - \tan(\theta F_r)(F_{m2} + F_{m3} - F_{m1} - F_{m4}) = 0$$