

软件、算法与仿真

基于免疫系统的无线传感器网络性能优化

陈拥军, 袁慎芳, 吴键, 张英杰

(南京航空航天大学智能材料与结构航空科技重点实验室, 江苏 南京210016)

摘要:

根据免疫系统B细胞和T细胞模型,建立人工免疫系统与无线传感器网络间的相似关系,提出一种邻域节点选择算法,以判断传感器节点是否被激活。由于事件信息传递到汇聚节点会产生偏差,利用时空相关理论和自适应最小均方误差滤波算法,建立偏差与激活节点数目及偏差与节点通信频率之间的关系,确定传递事件信息所需最少激活节点数和最佳通信频率。不同条件下仿真结果表明,这种无线传感器网络优化策略能起到减少节点数目、降低通信频率及节约能耗的效果。

关键词: 人工免疫系统 无线传感器网络 时空间相关性 传感器网络优化

Performance optimization for wireless sensor networks based on immune system

CHEN Yong-jun, YUAN Shen-fang, WU Jian, ZHANG Ying-jie

(The Aeronautical Science Key Laboratory of Smart Material and Structure, Nanjing Univ. of Aeronautics and Astronautics, Nanjing 210016, China)

Abstract:

According to the B-cell and T-cell model of immune systems, the similarity between artificial immune system and wireless sensor networks is compared. A neighborhood node selection algorithm is proposed to decide if a sensor node is activated or not. Considering the feature of event estimation distortion at the sink node, the relations between distortion and number of activated sensor nodes as well as distortion and reporting frequency are constructed by the spatial-temporal correlation and adaptive least mean square filter. The minimum number of sensor nodes and the best reporting frequency are achieved. The simulation results in different conditions show that the optimization strategy for wireless sensor networks has the capability of reducing the number of sensor nodes, decreasing the reporting frequency and saving energy consumption.

Keywords: artificial immune system wireless sensor network spatial-temporal correlation sensor network optimization

收稿日期 修回日期 网络版发布日期

DOI: 10.3969/j.issn.1001-506X.2010.05.040

基金项目:

通讯作者:

作者简介:

作者Email:

参考文献:

本刊中的类似文章

1. 陈杰, 易本顺. 集中式无线传感器网络TDMA优化调度方案[J]. 系统工程与电子技术, 2010,32(1): 200-204
2. 曹红兵, 魏建明, 刘海涛. 无线传感器网络中基于粒子群优化的目标识别方法[J]. 系统工程与电子技术, 2010,32(05): 1014-1018
3. 杨文俊, 汪秉文, 尹安, 胡晓娅. 基于订阅分解的无线传感器网络中间件[J]. 系统工程与电子技术, 2010,32(2): 433-436

扩展功能

本文信息

▶ Supporting info

▶ PDF(OKB)

▶ [HTML全文]

▶ 参考文献[PDF]

▶ 参考文献

服务与反馈

▶ 把本文推荐给朋友

▶ 加入我的书架

▶ 加入引用管理器

▶ 引用本文

▶ Email Alert

▶ 文章反馈

▶ 浏览反馈信息

本文关键词相关文章

▶ 人工免疫系统

▶ 无线传感器网络

▶ 时空间相关性

▶ 传感器网络优化

本文作者相关文章

PubMed