工程与应用

卡尔曼滤波器在传感器软故障诊断中的应用

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摘要　　传感器发生软故障的特征是变化缓慢、不易检测。为克服传感器检测这一缺点设计了一种软故障诊断算法。该算法是在多重故障假设基础上，使用卡尔曼滤波器产生残差，采用加权二乘方（Weighted Sum of Squared Residuals，WSSR）方法对滤波残差进行处理，从而方便快速地检测出传感器的软故障，并实现隔离和重构。仿真实验表明，算法能很好地实现传感器软故障的检测、隔离和重构，不会发生误报和漏报现象。

关键词　　传感器软故障　卡尔曼滤波器　多重假设检验

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Kalman filter applied on diagnosis of sensor soft failure detection

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Abstract

Soft sensor failures，although small bias errors or drift errors that accumulate slowly with time，if undetected，may result in degraded or unsafe.Therefore the algorithm capable of detecting soft failures can be designed.The algorithm based on multiple-hypothesis-based testing，accumulate residuals with Kalrman filter.Likelihood ratio is generated for each set of residuals.A test is then performed which determines the most probable set of residuals by finding the maximum.When this maximum is above an isolation threshold，the faulty sensor is isolated and accommodation.From the simulation result，the algorithm can detect fault in time with no misinformation，and Kalman filter can accommodate fault sensors signal with legitimacy.

Key words　sensor soft failure　Kalman filter　multiple-hypothesis-based testing

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