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Author: Mr. Shun Yokota
Nihon University, Japan

Mr. Kaishu Koike
Nihon University, Japan
Prof.Dr. Yoshio Aoki
Nihon University, Japan
Dr. Yoji Ishikawa
Obayashi Corporation, Japan

CONTROL OF REBOUNDING IN TETHERED CUBESAT SYSTEMS

Abstract

In recent years, feasibility experiments for technologies related to space tethers have utilized CubeSats. For these satellites, one of the largest challenges is stabilizing the system's behavior after deployment of the tether. Traditionally, tethered satellites have taken advantage of the gravity-gradient force for stabilization. However, as the maximum tether length a CubeSat can store is limited, the maximum achievable gravity-gradient force that acts on the system is also much smaller than for that of larger missions. Also, reaching a stable state using the gravity-gradient force is also thought to take considerable time. This creates the need for a mechanism to control rebounding effects where impact forces at the end of tether deployment cause the main and secondary satellites to shoot back towards one another. In this research, experimentation and numerical analysis were used to examine the relationship between an endmass satellite's center of gravity and where the tether is attached; along with how modifying the tether's deployment velocity and acceleration affect rebounding.