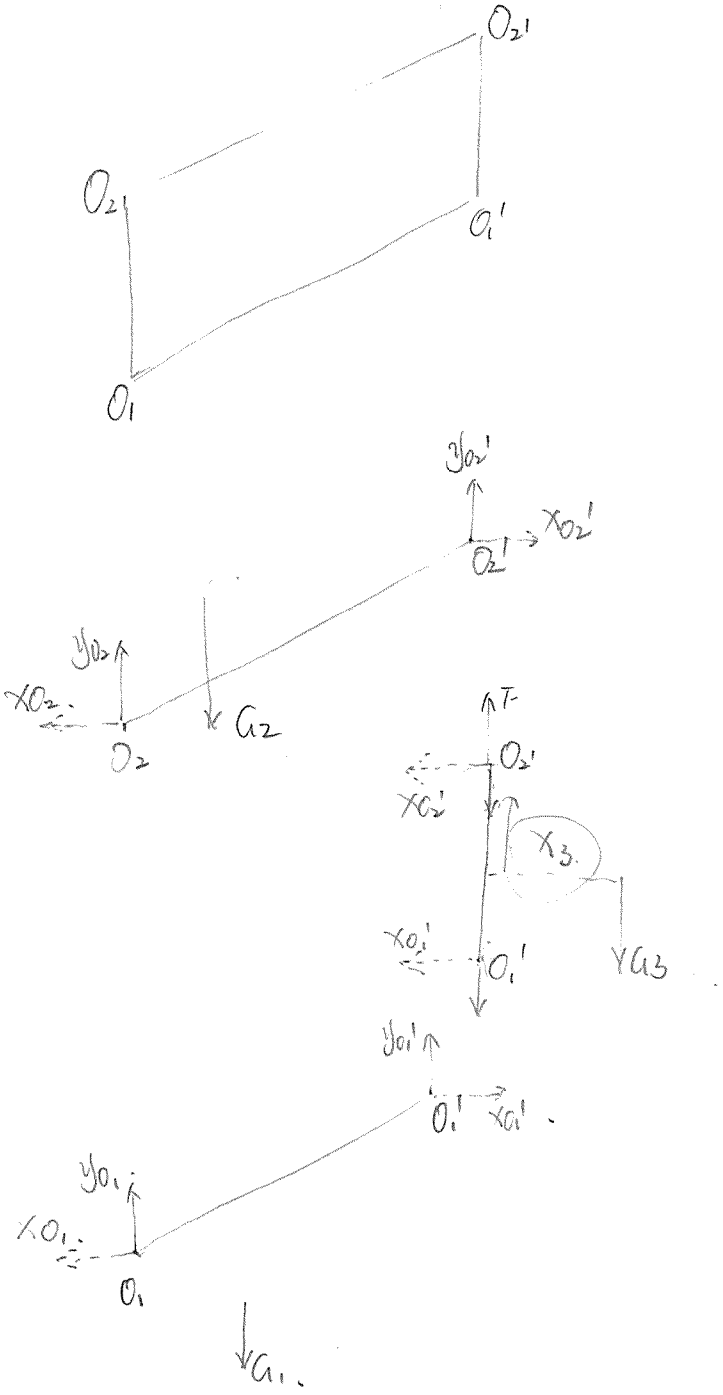


$$x_{O_1'} = -x_{O_2'}$$

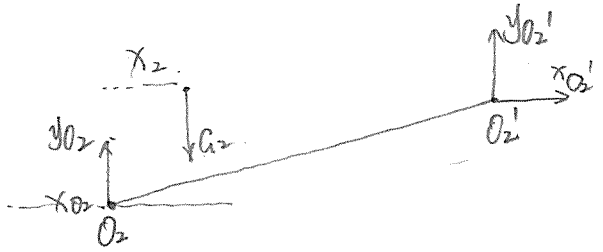
$$x_{O_1'} \cdot L_2 = -G_3 x_3$$

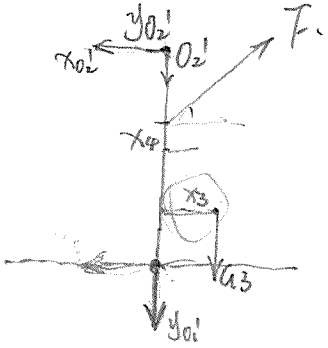
$$G_2 x_2 + x_{O_2'} \cdot 2L_1 \sin\theta = y_{O_2'} \cdot 2L_1 \cdot \cos\theta$$

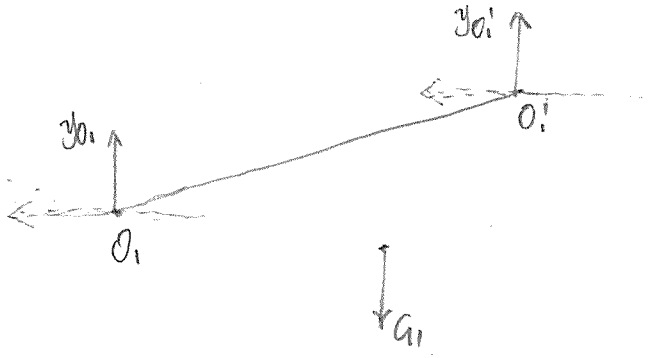
$$G_1 x_1 + x_{O_1'} \cdot 2L_1 \sin\theta = y_{O_1'} \cdot 2L_1 \cdot \cos\theta$$

$$G_1 x_1 + G_2 x_2 = 2L_1 \cos\theta \,(y_{O_1'} + y_{O_2'})$$

$$G_1 x_1 + G_2 x_2 = 2L_1 \cos\theta \,(T - G_3)$$







① $y_{O_1'} + y_{O_2'} + G_3 = F \cdot \cos\varphi$

② $x_{O_1'} + x_{O_2'} = F \cdot \sin\varphi$

③ O_2O_2' 中以 O_2 为支点，

$G_2 \cdot x_2 + x_{O_2'} \cdot 2L_1 \sin\theta = y_{O_2'} \cdot 2L_1 \cos\theta$

O_1O_1' 中以 O_1 为支点，✗ 不一定

$G_1 \cdot x_1 + x_{O_1'} \cdot 2L_1 \sin\theta = y_{O_1'} \cdot 2L_1 \cos\theta$ ✗

~~$G_1 \cdot x_1 + G_2 \cdot x_2 + 2L_1 \sin\theta (x_{O_1'} + x_{O_2'}) = 2L_1 \cos\theta (y_{O_1'} + y_{O_2'})$~~

~~$G_1 x_1 + G_2 x_2 + 2L_1 \cdot \sin\theta \cdot F \cdot \sin\varphi = 2L_1 \cos\theta (F \cdot \cos\varphi - G_3)$~~

$G_1 x_1 + G_2 x_2 + 2L_1 \cos\theta \cdot G_3 = 2L_1 \cos\theta \cdot F \cdot \cos\varphi - 2L_1 \sin\theta \cdot F \cdot \sin\varphi$

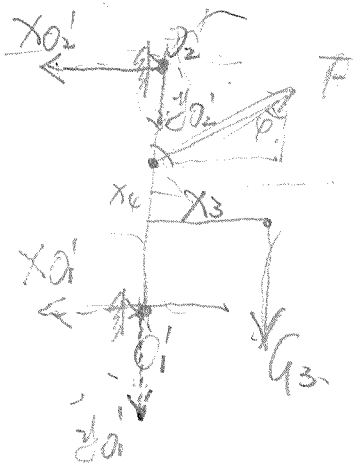
O_1O_2' 中以 O_1 为点：

$x_{O_1'}$ 这方向不确定，如果 G_3 特别大，$x_{O_1'}$ 是向左而不是右。

$F \cdot \sin\varphi \cdot (\frac{1}{2}L_2 + x_\varphi) + G_3 \cdot x_3 = x_{O_2'} \cdot L_2$

如果想求下，不行。

以O_1'为矩心，F、G_3顺时针，$X_{O_2'}$一定向左。



以O_2'为矩心，F逆、G_3顺，不能保证是否平衡。

设，所以②$y_{O_2'}$、$y_{O_1'}$向下，$X_{O_1'}$向左。

$\Sigma H=0$. $X_{O_2'} + X_{O_1'} = F\cdot\sin\varphi$ ---①

$\Sigma V=0$. $y_{O_2'} + y_{O_1'} + G_3 = F\cdot\cos\varphi$ --②

以O_1为矩心，

$M_+ = X_{O_2'}\cdot L_2$

$M_- = F\cdot\sin\varphi\cdot(\frac{1}{2}L_2 + X_4) + G_3\cdot X_3$ --③

以O_2为矩心，

$M_+ = F\cdot\sin\varphi\cdot(\frac{1}{2}L_2 - X_4)$

$M_- = X_{O_1'}\cdot L_2 + G_3\cdot X_3$ --④

四个未知数，四个方程。

$X_{O_2'}\cdot L_2 = F\cdot\sin\varphi\cdot(\frac{1}{2}L_2 + X_4) + G_3\cdot X_3$

$X_{O_1'}\cdot L_2 = F\cdot\sin\varphi\cdot(\frac{1}{2}L_2 - X_4) - G_3\cdot X_3$

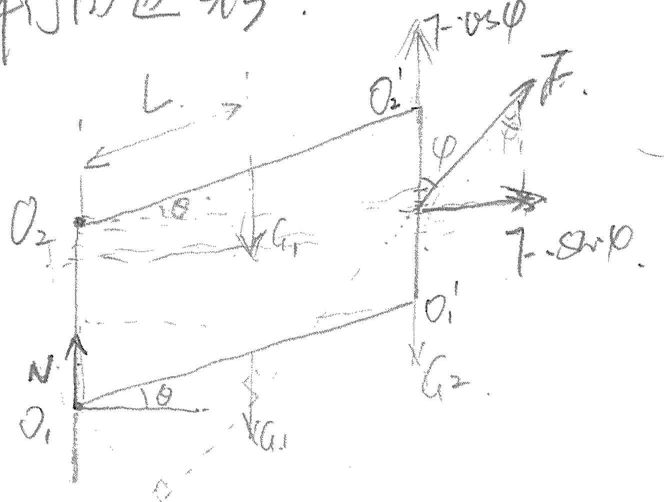
$\Downarrow$

$L_2(X_{O_1'} + X_{O_2'}) = F\cdot\sin\varphi\cdot L_2$

$\Downarrow$

$L_2\cdot F\cdot\sin\varphi = F\cdot\sin\varphi\cdot L_2$.

竖直平行四边形



方法二：由扭矩分析

$$2G_1 L\cos\theta + G_2\cdot 2L\cdot\cos\theta$$

$$= 2L(G_1\cdot\cos\theta + G_2\cdot\cos\theta)$$

$$M_- = 2L\cdot\cos\theta\,(G_1+G_2) \quad \cdots\cdots ①$$

$$M_+ = T\cdot\cos\varphi\cdot 2L\cdot\cos\theta - T\cdot\sin\varphi\cdot(L\cdot\sin\theta + \tfrac{1}{2}L_2)$$

$$+ T\cdot\sin\varphi\cdot(\tfrac{1}{2}L_2 - L\cdot\sin\theta)$$

$$= T\cdot\cos\varphi\cdot 2L\cdot\cos\theta - T\cdot\sin\varphi\cdot L\cdot\sin\theta$$

~~$-\tfrac{1}{2}T\cdot\sin\varphi\cdot L_2$~~

~~$+\tfrac{1}{2}T\cdot\sin\varphi\cdot L_2$~~

$$- T\cdot\sin\varphi\cdot L\cdot\sin\theta$$

$$= 2TL\cdot\cos\varphi\cdot\cos\theta - 2TL\sin\varphi\cdot\sin\theta$$

$$= 2TL[(\cos\varphi\cdot\cos\theta - \sin\varphi\sin\theta)] \quad \cdots ②$$

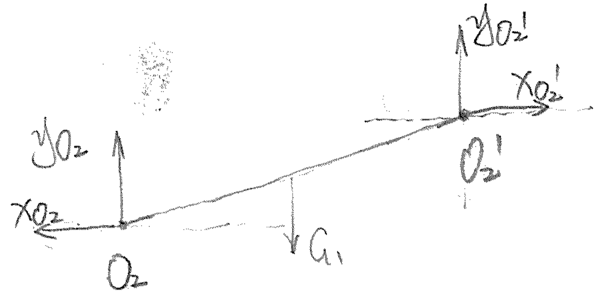
整体看、~~方法一：由力分析~~

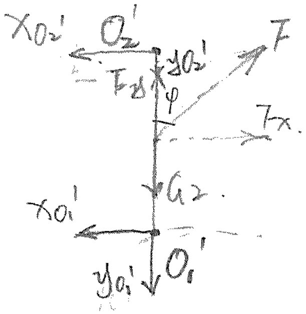
~~$T\cdot\cos\varphi = 2G_1 + G_2$~~

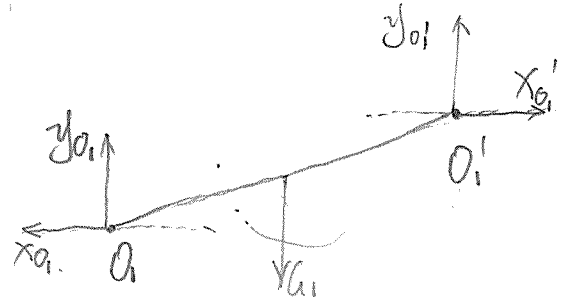
~~$T = \dfrac{2G_1+G_2}{\cos\varphi}$~~

失败
忽略了
O_1 的支撑力
N_{O_1} 不对

由 ① = ②，得 $2L\cos\theta(G_1+G_2) = 2TL[(\cos\varphi\cdot\cos\theta) - (\sin\varphi\sin\theta)] \Rightarrow T = \dfrac{\cos\theta(G_1+G_2)}{\cos\varphi\cdot\cos\theta - \sin\varphi\cdot\sin\theta}$







× ① O_1O_1' ~~是二力杆~~，以O_2'为支点，可知$N_{O_1'}$的方向（在O_1O_2'中）。以O_1'为支点，可知$N_{O_2'}$的方向 ↑ 有重力 推翻.

① O_1O_1'看，可知$y_{O_1'}$向上，y_{O_1}也向上，因扭矩要平衡.

O_2O_2'看，可知$y_{O_2'}$向上，y_{O_2}也向上.

$$y_{O_1'} + y_{O_2'} + G_2 = F\cdot\cos\varphi.$$

② $O_1'O_2'$看，以O_1'为支点，$x_{O_2'}$一定向左.

以O_2'为支点，$x_{O_1'}$一定向左.

⇓

$$x_{O_1'} + x_{O_2'} = F\cdot\sin\varphi.$$

③ 再看O_1O_1'，x方向要平衡，则 $x_{O_1} = x_{O_1'}$ 方向相反.

〃 〃 O_2O_2'，x 〃 〃 则 $x_{O_2} = x_{O_2'}$ 〃 〃

⇓

$$\begin{cases} y_{O_2} + y_{O_2'} = G_1 \\ y_{O_1} + y_{O_1'} = G_1 \end{cases}$$

O_2O_2'中以O_2为支点，O_1O_1'中以O_1为支点：

$$\begin{cases} G_1\cdot L\cos\theta + x_{O_2'}\cdot 2L\sin\theta = y_{O_2'}\cdot 2L\cos\theta \\ G_1\cdot L\cos\theta + x_{O_1'}\cdot 2L\sin\theta = y_{O_1'}\cdot 2L\cos\theta \end{cases}$$

$$\sum G_1 \cdot \cos\theta + 2T\sin\theta\,(\underbrace{x_{O_1}' + x_{O_2}'}_{\Downarrow\ T\cdot\sin\varphi}) = 2T\cdot\cos\theta\,(\underbrace{y_{O_1}' + y_{O_2}'}_{\Downarrow\ T\cdot\cos\varphi - G_2})$$

$$G_1\cdot\cos\theta + T\cdot\sin\theta\cdot\sin\varphi = T\cdot\cos\theta\cdot\cos\varphi - G_2\cdot\cos\theta$$

$$\Downarrow$$

$$T(\cos\theta\cdot\cos\varphi - \sin\theta\cdot\sin\varphi) = G_1\cos\theta + G_2\cdot\cos\theta$$

$$\Downarrow$$

$$T = \frac{\cos\theta(G_1+G_2)}{\cos\theta\cdot\cos\varphi - \sin\theta\sin\varphi}$$