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Integrated vibration isolation and attitude control for spacecraft with uncertain or unknown payload inertia parameters

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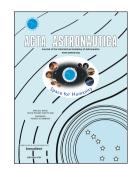
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1	ACCEPTED MANUSCRIPT Integrated vibration isolation and attitude control for spacecraft with
2	uncertain or unknown payload inertia parameters
2	T : C Y T $*^2$ O H^3
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5	Abstract: To meet the spacecraft attitude control requirements with high accuracy and stability, all vibrations in
6	the spacecraft should be reduced in appropriate ways. This paper presents an integrated control method for
7	attitude and the vibrations in both high frequency and low frequency in the spacecraft. The integrated control
8	method includes a vibration isolation platform and a modified adaptive attitude control method. The paper
9	presents a vibration isolation platform with magnetic suspension to reduce high frequency vibrations and a
10	parameter design method for the platform. An adaptive control method is presented to reduce low frequency
11	vibrations while accounting for the bandwidth constraint due to the vibration isolation platform. Firstly, a
12	parameter design method is proposed for the vibration isolation platform, and an entire 6×12 dimensional
13	transformation matrix is derived for the case that the inertia of the payload is of the same order of magnitude as
14	that of spacecraft bus. Then, an adaptive attitude controller is presented that accounts for the coupling
15	characteristics of the spacecraft, the vibration isolation platform and the uncertain or unknown payload inertia
16	parameters. To ensure the robustness of the attitude control system and the performance of the vibration
17	isolation system, a method of estimating the initial value of the payload inertia is presented using classical
18	control theory. Finally, numerical simulations demonstrate that the integrated control method presented in this
19	paper can achieve the attitude control task for spacecraft with high accuracy and stability.
20	Keywords: vibration isolation platform, magnetic suspension, attitude control, adaptive control, transformation
21	matrix

21 matrix

22 1. Introduction

23 Earth observation and deep space observation satellites with high resolution such as the Hubble Space

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