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Author: Dr. Weipeng Li
Beihang University, China, liweipeng@buaa.edu.cn

Prof. Hai Huang
Beihang University, China, hhuang@buaa.edu.cn
Mr. shunning yuan
Beihang University, China, yuanshunn@163.com
Dr. Chen Shenyan
Beihang University, China, chenshenyan@buaa.edu.cn

ACTIVE ISOLATION/SUPPRESSION FOR SATELLITE MICRO-VIBRATION WITH STEWART PLATFORM

Abstract

A Stewart platform actuated by voice coil motors (VCM) is selected as the control device to realize active isolation/suppression for micro-vibration onboard a satellite. A single-input-single-output (SISO) control strategy is established for the Stewart platform by decoupling it's dynamic model to the single strut model. The effectiveness of the vibration isolation as well as the limitation on vibration suppression of the Skyhook control method is analyzed, then a positive force feedback (PFF) loop is implemented to achieve isolation. To enhance the robust stability properties of the control system, an acceleration feedback loop is added to the system. Finally, active isolation/suppression experiments are conducted on the Stewart platform's single strut for micro-vibration. A base sweep excitation and a payload side single tone disturbance are induced on the single strut, and isolation/suppression is conducted with this paper's control method. The experimental results show that the control performance is quite good and stable with respect to both vibration isolation and suppression. The effectiveness of the control method is verified and the feasibility of applying this method with the VCM on the Stewart platform is proved.