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异构传感器网络的分布式能量有效成簇算法

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Abstract

In order to prolong the network lifetime, energy-efficient protocols should be designed to adapt the characteristic of wireless sensor networks. Clustering Algorithm is a kind of key technique used to reduce energy consumption, which can increase network scalability and lifetime. This paper studies the performance of clustering algorithm in saving energy for heterogeneous wireless sensor networks. A new distributed energy-efficient clustering scheme for heterogeneous wireless sensor networks is proposed and evaluated. In the new clustering scheme, cluster-heads are elected by a probability based on the ratio between residual energy of node and the average energy of network. The high initial and residual energy nodes will have more chances to be the cluster-heads than the low energy nodes. Simulation results show that the clustering scheme provides longer lifetime and higher throughput than the current important clustering protocols in heterogeneous environments.

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摘要

为了延长网络的生存时间,需要设计能量有效的协议,以适应传感器网络的特点.成簇算法是传感器网络中减少能量消耗的一种关键技术,它能够增强网络的扩展性和延长网络的生存时间.研究了异构传感器网络中成簇算法在节省能量方面的性能,提出一种适应异构无线传感器网络的分布式能量有效的成簇方案.此方案基于节点剩余能量与网络节点的平均能量的比例来选举簇头节点.较高初始能量和剩余能量的节点比低能量节点拥有更多的机会成为簇头节点,从而使网络能量均匀消耗,延长网络的生存时间.模拟实验结果显示,与现有的重要成簇方案相比,新的成簇算法在异构网络下提供了更长的网络生存时间和更大的网络有效吞吐量.

References:

- [1] Akyildiz I, Su W, Sankarasubramaniam Y, Cayirci E. A survey on sensor networks. *IEEE Communications Magazine*, 2002,40(8): 102-114.
- [2] Krishna P, Vaidya NH, Chatterjee M, Pradhan D. A cluster-based approach for routing in dynamic networks. *Proc. of the ACM SIGCOMM'97*, 1997,27(2):49-65.
- [3] McDonald B, Znati T. Design and performance of a distributed dynamic clustering algorithm for ad-hoc networks. In: Jacobs A, ed. *Proc. of the Annual Simulation Symp.* New York: IEEE Press, 2001. 27-35.

- [4] Mhatre V, Rosenberg C, Kofman D, Mazumdar R, Shroff N. Design of surveillance sensor grids with a lifetime constraint. In: Karl H, Willig A, Wolisz A, eds. Proc. of the EWSN 2004. Berlin: Springer-Verlag, 2004. 263-275.
- [5] Heinzelman WR, Chandrakasan AP, Balakrishnan H. Energy-Efficient communication protocol for wireless microsensor networks. In: Proc. of the HICSS 2000. 2000. 3005-3014.
- [6] Ni SY, Tseng YC, Chen YS, Sheu JP. The broadcast storm problem in a mobile ad hoc network. In: Kodesh H, ed. Proc. of the ACM/IEEE MobiCom'99. New York: ACM Press, 1999. 151-162.
- [7] Estrin D, Govindan R, Heidemann J, Kumar S. Next century challenges: Scalable coordination in sensor networks. In: Kodesh H, ed. Proc. of the ACM/IEEE MobiCom'99. New York: ACM Press, 1999. 263-270.
- [8] Duarte-Melo EJ, Liu M. Analysis of energy consumption and lifetime of heterogeneous wireless sensor networks. In: Wang CH, Lee Y, eds. Proc. of the GLOBECOM 2002. New York: IEEE Press, 2002. 21-25.
- [9] Smaragdakis G, Matta I, Bestavros A. SEP: A stable election protocol for clustered heterogeneous wireless sensor networks. In: Proc. of the Int'l Workshop on SANPA 2004. 2004.
- [10] Heinzelman WR, Chandrakasan AP, Balakrishnan H. An application-specific protocol architecture for wireless microsensor networks. IEEE Trans. on Wireless Communications, 2002,1(4):660-670.
- [11] Lindsey S, Raghavendra CS. PEGASIS: Power efficient gathering in sensor information systems. In: Williamson DA, ed. Proc. of the IEEE Aerospace Conf. Vol 3, New York: IEEE Press, 2002. 1125-1130.
- [12] Younis O, Fahmy S. HEED: A hybrid, energy-efficient, distributed clustering approach for ad hoc sensor networks. IEEE Trans. on Mobile Computing, 2004,3(4):660-669.
- [13] Mhatre V, Rosenberg C. Design guidelines for wireless sensor networks: communication, clustering and aggregation. Ad Hoc Network Journal, 2004,2(1):45-63.
- [14] Ye M, Li C, Chen G, Wu J. EECS: An energy efficient cluster scheme in wireless sensor networks. In: Dahlberg T, Oliver R, Sen A, Xue GL, eds. Proc. of the IEEE IPCCC 2005. New York: IEEE Press, 2005. 535-540.
- [15] Depedri A, Zanella A, Verdone R. An energy efficient protocol for wireless sensor networks. In: Proc. of the AINS 2003. Menlo Park, 2003. 1-6.
- [16] Bandyopadhyay S, Coyle EJ. An energy efficient hierarchical clustering algorithm for wireless sensor networks. In: Mitchell K, ed. Proc. of the INFOCOM 2003. Vol 3, New York: IEEE Press, 2003. 1713-1723.
- [17] Banerjee S, Khuller S. A clustering scheme for hierarchical control in multi-hop wireless networks. In: Bauer F, Cavendish D, eds. Proc. of the INFOCOM 2001. Vol 2, New York: IEEE Press, 2001. 1028-1037.
- [18] Krishnan R, Starobinski D. Message-Efficient self-organization of wireless sensor networks. In: Yanikomeroglu H, ed. Proc. of the IEEE WCNC 2003. Vol 3, New York: IEEE Press, 2003. 1603-1608.
- [19] UCN/LBL/VINT, Network simulator-NS2. 1995. <http://www.isi.edu/nsnam/ns/>