Accepted Manuscript

Attitude stabilization of flapping micro-air vehicles via an observer-based sliding mode control method

Xuan-Toa Tran, Hyondong Oh, In-Rae Kim, Seungkeun Kim

PII: S1270-9638(17)31731-5
DOI: https://doi.org/10.1016/j.ast.2018.01.045
Reference: AESCTE 4430

To appear in: *Aerospace Science and Technology*

Received date: 20 September 2017
Revised date: 5 December 2017
Accepted date: 10 January 2018

Please cite this article in press as: X.-T. Tran et al., Attitude stabilization of flapping micro-air vehicles via an observer-based sliding mode control method, *Aerosp. Sci. Technol.* (2018), https://doi.org/10.1016/j.ast.2018.01.045

Attitude stabilization of flapping micro-air vehicles via an observer-based sliding mode control method

Xuan-Toa Tran[a], Hyondong Oh[a,*], In-Rae Kim[b], Seungkeun Kim[b]

[a] *School of Mechanical and Nuclear Engineering, Ulsan National Institute of Science and Technology, Ulsan 44919, South Korea*
[b] *Department of Aerospace Engineering, Chungnam National University, 99 Daehak-ro, Yuseong-gu, Daejeon 305-764, South Korea*

Abstract

This paper introduces an observer-based sliding mode control strategy for stabilizing the attitude of flapping micro-air vehicles in the presence of unknown uncertainties and external disturbances. First, a finite-time observer is designed to estimate the lumped disturbances. Next, a controller is developed to provide attitude stabilization with high robustness where the lumped disturbances could be completely rejected after a finite amount of time. The stability of the closed-loop system is rigorously proven. By employing MATLAB/Simulink software, a numerical simulation example including a comparison between the proposed method and a conventional sliding mode controller is provided to illustrate the effectiveness of the proposed method and to confirm the theoretical results.

Keywords: Flapping micro-air vehicles, Attitude stabilization, Finite-time observer, Sliding mode control

*Corresponding author
Email address: h.oh@unist.ac.kr (Hyondong Oh)