

## 基于扩展滤波器的非线性系统迭代学习故障诊断算法

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## Iterative learning fault diagnosis algorithm for nonlinear systems based on extended filter

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摘要

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## 摘要

针对一类存在执行器和传感器故障的非线性系统, 提出基于滤波器的故障重构方法. 为了使算法同时适用于状态和输出端, 通过由系统方程构造新状态方程对系统作扩展变换, 将原系统输出端非线性和故障转换到扩展系统的状态方程, 在此基础上设计故障诊断滤波器, 采用迭代学习调节算法更新虚拟故障使之逼近实际故障. 该算法可以检测和估计系统故障, 并且对不同类型故障具有一定的适应性. 在单关节机器人模型上进行仿真实验, 实验结果验证了所提出算法的可行性和有效性.

**关键词:** 非线性系统, 系统扩展, 故障诊断滤波器, 虚拟故障, 迭代学习

## Abstract:

A fault reconstruction approach based on the filter is proposed for nonlinear systems with actuator and sensor fault. To make the algorithm applicable to both state and output sides, a new state equation is constructed by the system equation to transform and extend the system, which can convert nonlinear terms and fault of original system output to the state equation of the extended system. Afterwards, a fault diagnosis filter based on the iterative learning algorithm is chosen to update virtual fault to make it approximate to actual fault, and the algorithm can detect and estimate the system faults of different types adaptively. Simulation results of a single-joint robot show the feasibility and effectiveness of the proposed algorithm.

**Key words:** nonlinear system system extension fault diagnosis filter virtual fault iterative learning

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