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基于视线制导的共面航天器自主交会控制研究 (PDF)

Title: Control Strategies for Coplanar Autonomous Rendezvous Based on Line‐of‐sight Guidance

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关键词： 交会; 视线制导; 零控脱靶量; 比例导引

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摘要： 研究了基于视线制导的共面航天器自主交会控制。为便于设计适用于自主交会的控制方法，首先建 立了视线坐标系相对运动方程，然后基于相对测量信息分别设计了纵向和法向控制器。纵向控制器是基于零 控脱靶量算法所设计的一种新的自适应控制方法，完成交会速度和位置控制;法向控制器是一种姿态约束PI 型比例导引，实现交会视线角的控制。所设计的控制器对不同初始交会条件具有良好的适应性。对圆和椭圆 轨道交会仿真结果证明了该控制方法是有效可行的。

Abstract: The control strategies based on line‐of‐sight（LOS）guidance for coplanar autonomous rendezvous were presen‐ted. The relative equations described in the local orbital frame were transformed into LOS frame. In the LOS frame, the rendezvous controllers along LOS and perpendicularly to LOS directions were designed respectively. To meet the re‐quirements of relative positions and velocities in the rendezvous, a new adaptive controller in the LOS direction based on zero‐effort‐miss（ZEM）was designed. Then, a modified proportional navigation guidance law with LOS angle con‐straint was used to control the LOS angle in rendezvous process. The controllers can be implemented only using the rel‐ative motion information between rendezvous spacecraft and are insensitive to initial condition. Numerical simulations for the target spacecraft both on circular and elliptical orbits were given to validate feasibility of the control strategies.

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