Contents

List of Symbols

Latin Letters

Symbol	Unit	Description
Content	Content	Content
Content	Content	Content
Content	Content	Content

Nomenclature

Latin Letters

Symbol	Unit	Description
$a(t)$	–	Function of the first order lag element in time domain
b	m	Lever arm of the rotors to the C.G. along the body y-axis
d	m/s^2	Disturbance
d_0, d_1, d_2	–	Denominator coefficients of the discrete second order filter
$E(t)$	m	Objective function
$\boldsymbol{F}$	N	Force vector
$\boldsymbol{F}_A$	N	Aerodynamic force vector
$\boldsymbol{F}_G$	N	Gravitational force vector
$\boldsymbol{F}_P$	N	Propulsive force vector
$\boldsymbol{f}(\boldsymbol{x})$	–	Nonlinear vector field
g	m/s^2	Gravitational acceleration
$H(s),\ H(z)$	–	Transfer function of the second order filter
$\boldsymbol{h}(\boldsymbol{x})$	–	Nonlinear vector field
$\boldsymbol{I}$	Nm^2	Inertia tensor of the quadrotor
$\boldsymbol{I_{rzz}}$	Nm^2	zz-element of the inertia tensor of the rotor
i	–	Relative degree of the dynamic system
K	–	Compensation gain
K_{cmd}	–	Thrust mapping parameter
k	kg/s	Drag coefficient
k	–	Gain of the actuator dynamics
k_F	$\frac{N}{rad/s}$	Force constant of the rotors
k_M	$\frac{Nm}{rad/s}$	Moment constant of the rotors
L	–	Lie derivative operator

l	m	Lever arm of the rotors to the C.G. along the body y-axis
$\boldsymbol{M}$	Nm	Moment vector
$\boldsymbol{M}_A$	Nm	Aerodynamic moment vector
$\boldsymbol{M}_c$	Nm	Control moment vector
$\boldsymbol{M}_G$	Nm	Gravitational moment vector
$\boldsymbol{M}_P$	Nm	Propulsion moment vector
$\boldsymbol{M}_{gyro}$	Nm	Moment vector due to the gyroscopic effects of the rotor
$\boldsymbol{M}_{OB}$	–	Transformation matrix from the body-fixed into NED frame
m_r	kg	Additional mass (disturbance)
n	m	Number of samples
n_0, n_1, n_2	–	Numerator coefficients of the discrete second order filter
P	–	Parameter
p	rad/s	Roll rate
q	rad/s	Pitch rate
r	rad/s	Yaw rate
s	–	Laplace variable

Chapter 1

Introduction

Chapter 2

Second Chapter