

ASTRODYNAMICS SYMPOSIUM (C1)
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RECONFIGURABLE COOPERATIVE ATTITUDE CONTROL OF MAGNETICALLY ACTUATED
SATELLITES FORMATION

Abstract

Small satellite design is constrained by small power, weight and size requirements. Meeting these requirements simultaneously requires reducing the system backups which prohibits making a satellite system fail operational. Such small satellites are often magnetically actuated. The under-actuation problem of a magnetically actuated satellite equipped with three magnetic coils has been extensively studied since 1970s. Moreover, the attitude control of a satellite using two actuators and time dependent feedback control has been developed, but the magnetic attitude control of a satellite, which is already an under actuated system, in the post failure scenario of one of the three magnetic actuators has not been developed yet. Failure of any one of the magnetic coils may render a satellite dysfunctional if proper control reconfiguration is not provided keeping in view that redundant attitude control system is not available. In this paper reconfigurable cooperative attitude control of magnetically actuated satellites formation is presented which has not been carried out yet. A new formulation for reconfiguring the control based on magnetic dipole moment modulation for the cooperative attitude control of the formation is developed and implemented to show the efficacy of the proposed reconfiguration of the magnetic moment. In the post failure scenario of one of the magnetic coils, the cooperative controlling capability of the system remains intact which comes at the cost of high magnetic dipole moment in the functional magnetic coils but not at the cost of extra power. This also reduces the cross coupling of the coils. The proposed magnetic dipole moment modulation in combination with the conventional control law is found to be much effective.