IDGAF

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Abstract

Summarize!

The Basic Model

$$\frac{d}{dt}\begin{bmatrix} x \\ y \\ z \\ \alpha \\ \beta \\ \gamma \\ \dot{x} \\ \dot{y} \\ \dot{z} \\ \dot{\alpha} \\ \dot{\beta} \\ \dot{\gamma} \end{bmatrix} = \begin{bmatrix} 0 \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ 0 \\ -9.81 \\ 0 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \cdots 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ \vdots & \ddots & 1 & 0 & 0 & 0 & 0 \\ \vdots & & \ddots & 1 & 0 & 0 & 0 \\ \vdots & & & \ddots & 1 & 0 & 0 \\ \vdots & & & & \ddots & 1 & 0 \\ \vdots & & & & & \ddots & 1 \\ \vdots & & & & & & 0 \\ \vdots & & & & & & \vdots \\ \vdots & & & & & & \vdots \\ \vdots & & & & & & \vdots \\ \vdots & & & & & & \vdots \\ 0 & \cdots & \cdots & \cdots & \cdots & \cdots & 0 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \\ \alpha \\ \beta \\ \gamma \\ \dot{x} \\ \dot{y} \\ \dot{z} \\ \dot{\alpha} \\ \dot{\beta} \\ \dot{\gamma} \end{bmatrix} + \begin{bmatrix} \underline{\underline{0}} \\ \cdots\cdots \\ \underline{\underline{R}} \\ \cdots\cdots \\ \underline{\underline{I}} \end{bmatrix} \cdot \begin{bmatrix} F_{x,R} \\ F_{y,R} \\ F_{z,R} \end{bmatrix}$$

$$\underline{\underline{I}} = \begin{bmatrix} 0 & \frac{l}{2 \cdot I} & 0 \\ \frac{l}{2 \cdot I} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\underline{\underline{R}} = \underline{\underline{R}}(\alpha, \beta, \gamma) = \begin{bmatrix} c(\gamma) & -s(\gamma) & 0 \\ s(\gamma) & c(\gamma) & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} c(\beta) & 0 & s(\beta) \\ 0 & 1 & 0 \\ -s(\beta) & 0 & c(\beta) \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & c(\alpha) & -s(\alpha) \\ 0 & s(\alpha) & c(\alpha) \end{bmatrix}$$

$$\begin{bmatrix} F_{x,R} \\ F_{y,R} \\ F_{z,R} \end{bmatrix} = \underline{\underline{B}}(\alpha_R, \beta_R) \cdot \begin{bmatrix} 0 \\ 0 \\ F_{R,total} \end{bmatrix} \quad \text{with} \quad \underline{\underline{B}}(\alpha_R, \beta_R) = \begin{bmatrix} c(\beta_R) & 0 & s(\beta_R) \\ 0 & 1 & 0 \\ -s(\beta_R) & 0 & c(\beta_R) \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & c(\alpha_R) & -s(\alpha_R) \\ 0 & s(\alpha_R) & c(\alpha_R) \end{bmatrix}$$

Control Loop

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Code-Implementation

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