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卫星姿态跟踪的间接自适应模糊预测控制

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摘要 对含模型不确定性和未知干扰的卫星姿态系统提出了具有间接自适应模糊补偿的广义预测跟踪控制方法. 首先基于卫星姿态动力学模型设计了非线性广义预测控制律, 再利用自适应模糊系统逼近预测控制律中的模型不确定项, 使得所得到的预测控制算法可实施. 证明了当卫星姿态模型中不确定项满足一定条件时, 所设计的控制律可使卫星姿态跟踪误差收敛到原点的小邻域内,并仿真结果验证了所提出方法的有效性.

关键词 卫星姿态控制, 广义预测控制, 自适应模糊控制.

分类号

Indirect Adaptive Fuzzy Predictive Control for Attitude Tracking of Satellites

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Abstract An indirect adaptive fuzzy generalized predictive tracking control strategy for satellite attitude systems with modeling uncertainty and unknown external disturbances is presented in this paper. First, a nonlinear generalized predictive control law is designed based on the satellite attitude dynamical model;then, adaptive fuzzy systems are constructed to approximate model uncertainties in the predictive control law such that the obtained control algorithm can be implemented. It is proved that by using the proposed controller, satellite can track the desired attitude trajectory and the tracking error converges to a small neighborhood of the origin. Simulation results show the effectiveness of the method.

Key words Satellite attitude control generalized predictive control adaptive fuzzy control.

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