

## 基于交叉流网络编码的节能路由

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## An Energy-saving Routing Based on Network Coding on Intersecting Flows

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摘要

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**摘要** 节能路由是无线自组织网络的一个重要研究课题,对延长网络生存时间极为重要。在传统路由下,多对节点之间通信使用的多条数据传递路径会出现交叉——存在公共节点,这些公共节点因需要转发来自多条交叉路径的数据包而比其它节点消耗更多的能量,从而过早因能量耗竭而失效。为了克服这一能耗不均衡问题,该文提出基于网络编码的节能路由NCBEER (Network Coding Based Energy Efficient Routing),它可捕捉多条路径交叉的机会,让公共节点对所转发的数据包进行编码,然后把编码数据包多播(Multicast)邻居节点,以减少公共节点转发数据包次数从而降低能耗;推导了编码节点使全部接收节点接收到编码数据包所需要的平均多播次数,定义了无线链路的传输代价,并将之作为信源将流量分配给不同路径的依据。仿真试验表明,NCBEER可降低和均衡节点的能耗,且能够延长网络生存时间。

**关键词:** 无线自组织网络 路由 网络编码 节能

**Abstract:** Energy-saving routing is one of the important topics in Wireless Ad hoc NETWORKS (WANETS), which is significant for prolonging network lifetime. Under convention routing, the data delivery paths, with each used by a pair of nodes, may intersect at some nodes, which causes these shared nodes to forward packets from multiple intersecting paths, making them expend more energy than other nodes and become invalid quickly due to energy depletion. To overcome the problem of uneven energy consumption among nodes, a Network Coding Based Energy Efficient Routing (NCBEER) is presented in this paper, which is able to capture the opportunity of path intersecting, allows the shared nodes to encode the forwarded packets, and multicasts the coded packets to neighboring nodes so that the number of transmissions and energy expenditure are reduced. In addition, the average number of multicasts for a coding node to guarantee the coded packet to be received by all the receiving nodes is derived; and the delivery cost of a wireless link is defined, which is used by NCBEER to dispatch packets to different paths. Simulation shows that NCBEER is able to reduce and balance energy expenditure of nodes and network lifetime is prolonged.

**Keywords:** Wireless Ad hoc network Routing Network coding Power saving

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