

基于反向生成CDS树的无线传感器网络拓扑控制算法研究

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摘要:

拓扑控制是无线传感器网络中一种有利于节约能量、延长网络生命周期的策略。作为一种著名的基于CDS树的拓扑控制机制, A3算法的目标是在保证网络连通和通信覆盖的前提下, 通过关闭一些非必要节点来获得一个次优连通支配集(CDS)。本文针对A3算法在构建连通支配集时通信开销较大的问题, 提出了一种基于叶节点反向生成CDS树的改进型算法A3G。该算法利用反向拓扑方法来寻找连通支配集, 减少了节点间的信息交换。仿真结果显示, 相对于A3算法和一些其他著名的拓扑控制算法, A3G算法在活动节点数和能效方面具有明显的优越性。

关键词: 拓扑控制; 无线传感器网络; A3算法; 连通支配集; 通信开销; 通信覆盖

A Topology Control Algorithm Based on Reversely-Constructed CDS Tree for Wireless Sensor Networks

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Abstract:

Topology control is a strategy to save energy and extend the lifetime of wireless sensor networks. As a famous topology control mechanism based on CDS tree, the A3 algorithm aims to find a sub-optimal Connected Dominating Set (CDS) by turning off unnecessary nodes, under condition of keeping the network connectivity and communication coverage. In light of the problem of high communication overhead in the A3 algorithm, we propose an improved algorithm named A3G, which constructs the CDS tree reversely from leaf nodes upwards. The algorithm reduces the amount of information exchange between the nodes. As shown by simulation results, the A3G algorithm outperforms the A3 algorithm and other well-known topology construction algorithms, in terms of the number of active nodes and energy efficiency.

Keywords: Topology control; wireless sensor networks; A3 algorithm; connected dominating sets (CDS); communication overhead; communication coverage.

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