

Weighted-Median Based Distributed Fault Detection for Wireless Sensor Networks

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Abstract

The existence of faulty sensor measurements in wireless sensor networks (WSNs) will cause not only a degradation of the network quality of service but also a huge burden of the limited energy. This paper investigates using the spatial correlation of sensor measurements to detect the faults in WSNs. Specially, (1) a novel approach of weighting the neighbors' measurements is presented, (2) a method to characterize the difference between sensor measurements is introduced, (3) a weighted median fault detection scheme (WMFDS) is proposed and evaluated for both binary decisions and real number measurements. Theoretical analysis and simulation results show that the proposed WMFDS can attractively obtain the high detection accuracy and considerably reduce the false alarm probability even in the existence of large fault sets. It is demonstrated that the proposed WMFDS is of excellent performance in fault detection for WSNs.

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摘要

无线传感器网络中的错误测量数据会导致网络服务质量下降和能量浪费.提出了一种通过融合邻居节点的测量数据来实现故障检测的策略.主要做了以下3项工作:(1) 提出了一种新颖的对邻居节点测量数据进行加权的方法;(2) 提出了一种衡量测量数据之间差距的方法;(3) 提出了基于加权中值的故障诊断策略WMFDS(weighted median fault detection scheme),它同时适用于二进制决策和实数测量值.理论分析及仿真结果表明,即使节点发生故障的概率很高,提出的诊断策略也能得到很高的检测精度和较小的误判率,这表明在无线传感器网络故障检测中应用该方法具有很好的性能.

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