HW4

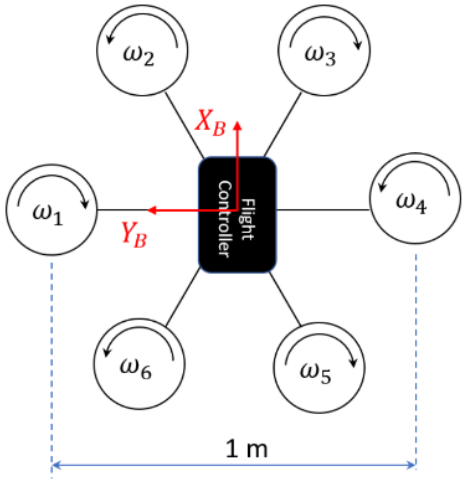
Due April 6th, 2020

Given a hexacopter as shown in the figure, please find

1. its allocation matrix. $\begin{bmatrix} f \\ \tau_x \\ \tau_y \\ \tau_z \end{bmatrix} = M \begin{bmatrix} f_1 \\ f_2 \\ \vdots \\ f_6 \end{bmatrix}$.

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

(Note that the drag torque factor and the thrust force coefficient is $C_{\tau f}$ and k_f.)



l = 0.5 m

1. $\begin{bmatrix} f \\ \tau_x \\ \tau_y \\ \tau_z \end{bmatrix} =$

$$\begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 \\ l & l \cdot \sin(30^\circ) & -l \cdot \sin(30^\circ) & -l & -l \cdot \sin(30^\circ) & l \cdot \sin(30^\circ) \\ 0 & -l \cdot \sin(60^\circ) & -l \cdot \sin(60^\circ) & 0 & l \cdot \sin(60^\circ) & l \cdot \sin(60^\circ) \\ C_{\tau f} & -C_{\tau f} & C_{\tau f} & -C_{\tau f} & C_{\tau f} & -C_{\tau f} \end{bmatrix} \begin{bmatrix} f_1 \\ f_2 \\ \vdots \\ f_6 \end{bmatrix}$$

2. $\begin{bmatrix} f \\ \tau_x \\ \tau_y \\ \tau_z \end{bmatrix} =$

$$k_f \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 \\ l & l \cdot \sin(30^\circ) & -l \cdot \sin(30^\circ) & -l & -l \cdot \sin(30^\circ) & l \cdot \sin(30^\circ) \\ 0 & -l \cdot \sin(60^\circ) & -l \cdot \sin(60^\circ) & 0 & l \cdot \sin(60^\circ) & l \cdot \sin(60^\circ) \\ C_{\tau f} & -C_{\tau f} & C_{\tau f} & -C_{\tau f} & C_{\tau f} & -C_{\tau f} \end{bmatrix} \begin{bmatrix} \omega_1^2 \\ \omega_2^2 \\ \vdots \\ \omega_6^2 \end{bmatrix}$$