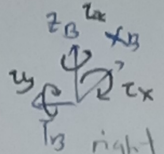
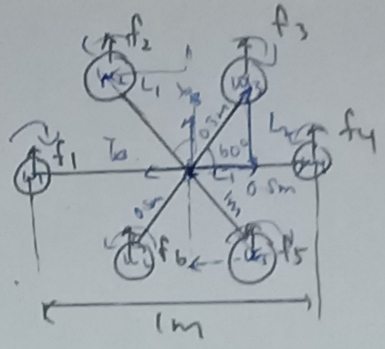
05111108 潘俊偉 HW4

1. Allocation Matrix



I_B right hand rule



$$\begin{bmatrix} f \\ \tau_x \\ \tau_y \\ \tau_z \end{bmatrix} = M \begin{bmatrix} f_1 \\ f_2 \\ \vdots \\ f_6 \end{bmatrix}$$

$$\begin{bmatrix} f \\ \tau_x \\ \tau_y \\ \tau_z \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 \\ L_3 & L_1 & -L_1 & -L_3 & -L_1 & L_1 \\ 0 & -L_2 & -L_2 & 0 & L_2 & L_2 \\ C_{Tf} & -C_{Tf} & C_{Tf} & -C_{Tf} & C_{Tf} & -C_{Tf} \end{bmatrix} \begin{bmatrix} f_1 \\ f_2 \\ f_3 \\ f_4 \\ f_5 \\ f_6 \end{bmatrix}$$

$$\begin{bmatrix} f \\ \tau_x \\ \tau_y \\ \tau_z \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 \\ 0.5 & 0.25 & -0.25 & -0.5 & -0.25 & 0.25 \\ 0 & -0.433 & -0.433 & 0 & 0.433 & 0.433 \\ C_{Tf} & -C_{Tf} & C_{Tf} & -C_{Tf} & C_{Tf} & -C_{Tf} \end{bmatrix} \begin{bmatrix} f_1 \\ f_2 \\ f_3 \\ f_4 \\ f_5 \\ f_6 \end{bmatrix}$$

Assumes:
The distance motor to motor are the same.

$L_1 = (0.5)\cos 60^\circ = 0.25m$

$L_2 = (0.5)\sin 60^\circ = 0.433m$

$L_3 = 0.5m$

τ_z (依旋轉方向對機架)

2. $$\begin{bmatrix} f \\ \tau_x \\ \tau_y \\ \tau_z \end{bmatrix} = M \begin{bmatrix} \omega_1^2 \\ \omega_2^2 \\ \vdots \\ \omega_6^2 \end{bmatrix}$$

set thrust factor as k_f
drag torque factor as b

$$\begin{bmatrix} f \\ \tau_x \\ \tau_y \\ \tau_z \end{bmatrix} = \begin{bmatrix} k_f & k_f & k_f & k_f & k_f & k_f \\ k_f L_3 & k_f L_1 & -k_f L_1 & -k_f L_3 & -k_f L_1 & k_f L_1 \\ 0 & -k_f L_2 & -k_f L_2 & 0 & k_f L_2 & k_f L_2 \\ b & -b & b & -b & b & -b \end{bmatrix} \begin{bmatrix} \omega_1^2 \\ \omega_2^2 \\ \omega_3^2 \\ \omega_4^2 \\ \omega_5^2 \\ \omega_6^2 \end{bmatrix}$$

$b = k_f C_{Tf}$

$$\begin{bmatrix} f \\ \tau_x \\ \tau_y \\ \tau_z \end{bmatrix} = \begin{bmatrix} k_f & k_f & k_f & k_f & k_f & k_f \\ 0.5k_f & 0.25k_f & -0.25k_f & -0.5k_f & -0.25k_f & 0.25k_f \\ 0 & -0.433k_f & -0.433k_f & 0 & 0.433k_f & 0.433k_f \\ k_f C_{Tf} & -k_f C_{Tf} & k_f C_{Tf} & -k_f C_{Tf} & k_f C_{Tf} & -k_f C_{Tf} \end{bmatrix} \begin{bmatrix} \omega_1^2 \\ \omega_2^2 \\ \omega_3^2 \\ \omega_4^2 \\ \omega_5^2 \\ \omega_6^2 \end{bmatrix}$$