APPLICABILITY OF CLOHESSY-WILTSHIRE MODEL FOR OPTIMAL LOW-THRUST RENDEZVOUS

Yajur Kumar
Flight Control Engineer
Skydeploy Flight Systems Inc
Delhi-110 092, India
Email : yajurkumar@outlook.com

Abstract

This paper investigates the applicability of the continuous thrust Clohessy-Wiltshire model for the optimal low-thrust rendezvous in the orbit. While simplifying the non-linear equations of relative orbital motion, certain assumptions were taken in account by Clohessy and Wiltshire to linearize the system of equations. When the same model is used for optimization of thetrajectory of a relative transfer in the orbit using low-thrust, because of the assumptions in the dynamic model there are errors in the result which in turn depends upon the initial conditions for the optimal control problem. A study has been done to investigate the possible trend of error in the control input by varying the initial conditions for the relative transfer and comparing the results with those obtained using non-linear equations. Further, the trend of error in control input has also been studied by increasing the altitude of the target spacecraft orbit. Optimization of the relative motion trajectory has been performed to account for minimum propellant expenditure.