Control Design for Fuel-Optimal Formation Keeping

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Satellite formation flying is the placing of multiple satellites into nearby orbits to form 'clusters' of satellites. These clusters of satellites usually work together to accomplish a mission. There are many benefits to using multiple satellite as opposed to one large satellites such as increasing productivity, reducing mission and launch cost. Hill's equations are useful to describe the relative motion of two satellites in formation flying, however, the disturbance forces acting on satellites is not considered in that equations. In this paper, a method for maintaining the relative distance between satellites is presented, which used mean orbital elements considering J2 perturbation. Control design process is also presented for minimizing total fuel consumption.