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INFLUENCE OF SENSOR AND ACTUATOR ERRORS ON TWO IMPULSIVE SATELLITE FORMATION CONTROL METHODS

Abstract

This paper investigates how sensor and actuator errors are impacting formation control accuracy and propellant consumption of a two-satellite formation in a Low Earth Orbit. Realistic relative navigation errors are implemented, based on results from the PRISMA mission, as well as realistic actuator uncertainty and actuator constraints. Two impulsive control methods are investigated. The first method is based on a controller that currently flies onboard PRISMA and the second method uses linear programming to arrive at a model predictive controller. The contol methods are tested in a simulation environment and are subjected to realistic orbital perturbations, sensor errors and actuator errors. Both control methods are able of maintain the desired relative geometry of a projected circular orbit in the presence of the errors. The model predictive controller demonstrates the best control accuracy, while the other method shows a lower propellant consumption. The results show that, based on the used scenario, sensor errors dominate both the formation control accuracy and propellant consumption. The versatility of the model predictive controller is demonstrated in a challenging formation control scenario including formation maintenance and formation reconfiguration tasks.