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论文与报告

基于LMI优化的主动悬架多目标控制

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摘要
首先将汽车主动悬架的控制问题归结为有时域硬约束的鲁棒干扰抑制问题.在多目标控制框架下,基于线性矩阵不等式(LMI)优化技术,提出了一种H_2/广义H_2混合控制策略:利用广义H_2范数描述系统的时域硬约束,同时选择H_2范数最小化系统的性能输出,最终将系统的控制律归结为求解具有LMI约束的半定规划问题.以半车模型为例设计了主动悬架控制器,并给出了较全面的分析和仿真结论.最后利用快速原型(RCP)和硬件在回路仿真(HILS)一体化技术进一步验证所提方法的有效性和可行性.

关键词 主动悬架 时域硬约束 H2性能 广义H2性能 硬件在回路仿真
分类号

Multi-objective Control Design for Active Suspensions: An LMI Approach

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Abstract
This paper formulates the active suspension control problem as a disturbance attenuation problem with time-domain hard constraints. In the framework of multi-objective control, this paper suggests a mixed H_2/generalized H_2 control strategy based on LMI optimization for the disturbance attenuation problem with constraints: the generalized H_2 norm is adapted to capture requirements of satisfying time-domain hard constraints and the H_2 norm is used to minimize the performance output. The control problem with hard constraints is converted to an LMI based semidefinite programming problem. Analysis and simulation results for a half-car model are presented. Finally, integrative real-time experiments of RCP and HILS were made to validate the proposed control approache.

Key words Active suspensions time-domain hard constraints H2 performance generalized H2 performance HILS

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