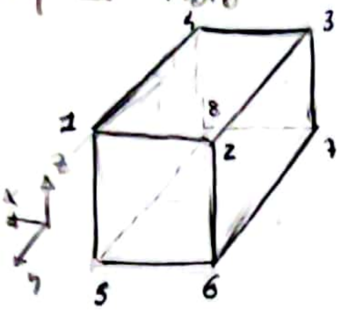
Eq di Moto



Ogni ugello è angolato con $\alpha[x]$, $\beta[y]$, $\gamma[z]$ e $\alpha = \frac{\pi}{2} - \beta$

$$S_{1-8} = \begin{Bmatrix} \pm \cos\alpha \sin\gamma \\ \pm \sin\alpha \sin\gamma \\ \pm \cos\gamma \end{Bmatrix} |S|$$

- Per cui chiamiamo $S_{x,y,z}$ le componenti e il segno indicherà la dir $(\pm\alpha, \gamma)$

$$S_1 = \begin{Bmatrix} -S_x \\ -S_y \\ S_z \end{Bmatrix} \quad S_2 = \begin{Bmatrix} S_x \\ -S_y \\ S_z \end{Bmatrix} \quad S_3 = \begin{Bmatrix} S_x \\ S_y \\ S_z \end{Bmatrix} \quad S_4 = \begin{Bmatrix} -S_x \\ S_y \\ S_z \end{Bmatrix}$$

$$S_5 = \begin{Bmatrix} -S_x \\ -S_y \\ -S_z \end{Bmatrix} \quad S_6 = \begin{Bmatrix} S_x \\ -S_y \\ -S_z \end{Bmatrix} \quad S_7 = \begin{Bmatrix} S_x \\ S_y \\ -S_z \end{Bmatrix} \quad S_8 = \begin{Bmatrix} -S_x \\ S_y \\ -S_z \end{Bmatrix}$$

- Poi per il controllo PWM introduciamo $\tau = \frac{\vartheta}{T}$ con ϑ di apertura e T campl.
- Per i momenti definiamo come per le spinte i bracci

$$r_1 = \begin{Bmatrix} L/2 \\ L \\ L/2 \end{Bmatrix} \quad r_2 = \begin{Bmatrix} -L/2 \\ L \\ L/2 \end{Bmatrix} \quad r_3 = \begin{Bmatrix} -L/2 \\ -L \\ L/2 \end{Bmatrix} \quad r_4 = \begin{Bmatrix} L/2 \\ -L \\ L/2 \end{Bmatrix}$$

$$r_5 = \begin{Bmatrix} L/2 \\ L \\ -L/2 \end{Bmatrix} \quad r_6 = \begin{Bmatrix} -L/2 \\ L \\ -L/2 \end{Bmatrix} \quad r_7 = \begin{Bmatrix} -L/2 \\ -L \\ -L/2 \end{Bmatrix} \quad r_8 = \begin{Bmatrix} L/2 \\ -L \\ -L/2 \end{Bmatrix}$$

ma seguono un pattern simile alle spinte, probabilmente si possono scrivere in maniera semplif.

=> EQUAZIONI

$\boxed{\text{SPOST}}$ $\underline{T} = -\underline{S}$

$$\begin{cases} T_x = S_{1x} + S_{4x} + S_{5x} + S_{8x} + S_{2x} + S_{3x} + S_{6x} + S_{7x} = +S_x(\tau_1+\tau_4+\tau_5+\tau_8) - S_x(\tau_2+\tau_3+\tau_6+\tau_7) \\ T_y = +S_y(\tau_1+\tau_2+\tau_5+\tau_6) - S_y(\tau_3+\tau_4+\tau_7+\tau_8) \\ T_z = +S_z(\tau_5+\tau_6+\tau_7+\tau_8) - S_z(\tau_1+\tau_2+\tau_3+\tau_4) \end{cases}$$

con $|T_i|$ costante $\forall i$ e agiamo con IMPULSI

→ L'attivazione di 4 thruster lungo x^+ porta a $T_{y,z} = 0$ e così per tutti i quartetti

$\boxed{\text{ROTAZ}}$

$$\underline{M} = -\sum \underline{r}_i \times \underline{S}_i = \sum \begin{Bmatrix} -r_y S_z + r_z S_y \\ -r_z S_x + r_x S_z \\ -r_x S_y + r_y S_x \end{Bmatrix}_i$$

Il meno ci va perché il flusso esce da una parte, la spinta però è dalla parte opposta

$$\begin{cases} M_x = S_z L(\tau_3+\tau_4+\tau_5+\tau_6-\tau_1-\tau_2-\tau_7-\tau_8) + S_y \frac{L}{2}(\tau_3+\tau_4+\tau_5+\tau_6-\tau_1-\tau_2-\tau_7-\tau_8) \\ M_y = S_x \frac{L}{2}(\tau_1+\tau_4+\tau_6+\tau_7-\tau_2-\tau_3-\tau_5-\tau_8) + S_z \frac{L}{2}(\tau_1+\tau_4+\tau_6+\tau_7-\tau_2-\tau_3-\tau_5-\tau_8) \\ M_z = S_y \frac{L}{2}(\tau_1+\tau_3+\tau_5+\tau_7-\tau_2-\tau_4-\tau_6-\tau_8) + S_x L(\tau_2+\tau_4+\tau_6+\tau_8-\tau_1-\tau_3-\tau_5-\tau_7) \end{cases}$$

$$\to \begin{cases} M_x = (S_z L + S_y \frac{L}{2})(\tau_3+\tau_4+\tau_5+\tau_6-\tau_1-\tau_2-\tau_7-\tau_8) \\ M_y = (S_x \frac{L}{2} + S_z \frac{L}{2})(\tau_1+\tau_4+\tau_6+\tau_7-\tau_2-\tau_3-\tau_5-\tau_8) \\ M_z = (S_y \frac{L}{2} - S_x L)(\tau_1+\tau_3+\tau_5+\tau_7-\tau_2-\tau_4-\tau_6-\tau_8) \end{cases}$$