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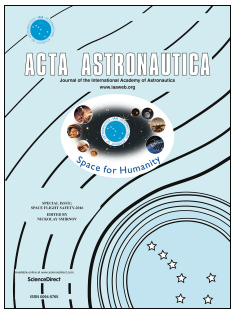

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Dynamics and Control of Three-body Tethered System in Large Elliptic Orbits

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Abstract

This paper investigates the dynamic characteristics a three-body tethered satellite system in large elliptic orbits and the control strategy to suppress the libration of the system in orbital transfer process. The system is modeled by a two-piece dumbbell model in the domain of true anomaly. The model consists of one main satellite and two subsatellites connected with two straight, massless and inextensible tethers. Two control strategies based on the sliding mode control are developed to control the libration to the zero state and the steady state respectively. The results of numerical simulations show that the proposed control scheme has good performance in controlling the libration motion of a three-body tethered satellite system in an elliptic orbit with large eccentricity by limited control inputs. Furthermore, Hamiltonians in both states are examined and it shows that less control input is required to control the libration motion to the steady state than that of zero state.

Keywords: *Three-body tethered system; orbit eccentricity; chaotic motion; libration suppress*

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