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一种基于LS-SVM 的联邦滤波故障检测方法

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Fault detection method based on LS-SVM for federated Kalman filter

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摘要

针对??2 检验法在组合导航系统联邦滤波故障检测中的不足, 提出一种基于最小二乘支持向量机(LS-SVM) 的故障检测方法, 即在LS-SVM 对子滤波器新息进行预测的基础上构造故障检测量. 以捷联惯导/卫星/天文组合导航系统为应用平台, 采用无重置的联邦滤波对子系统突变和渐变两种故障的检测进行了仿真分析. 仿真结果表明, 所提出的LS-SVM 检测法比残差??2 检验法具有更好的故障检测能力, 由此验证了方法的有效性.

关键词 ： 组合导航；故障检测；最小二乘支持向量机；联邦滤波

Abstract：

Aiming at the shortage in ??2 detection methods, a fault detection method based on least squares support vector machine(LS-SVM) is proposed for federated Kalman filter in integrated navigation system, which constructs the fault detection variable based on the forecasted residual by using LS-SVM. Based on the strapdown inertial navigation system/
global navigation satellite system /celestial navigation system integrated navigation system platform, the simulation faults of
mutation and transition in the subsystem are detected by using the LS-SVM method and residual ??2 detection method, which
is analyzed by using the no-reset federated Kalman filter model. The result of experiment shows that the fault detection ability of the LS-SVM method is better than that of the residual ??2 detection method, which shows the effectiveness of the
proposed LS-SVM method.

Key words： integrated navigation ; fault detection ; least squares support vector machine ; federated Kalman filter

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