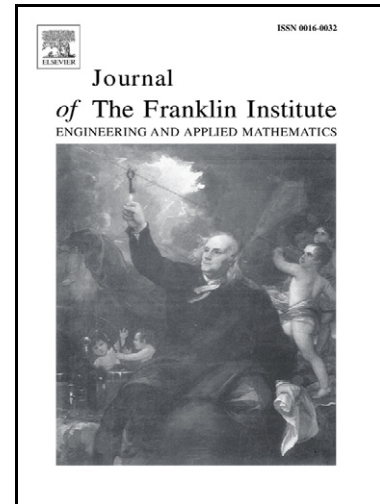


Fault Tolerant Flight Control System for the Tilt-rotor UAV

Sewook Park, Jonghee Bae, Youdan Kim, Sungwan Kim



www.elsevier.com/locate/jfranklin

PII: S0016-0032(13)00031-8
DOI: <http://dx.doi.org/10.1016/j.jfranklin.2013.01.014>
Reference: FI1670

To appear in: *Journal of the Franklin Institute*

Received date: 30 March 2012
Revised date: 29 October 2012
Accepted date: 11 January 2013

Cite this article as: Sewook Park, Jonghee Bae, Youdan Kim and Sungwan Kim, Fault Tolerant Flight Control System for the Tilt-rotor UAV, *Journal of the Franklin Institute*, <http://dx.doi.org/10.1016/j.jfranklin.2013.01.014>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Fault Tolerant Flight Control System for the Tilt-rotor UAV

Sewook Park ^a, Jonghee Bae ^a, Youdan Kim ^{a,*}, and Sungwan Kim ^b

^a*School of Mechanical and Aerospace Engineering, Seoul National University, Seoul 151-742, South Korea*

^b*College of Medicine, Seoul National University, Seoul 151-742, South Korea*

Elsevier use only: Received date here; revised date here; accepted date here

Abstract

A fault tolerant control scheme for actuator and sensor faults is proposed for a tilt-rotor unmanned aerial vehicle (UAV) system. The tilt-rotor UAV has a vertically take-off and landing (VTOL) capability like a helicopter during the take-off & landing while it could cruise with a high speed as a conventional airplane flight mode. A dual system in the flight control computer (FCC) and the sensor is proposed in this study. To achieve a high reliability, a fault tolerant flight control system is required for the case of actuator or sensor fault. For the actuator fault, the fault tolerant control scheme based on model error control synthesis is presented. A designed fault tolerant control scheme does not require system identification process and it provides an effective reconfigurability without fault detection and isolation (FDI) process. For the sensor fault, the fault tolerant federated Kalman filter is designed for the tilt-rotor UAV system. An FDI algorithm is applied to the federated Kalman filter in order to improve the accuracy of the state estimation even when the sensor fails. For a linearized six-degree-of-freedom linear model and nonlinear model of the tilt-rotor UAV, numerical simulation and process-in-the-loop simulation (PILS) are performed to demonstrate the performance of the proposed fault tolerant control scheme.

Key words: fault tolerant control, fault detection and isolation, predictive filter, decentralized Kalman filter, federated Kalman filter, sensitivity factor

*Corresponding author.

Download English Version:

<https://daneshyari.com/en/article/4975545>

Download Persian Version:

<https://daneshyari.com/article/4975545>

[Daneshyari.com](https://daneshyari.com)