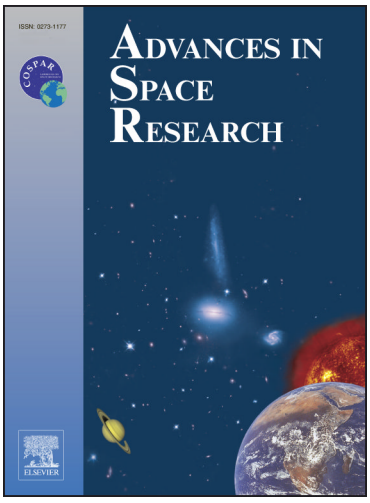

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Optimal Spacecraft Rendezvous by Minimum Velocity Change and Wait Time

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Abstract

An optimization problem is investigated in this paper to obtain a minimum velocity change, sometimes called as minimum-energy, to rendezvous a target spacecraft. The problem formulation starts with known initial positions and velocity vectors of two spacecraft, so-called *target* and *chaser*, respectively. The Kepler's time-of-flight equation in terms of the universal variables and the relationship between final position vectors of the two spacecraft are posed as constraints. Three-dimensional orbital information is obtained by using the f and g solution that called the Lagrange coefficients. One of advantages for the universal variables is that it provides total orbital information valid for all conic orbits without much numerical difficulty. The *wait time* concept is also employed to release the magnitude of velocity changes by minimizing the performance index. Finally, these techniques are demonstrated using numerical simulations.

Keywords: Two-Impulsive Rendezvous, Minimum Velocity Change, Wait Time, Non-Coplanar Elliptical Orbit

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