

Accepted Manuscript

Robust control of unmanned helicopters with high-order mismatched disturbances via disturbance-compensation-gain construction approach

Xing Fang, Fei Liu, Zhengtao Ding

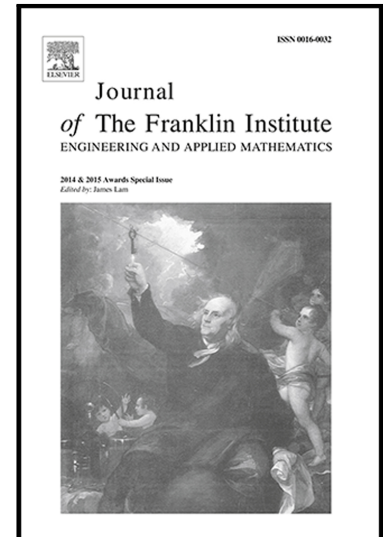
PII: S0016-0032(18)30548-9
DOI: <https://doi.org/10.1016/j.jfranklin.2018.08.015>
Reference: FI 3604

To appear in: *Journal of the Franklin Institute*

Received date: 29 November 2017
Revised date: 30 May 2018
Accepted date: 12 August 2018

Please cite this article as: Xing Fang, Fei Liu, Zhengtao Ding, Robust control of unmanned helicopters with high-order mismatched disturbances via disturbance-compensation-gain construction approach, *Journal of the Franklin Institute* (2018), doi: <https://doi.org/10.1016/j.jfranklin.2018.08.015>

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 proof before it is published in its final 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.



Robust control of unmanned helicopters with high-order mismatched disturbances via disturbance-compensation-gain construction approach

Xing Fang^{a,*}, Fei Liu^a, Zhengtao Ding^b

^aKey Laboratory of Advanced Process Control for Light Industry of the Ministry of Education, Institute of Automation, Jiangnan University, Wuxi 214122, P.R. China

^bSchool of Electrical and Electronic Engineering, University of Manchester, Sackville Street Building, Manchester M13 9PL, UK

Abstract

In this paper, a novel robust control strategy based on disturbance-compensation-gain (DCG) construction approach is proposed for small-scale unmanned helicopters in the presence of high-order mismatched disturbances. The overall control structure consists of two hierarchical layers. The inner-loop controller is to guarantee the stability of the unmanned helicopters subject to high-order mismatched disturbances. With the estimation of the disturbances and their successive derivatives via finite-time disturbance observer (FTDO), by properly designing some disturbance compensation gains, a novel robust controller is developed to remove the high-order mismatched disturbances from the output channels. The outer-loop controller is to produce flight commands for inner-loop system, as well as to track the reference trajectory, which is carried out with the dynamic inversion technique. The simulation results demonstrate that the unmanned helicopters are capable to perform flight missions autonomously with the proposed control strategy.

Keywords: Small-scale unmanned helicopters, mismatched disturbances, disturbance-compensation-gain (DCG) construction, finite-time disturbance observer (FTDO)

[☆]Fully documented templates are available in the elsarticle package on CTAN.

* *Email addresses:* xingfang@jiangnan.edu.cn (Xing Fang).

Download English Version:

<https://daneshyari.com/en/article/10226044>

Download Persian Version:

<https://daneshyari.com/article/10226044>

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