

ASTRODYNAMICS SYMPOSIUM (C1)  
Mission and Constellation Design (5)

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PROPORTIONAL GUIDANCE LAW FOR FAR RANGE RENDEZVOUS

**Abstract**

Far range rendezvous can start when relative navigation between chaser and target is established, and it generally begins at a range of tens kilometers while terminates at several kilometers from the target. The general methods used in the trajectory control of far range rendezvous are the Clohessy-Wiltshire(C-W) guidance law and the Lambert guidance law, however, if there are significant errors in navigation and control, the propellant consumption to prevent trajectory dispersion will increase seriously. The proportional guidance law is close-loop in trajectory control, which is widely used in space target interception, and errors of navigation and control will be corrected during the later control. In this paper, the proportional guidance law is proposed for the trajectory control of far range rendezvous. Firstly, the minimum-propellant reference trajectory for far range rendezvous is designed based on genetic algorithm. Secondly, the constant thrust proportional guidance law is deduced, which is proposed for the trajectory control of far range rendezvous. Lastly, performances of the proportional guidance law and the C-W guidance law are compared in terms of terminal-position precision and propellant consumption. It is shown that the proportional guidance law can guarantee the higher terminal-position precision with the fewer propellant consumption when the navigation and control errors are significant.