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加速度计组合件高精度两级鲁棒温度控制

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High Precision Two-stage Robust Temperature Control for Accelerometer Unit

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摘要

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摘要 将存在多个工作环境的加速度计组合件两级温度控制系统的受控对象描述为存在有界干扰和非线性不确定性(包括系统的建模误差和两个控制通道间的相互耦合)的两输入两输出非线性时变不确定系统, 提出了一种基于信号补偿的鲁棒温度控制方法。该方法设计的控制器由标称控制器和鲁棒补偿器组成。此控制器为线性定常的, 易于物理实现。证明了闭环系统的鲁棒控制特性, 实验结果显示所设计的控制系统能够在多个工作环境下实现加速度计组合件内部和外部的低精度鲁棒温度控制。

关键词: 控制理论与控制工程 温度控制 鲁棒控制 加速度计 多工作点

Abstract: An accelerometer unit two-stage temperature control system with multi-operating conditions is described as a two-input two-output nonlinear time varying uncertain system with bounded disturbance and nonlinear uncertainty. The nonlinear uncertainty comprises system modeling error and the coupling of two interacting control channels. A robust temperature control method based on signal compensation is proposed. A controller designed by this method consists of a nominal controller and a robust compensator. The controller is linear time invariant and can be realized easily. Robust control property of the closed-loop system is proven and experimental results show that the designed control system can guarantee high precision robust control of both the interior and exterior temperature of the accelerometer unit under multi-operating conditions.

Keywords: control theory and control engineering temperature control robust control accelerometer multi-operating points

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