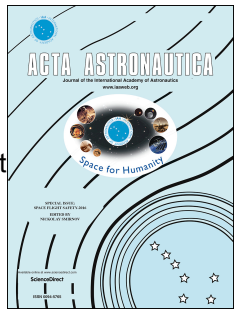
Accepted Manuscript



Multi-objective integrated robust H∞ control for attitude tracking of a flexible spacecraft

Shunan Wu, Weimeng Chu, Xue Ma, Gianmarco Radice, Zhigang Wu

PII: S0094-5765(17)31509-6

DOI: 10.1016/j.actaastro.2018.05.062

Reference: AA 6918

To appear in: *Acta Astronautica*

Received Date: 25 October 2017

Revised Date: 27 April 2018

Accepted Date: 31 May 2018

Please cite this article as: S. Wu, W. Chu, X. Ma, G. Radice, Z. Wu, Multi-objective integrated robust H∞ control for attitude tracking of a flexible spacecraft, *Acta Astronautica* (2018), doi: 10.1016/j.actaastro.2018.05.062.

Multi-objective integrated robust H∞ control for attitude tracking of a flexible spacecraft

Shunan Wu[a], Weimeng Chu[a], Xue Ma[b], Gianmarco Radice[c] and Zhigang Wu[a]

[a] School of Aeronautics and Astronautics, Dalian University of Technology, Dalian 116024, China

[b] Beijing Institute of Control Engineering, Beijing 100190, China

[c] School of Engineering, University of Glasgow, Glasgow G12 8QQ, UK

Abstract: This paper investigates the multi-objective attitude tracking problem of a flexible spacecraft in the presence of disturbances, parameter uncertainties and imprecise collocation of sensors and actuators. An integrated robust H∞ controller, including an output feedback component and a feedforward component, is proposed, and its gains are calculated by solving Linear Matrix Inequalities. The output feedback component stabilizes the integrated control system while the feedforward component can drive the attitude motion to track the desired angles. The system robustness against disturbances, parameter uncertainties and imprecise collocation is addressed by the H∞ approach and convex optimization. Numerical simulations are finally provided to assess the performance of the proposed controller.

Keywords: Attitude control, Flexible spacecraft, Robust control, Output feedback, Multi-objective

1. Introduction

Attitude control is a key requirement for most space missions, and many different approaches to addressing this problem are proposed [1-5]. The problem of spacecraft attitude control can be generally classified in two separate

Corresponding author: Shunan Wu, Tel/Fax: +86-411-84706791, E-mail: wushunan@dlut.edu.cn