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## 涡扇发动机传感器故障诊断的快速原型实时仿真

### Rapid prototype real-time simulation of turbo-fan engine sensor fault diagnosis

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中文关键词: [涡扇发动机](#) [传感器](#) [故障诊断](#) [快速原型](#) [实时仿真](#)

英文关键词: [turbo-fan engine](#) [sensor](#) [fault diagnosis](#) [rapid prototype](#) [real-time simulation](#)

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中文摘要:

为快速高效地完成涡扇发动机传感器故障诊断算法的硬件在环仿真试验, 构建了以NI CompactRIO为核心的传感器故障诊断系统的快速原型实时仿真平台. 基于一簇卡尔曼滤波器, 在LabVIEW编程环境中建立了传感器故障诊断系统. 分别在涡扇发动机模型稳态和动态工作时完成了对单个传感器故障的检测、隔离和重构的硬件在环仿真试验并验证了算法精度. 经过大量试验, 结果表明: 基于卡尔曼滤波器理论的诊断算法能在传感器故障情况下确保控制系统安全运行, 诊断精度最高可达1.4%; 同时表明, 该快速原型实时仿真平台的设计是成功的. 研究工作为发动机传感器故障诊断系统的半物理仿真试验奠定了基础.

英文摘要:

Centered on NI (National Instruments) CompactRIO, a real-time simulation platform with rapid prototyping was built to validate the fault diagnosis approaches for turbo-fan engine sensors rapidly and efficiently. Based on a bank of Kalman filters, an turbo-fan engine sensor fault diagnostics system was developed in LabVIEW environments. Extensive experiments were conducted for the fault detection, isolation and restructuring of individual sensor faults, at both steady state and dynamic conditions. The accuracy of the proposed algorithm was thus verified. Experimental results showed that Kalman filter algorithm could ensure safe operation of engine control system even in the case of sensor failures, the best accuracy of diagnosis reached 1.4%, and the effectiveness of this rapid prototype real-time platform for sensor fault diagnosis was also shown. Consequently, the developed platform could be taken as the foundation for semi-physical tests.

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