无线传感器网络环境下的一种轻量级事件容错检测算法

作　者：董传明, 刘克中, 罗广, 金湖庭

单　位：武汉理工大学

摘　要：

由于节点经常布置于恶劣的环境中以及节点自身资源的有限性，节点在运行过程中容易发生漏警错误和虚警错误，因此容错的事件检测方法受到了广泛的重视与研究。但传统方法在性能上表现出计算复杂度高和能耗大的特点，针对此，本文引入雷达目标检测中Cth/m的检测思想，提出一种基于时空特性的检测方法。该方法通过观察节点采样值数据变化率与时间特性相似度来判断是事件发生还是节点出错。方法在一次迭代过程中，节点只需做m次距离比较和一次邻居状态查询，根据节点间的空间特性做出决策，表现出轻量级和低能耗的特点。仿真表明，方法还具有较低的漏警率和虚警率以及较高的故障识别率。此外，由于引入了节点可信度自适应调整机制，方法能够保证事件检测概率在迭代过程中一直保持较高水平，而不随时间恶化。

关键词：无线传感器网络；事件检测；容错；时空特征

A Light Weight Fault-tolerant Event Detection Method in Wireless Sensor Networks

Author's Name:

Institution:

Abstract:

Due to harsh environment and limited resources, nodes are prone to missed alarm and false alarm errors when in the process of running, so fault-tolerant event detection methods attract much attention in recent years. But traditional algorithms showed high computational complexity and high energy consumption. Aim at this, we adopt the Cth/m detection idea in radar target detection, and propose a detection method based on spatial-temporal characteristics. By observing the agreement between sample's changing rate and the spatial-temporal characteristics, nodes can determine whether event happens or error occurs. During the detecting process, nodes are only required to do m times distance comparison and one time neighbor query, then it can make decision, reflecting the light weighting and low power consumption characteristics of the method. Simulation results show that the method also has lowe missed alarm rate and false alarm rate, and high fault recognition rate. In addition, as credibility adaptive adjustment mechanism is introduced, the method can ensure event detection probability maintained at a high level in the iterative process and not deteriorate over time.

Keywords: wireless sensor networks; event detection; fault tolerant; spatial-temporal characteristics

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