

无线传感网优化生存时间的分布式功率控制

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摘要：

为了延长无线传感网的生存时间，提出优化生存时间的分布式功率控制算法(DPCOL)。该算法分析节点发送功率变化下的链路流量平衡约束，链路最大传输速率约束，节点能耗约束等条件，建立最大化生存时间的网络模型。采用分布式功率迭代和次梯度算法求解该模型。节点获知与各邻居节点通信所需要的最低发送功率集，随机选择发送功率集中的功率作为当前发送功率，接收邻居节点的参数信息，初始化自身参数，并通过次梯度算法分布式计算节点生存时间。经过一定时间的迭代计算，可获得网络局部最优生存时间，各个节点局部最优发送功率和当前的数据转发概率。仿真实验表明，该算法可以平衡节点能耗和邻居节点数量，延长网络生存时间，在一定的条件下比采用固定发送功率的算法更优。

关键词：无线传感网；功率控制；次梯度；网络生存时间

Distributed Power Control for Optimizing Lifetime in Wireless Sensor Networks

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Abstract:

To prolong the lifetime in wireless sensor networks, distributed power control algorithm for optimizing lifetime (DPCOL) is proposed. The algorithm analyzes the conditions such as link flow balance constraint, link constraint for maximum transmission rate and node energy constraint when node transmission power changes. It establishes the network module for maximum lifetime. To solve the model, distributed power iteration and subgradient algorithm are used. Nodes obtain the minimum transmission power set needed to communicate with neighbors, randomly select the current transmission power in the set, receive the parameter information of neighbor nodes, initialize their own parameters and distributed compute node lifetime with subgradient algorithm. After a certain time of iteration, DPCOL can obtain the local optimal network lifetime, local optimal transmission power of each node and current data forwarding probability. Simulation results show that the algorithm can balance node energy consumption and the number of neighbor nodes, and prolong the network lifetime. Under certain conditions, DPCOL algorithm outperforms the algorithm which uses fixed transmission power.

Keywords: Wireless sensor networks; Power Control; Subgradient; Network Lifetime

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