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### 航天器椭圆轨道自主交会的自适应学习控制策略

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### Adaptive Learning Control Strategy for Autonomous Rendezvous of Spacecrafts on Elliptical Orbit

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摘要

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**摘要** 提出了一种在缺少绝对轨道信息时的航天器椭圆轨道自主交会方法。利用Lawden方程描述椭圆轨道下的两星相对运动关系，并将方程中的时变参数单独归类。在假设这些时变参数无法得到的情况下，采用Lyapunov方法设计了椭圆轨道下自主交会的参数估计规则和自适应学习控制律。仿真结果表明，在只有相对状态信息的情况下，估计参数有效地跟踪了真实参数的变化，所设计的控制律能够实现椭圆轨道下航天器的自主交会。

**关键词：** 空间交会 Lyapunov方法 自适应算法 学习法则 参数估计

**Abstract:** An approach for spacecraft autonomous rendezvous in an elliptical orbit without orbit information is developed. Lawden equation is used to describe the relative motion of two spacecrafts, and all the variable parameters in the equation are classified. With the assumption that the variable parameters are unavailable, a parameter estimate rule and an adaptive learning control law for autonomous rendezvous in the elliptical orbit are designed via Lyapunov methods. Simulation results indicate that the estimated parameters track the real parameters effectively. Meanwhile the adaptive learning control law can realize autonomous rendezvous in the elliptical orbit with relative state information only.

**Keywords:** space rendezvous Lyapunov methods adaptive algorithms learning algorithms parameter estimation

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