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Off center spinning mass controller for Quad Copters

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April 10, 2018



Abstract

Your abstract.

1 Symbols

Here is a list of all symbols used in this paper:

ξ	linear position vectors
η	angular position vectors
α	roll angle
β	pitch angle
γ	yaw angle
V_B	linear velocity vectors in Body frame
ν_B	angular velocity vectors in Body frame
R	rotation matrix from body to inertial frame
S_x, C_x, T_x	$\sin(x), \cos(x), \tan(x)$ respectively

2 Mathematical Derivation

2.1 Free Body Diagram

2.2 Inertial / Body / Controller frame transformation

The Rotation matrix is shown below,

$$R = \begin{bmatrix} C_\gamma C_\beta & C_\gamma S_\beta S_\alpha - S_\alpha C_\alpha & C_\gamma S_\beta C_\alpha + S_\gamma S_\alpha \\ S_\gamma C_\beta & S_\beta S_\theta S_\alpha + C_\gamma C_\alpha & S_\gamma S_\beta C_{alpha} - C_\gamma S_\alpha \\ -S_\beta & C_\beta S_\alpha & C_\beta C_\alpha \end{bmatrix}$$

2.3 Newton-Euler equations

$$m\dot{V}_B + \xi_B \times (mV_B) = R^T G + T_B$$