

SPACE SYSTEMS SYMPOSIUM (D1)
Enabling Technologies for Space Systems (2)

Author: Prof. Hironori FUJII
Kanagawa Institute of Technology, Japan

Prof. Takeo WATANABE
Teikyo University, Japan
Prof. Tairou Kusagaya
Tokyo Metropolitan College of Industrial Technology, Japan
Mr. Kenichi Anma
Mitsubishi Heavy Industries, Ltd., Japan
Prof. Jixiang Fan
Harbin Normal University, China

TETHER ACTUATOR TO CONTROL VIBRATION OF SPACE STRUCTURES

Abstract

A Space Solar Power Satellite (SSPS) proposed by a Japanese organization is an example to employ tether technology to enhance the attitude stability of the system passively. The system consists of large flexible solar panel connected to a bus system through four tethers, and the gravity-gradient torque is utilized to stabilize its attitude with employment of the tether technology. This paper is devoted to study a control method of the vibration of the large flexible solar panel using tether as actuators. The tether tension is employed to control the vibration of the solar panel. Effectiveness is examined experimentally in this paper for vibration suppression on the tethered flexible space structures (SSPS) by employing a micro tension actuator. In the experiment, a micro tension actuator is used to generate very small tension and control the structure vibration. The micro tension actuator employs with a very flexible arm connected to tether in order to overcome the penalty of nonlinear behavior of tether. The control performance of the micro tension actuator is examined in its performance to suppress flexible structure connected through tether. Time responses of the vibration is shown. It is seen that the vibration of the panel is well controlled although tether is used to only pull but not push. The experiment results have verified the validity of this controller and the ability is confirmed on the vibration suppression of the micro tension actuator.