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基于区间特性和变量软约束的模型预测控制算法

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Model predictive control algorithm based on interval characteristic and variable soft constraint

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摘要

针对传统的区间模型预测控制算法的性能指标函数设计复杂, 以及被控变量进入区间后稳态轨迹变化幅度大的缺点, 提出一种区间特性和变量软约束的模型预测控制算法. 该算法仅利用期望输出区间的上下限, 通过预测输出与区间的等式关系构造区间跟踪偏差项, 同时利用预测输出和操作变量的增量二次型构造变量软约束项, 减小区间内的稳态轨迹的变化幅度, 上述两项合称为软约束区间跟踪性能指标项. 以回转窑模型为被控对象进行仿真, 表明了算法的有效性.

关键词 : 模型预测控制, 区间跟踪, 稳态轨迹, 软约束

Abstract :

As the disadvantages of cumbersome designing for the performance index function of the traditional zone model predictive control algorithm and steady state trajectories vary a lot after the controlled variable comes into the interval, a novel model predictive control algorithm is proposed based on interval characteristic and variable soft constraint. This algorithm only utilizes the desired output interval limits to construct the interval tracking bias term by an equivalent relation between the predictive output and the interval. The variable soft control term is constructed through the the quadratic form of increase of the prediction output controlled variable and operating variable, which contributes to reducing the range of steady-state track in the interval, then the above two are collectively referred to as zone tracking performance index based on variables soft constraint. The simulation experiment is carried out by taking the rotary kiln model as the controlled object, which validates the effectiveness of the proposed algorithm.

Key words : model predictive control range tracking steady-state trajectory soft constraint

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