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追踪器本体坐标系下航天器姿轨一体化控制律设计

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Integrated orbit and attitude control for spacecraft in body fixed coordinate of chaser

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摘要 图/表 参考文献(17) 相关文章 (15)

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摘要

在追踪航天器本体坐标系下, 联合相对轨道动力学模型和四元素姿态动力学模型, 引入推进器配置矩阵, 建立六自由度姿态和轨道一体化模型. 该模型避免了控制输入向追踪器本体坐标系下的转换. 在此基础上, 采用输入-状态(ISS) 稳定性原理, 在干扰输入信息完全未知的情况下, 设计了非线性鲁棒一体化控制律. 该控制律实现了对椭圆轨道上目标航天器的扰动抑制和跟踪, 具有较好的鲁棒性和跟踪性. 最后, 针对运行在椭圆轨道上的目标给出仿真结果, 表明了所提出的一体化控制律的可行性和有效性.

关键词 ： 姿轨一体化, 六自由度, 输入- 状态稳定性, 鲁棒性

Abstract :

A robust coupled six degree of the freedom integrated orbit and attitude control model is derived in the body fixed coordinate of the chaser spacecraft. Relative translation and attitude dynamics are both presented, and further the thruster layout is considered. This model avoids that the proposed control forces need to be transformed to the body fixed coordinate. Based on this model, a nonlinear robust integrated orbit and attitude control law is proposed by using input-
to-state stability(ISS) in the presence of unknown bounded disturbance. Based on the obtained integrated control law, the desired force is produced to achieve robust tracking of a spacecraft target, and suppressing the unknown bounded disturbance. Finally, the algorithm is tested by using computer simulations against a spacecraft target in elliptic orbit.

Key words : integrated orbit and attitude control 6-DOF input-to-state stability robustness

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