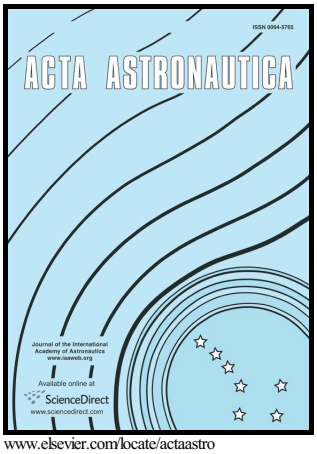

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Finite time coordinated formation control for spacecraft formation flying under directed communication topology

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1 Abstract

This paper investigates the finite time coordinated formation control problem for spacecraft formation flying (SFF) under the assumption of directed communication topology. By using the neighborhood state measurements, a robust finite time coordinated formation controller is firstly designed based on the nonsingular terminal sliding mode surface. To address the special case that the desired trajectory of the formation is only accessible to a subset of spacecraft in the formation, an adaptive finite time coordinated formation controller is also proposed by designing a novel sliding mode surface. In both cases, the external disturbances are explicitly taken into account. Rigorous theoretical analysis proves that the proposed control schemes ensure that the closed-loop system can track the desired time-varying trajectory in finite time. Numerical simulations are presented that not only highlights the closed-loop performance benefits from the proposed control algorithms, but also illustrates the effectiveness in the presence of external disturbances when compared with the existing coordinated formation control schemes.