压缩感知的能量异构WSN分簇路由协议

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摘　要：

分簇路由协议对用于环境监测的无线传感器网络具有较好的节能性，数据压缩可以减少节点通信的数据量，但增加了分簇层次结构簇头的能耗和汇聚节点算法的复杂度，而由高能力节点担任簇头可以实现能量均衡并改善网络性能。针对无线传感器网络能量异构普遍存在的特点，提出了一种基于压缩感知的能量异构分簇路由协议（CSCH算法）。该算法根据异构节点能量确定多极簇头选举的概率，将簇内节点的信息集中在簇头上，而簇头对所采集的数据进行稀疏、压缩，以减少向汇聚节点传输数据的节点数和通信量，汇聚节点利用重构算法可从来自簇头的少量数据中恢复出信号源。同时设计了一种基于正态分布的权值系数，以优化在数据量过少情况下压缩感知算法的信号重构性能。仿真实验结果表明，该协议不仅能充分利用能量异构资源，均衡网络能耗，延长整个网络生命周期，而且能精确恢复信号源。

关键词：无线传感器网络；能量异构；压缩感知；路由协议；能量均衡

Compressed Sensing Clustering Routing Protocol for Energy Heterogeneous WSN

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Abstract:

The clustering routing protocol has better energy efficiency for environmental monitoring in wireless sensor networks(WSN)，data compression can reduce the amount of data of nodes’ communication, but increase the energy dissipation of cluster head and the complexity of the fusion center algorithm in clustering hierarchy. While choosing high-energy node as cluster head can achieve energy-balanced and improve network performance. Aiming at the characteristics of universal energy heterogeneous, we proposed a compressed sensing clustering routing protocol for the energy of heterogeneous wireless sensor networks (CSCH algorithm). The algorithm determines the probability of multilever cluster head election according to the energy of nodes, gathering the information of nodes in cluster to cluster head, then cluster head sparses and compress the gathering data to reduce the number of nodes and the amount of communication that needs to transmit data to the fusion center. The fusion center can restore signal source from a few data of cluster head using reconstruction algorithm. We also designed a weight coefficient based on normal distribution to optimize information reconstruction performance of compressed sensing algorithm in the case of lacking data. Simulation results show that this protocol not only takes full advantage of heterogeneous energy resources, balances energy dissipation of network and extends the lifetime of the entire network, but also accurately restore the signal source.

Keywords: wireless sensor networks；energy heterogeneous；compressed sensing；routing protocol；energy-balanced

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