



## 论文摘要

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### 基于极大代数法的铝板轧制系统鲁棒性能

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**摘要:** 为了优化铝板轧制的时间, 提高系统的鲁棒性, 以极大代数法和排队论为工具, 对铝板多队列轧制系统进行分析。根据轧机与工件之间的工艺路径规则和加工条件规则, 以极大代数法为理论依据建立轧制控制系统的闭环控制模型, 对极大代数法的运算特性进行分析; 构造轧制过程的多队列多服务器模型; 定义多队列系统中参数摄动和鲁棒性的概念; 用基于极大代数法的串行生产线的闭环线性模型来研究采用不同的铝板轧制队列对系统稳态周期性能的影响; 以轧制过程的最短生产周期为优化目标, 运用摄动分析对系统的多个调度队列的性能进行比较讨论, 从而通过周期配置得到铝板轧制的优化调度方案。分析结果表明: 基于极大代数法的系统分析能有效地对调度队列的摄动性进行比较, 从而改善了轧制系统的鲁棒性, 缩短了系统总运行时间, 提高了运行效率。

**关键字:** 极大代数法; 离散事件动态系统; 鲁棒性; 摄动分析; 优化调度

### Robustness performance of aluminum plate rolling system based on maximum algebra method

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**Abstract:** In order to decrease aluminum plate rolling time and enhance system robustness, the aluminum plate rolling multi-queue system was analyzed by max algebra theory and queue theory. Based on the technologic route rules and process condition rules between machine tools and work pieces, a rolling control system closed-loop model was built up by max algebra and the computing character of maximum algebra was introduced. Moreover, multi-server/ multi-queue system model for rolling process was built. The concepts of parameter perturbation and robustness were defined. The influence of system stable cycle in different kinds of aluminum plates rolling queues was studied by the product lines closed-loop model. Taking the minimum production period as the optimal object, perturbation analysis was made to evaluate the different queues performances. The results show that the optimal scheduling plan can be obtained on the basis of period assignment method. The perturbation performance in scheduled queues can be compared by maximum algebra theory. The system robustness is improved and the total system running time is decreased. The system efficiency is improved by the scheduling method.

**Key words:** maximum-algebra; discrete event dynamic system; robustness; perturbation analysis; optimal scheduling

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