Dynamics of multi-tethered pyramidal satellite formation

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Highlights

- We model the dynamics of a multi-tethered pyramidal satellite formation.
- The formation's nominal motion is rotation about symmetry axis.
- We propose a control strategy that allows stabilizing the nominal spin state.
- We show that the formation can be implemented and made stable.
- Such formation can be used to co-locate satellites at a slot in geostationary orbit.

Abstract

This paper is devoted to the dynamics of a multi-tethered pyramidal satellite formation rotating about its axis of symmetry in the nominal mode. Whereas the combination of rotation and gravity-gradient forces is insufficient to maintain the mutual positions of satellites, they are assumed to be equipped with low-thrust rocket engines. We propose a control strategy that allows the stabilization of the nominal spin state and demonstrate the system's proper operation by numerically simulating its controlled motion. The discussed multi-tethered formations could be employed, for example, to provide co-location of several satellites at a slot in geostationary orbit.

Keywords

Tethered satellite systems; Satellite formations; Dynamics; Control

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