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Review on Improving Network Topology Lifetime by Optimal Node Position Clustering

Dhara Narendra Shah
Department of Computer Science and Engineering, Gondvana University, Bit,Balharsha, Maharashtra, India

Abstract—

Wireless sensor network(WSN) is facing key challenges like extending network lifetime due to sensor nodes having limited power supplies. Extending WSN lifetime is complicated because nodes often experience differential power consumption. For example, nodes closer to the sink in a given routing topology transmit more data and thus consume power more rapidly than nodes farther from the sink. Inspired by the huddling behavior of emperor penguins where the penguins take turns on the cold extremities of a penguin "huddle", we propose mobile node rotation, a new method for using low-cost mobile sensor nodes to address differential power consumption and extend WSN lifetime. Specifically, we propose to rotate the nodes through the high power consumption locations. We propose efficient algorithms for single and multiple rounds of rotations.

Keywords— ***Wireless sensor networks, network lifetime, energy optimization, mobile nodes, voronoi clustering technique, wireless routing***

I. INTRODUCTION

A wireless sensor network (WSN) is made up of tens to thousands of interconnected sensors that are randomly or deterministically deployed in a field of interest to monitor various environmental changes such as light, temperature, air pressure. Recent years have witnessed successful real-world deployments of wireless sensor networks (WSNs) in a wide range of civil and military applications. Sensing coverage and network connectivity are two of the most fundamental issues to ensure effective environmental sensing and robust data communication in a WSN application.

This paper presents fundamental studies on the sensing coverage and the network connectivity from mathematical modeling, theoretical analysis, and performance evaluation perspectives. Both lattice WSNs that follow a pattern-based deployment strategy and random WSNs that follow a random deployment strategy are considered. The aim of this chapter is to deliver a systematic study on the fundamental problems in WSNs and provide guidelines in selecting critical network parameters for WSN design and implementation in practice.

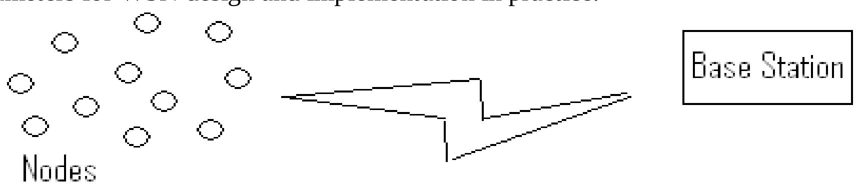

Fig. 1 Wireless Sensor Network(WSN)

II. BRIEF LITERATURE SURVEY

Several approaches have been proposed for extending the lifetime of a network. In general, they can be classified into four main groups: duty cycling, data reduction, topology control and controlled mobility. In duty cycling approaches [19], [20], [21], nodes alternate turning their power on and off and save their energy when they are turned off. In data reduction approaches, nodes reduce the amount of data that they generate and/or transmit and consequently reduce the energy consumed by the radio component. In topology control approaches, the main idea is to reduce the energy consumption by reducing the initial topology of the network. In this we reduce the transmission power to the minimum levels needed while keeping connectivity. In cluster based topologies are proposed. In contrast with our approach where nodes perform a physical rotation, cluster based approaches perform role rotation where nodes

switch between cluster head and cluster member. The last scheme for extending the lifetime is through controlled mobility. These approaches include mobile base stations, data mules, and mobile relays. In mobile station approaches, a powerful mobile base station node moves around the WSN and collects data from other nodes through one or multiple hops transmissions. The goal is to mitigate differential power consumption by rotating the set of nodes that are close to the base station. These approaches usually incur high latency because of the low speed of the mobile stations. In data mule approaches one or multiple mobile nodes, called mules, visit all the nodes in the network to collect the data and then physically carry the data to the sink. Similar to base station approaches, these approaches incur high latencies since nodes have to wait for a mule to pass by to transmit the data. In mobile relay approaches the mobile nodes in the network relocate to different positions to reduce the communication distances between nodes. Our approach shows several advantages over existing approaches. First, our simulations in Section 8 show that our approach significantly outperforms previous approaches in increasing network lifetime. Second, it can be applied in conjunction with duty cycling approaches to take advantage of the down time of nodes without significant additional interruption to the network. Third, compared to clustering approaches, our approach introduces significantly fewer.

III. PROBLEM FORMULATION

A. A wireless sensor network (WSN) is made up of tens to thousands of interconnected sensors that are randomly or deterministically deployed in a field of interest to monitor various environmental changes such as light, temperature, air pressure.
B. In a WSN, every sensor has a limited sensing range, denoted as rs, and a limited communication range, denoted as rc. The union of the sensing ranges of all sensors is defined as the network sensing coverage, which reflects how well the area of sensor field is monitored.
C. In addition, to communicate successfully, a WSN must provide satisfactory network connectivity, so as to eliminate the isolation of sensors and enable each sensor to report its sensing data to its fusion center. In order to understand the sensing coverage and network connectivity in a WSN, several fundamental models including network deployment model, sensing model, and communication model must be introduced.

IV. OBJECTIVE

We will present the analysis on sensing coverage, connectivity, and connected coverage for lattice WSNs following pattern-based deployment strategy and a random deployment strategy, respectively.

A. To improve the energy efficiency of the nodes.
B. To increase the system efficiency and make sure entire network is covered.
C. Our main objective is to improve the lifetime of the network by reducing this area, and making sure that the entire network is covered at the same time.
D. It will also improve the energy efficiency of the node, and thereby improve the lifetime of the network.

V. PROPOSED METHODOLOGY

The main contributions of this project are as follows:

A. Our motivation is to improve the lifetime of the network by reducing this area, and making sure that the entire network is covered at the same time.
B. To do this, we will be using **VORONOI** clustering. The **VORONOI** clustering technique will first divide the nodes into clusters.
C. Each cluster node will have the responsibility to cover only the area inside the cluster, which will reduce the network's dependency on the node to cover the area.
D. Thereby, if the node was covering the full area before, it needs to cover less than half of the area now. This will improve the energy efficiency of the node, and thereby improve the lifetime of the network.

VI. CONCLUSION

In this paper, we present a new node rotation paradigm for maximizing the lifetime of mobile WSNs. Our approach exploits the mobility of nodes to mitigate differential power consumption by having nodes take turns in high power consumption positions without modifying the existing topology. Our node rotation approach is very different than other schemes such as data mules in that all nodes expend relatively little energy on movement and move only a few times during the network lifetime.

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REFERENCES

[1] R. Szewczyk, A. Mainwaring, J. Polastre, J. Anderson, and D. Culler, “An analysis of a large scale habitat monitoring application,” in Proc. 2nd Int. Conf. Embedded Netw. Sensor Syst., 2004, pp. 214–226.
[2] M. Suzuki, S. Saruwatari, N. Kurata, and H. Morikawa, “A highdensity earthquake monitoring system using wireless sensor networks,” in Proc. 5th Int. Conf. Embedded Netw. Sensor Syst., 2007,
[3] L. Filipponi, S. Santini, and A. Vitaletti, “Data collection in wireless sensor networks for noise pollution monitoring,” in Proc. 4th IEEE Int. Conf. Distrib. Comput. Sensor Syst., 2008, pp. 492–497.
[4] IEEE Int. Conf. Distrib. Comput. Sensor Syst., 2008, pp. 492–497.pp. 373–374.S. Zhang, C. Zhu, J. K. O. Sin, and P. K. T. Mok, “A novel ultrathin elevated channel low-temperature poly-Si TFT,” *IEEE Electron Device Lett.*, vol. 20, pp. 569–571, Nov. 1999.
[5] (2002) The IEEE website. [Online]. Available: http://www.ieee.org/
[6] *Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification*, *IEEE* Std. 802.11, 1997.
[7] A. A. Somasundara, A. Ramamoorthy, and M. B. Srivastava, “Mobile element scheduling with dynamic deadlines,” IEEE Trans. Mobile Comput., vol. 6, no. 4, pp. 395–410, Apr. 2007.

[8] K. Dantu, M. Rahimi, H. Shah, S. Babel, A. Dhariwal, and G. S. Sukhatme, "Robomote: Enabling mobility in sensor networks," in *Proc. 4th Int. Symp*. Inf. Process. Sensor Netw., 2005, pp. 404–409.

[9] F. Mondada, E. Franzi, and A. Guignard, "The Development of Khepera," Experiments with the Mini-Robot Khepera, in Proc. 1st Int. Khepera Workshop, 1999, pp. 7–14.

[10] E.-S. Jung and N. H. Vaidya, "A power control MAC protocol for ad hoc networks," in Proc. 8th Annu. Int. Conf. Mobile Comput. Netw., 2002, pp. 36–47.

[11] Y. Shen, Y. Cai, X. Li, and X. Xu, "The restricted shortest-pathbased topology control algorithm in wireless multihop networks," IEEE *Commun. Lett.*, vol. 11, no. 12, pp. 937–939, Dec. 2007.

[12] A. Karnik, "Performance of TCP congestion control with rate feedback: TCP/ABR and rate adaptive TCP/IP," M. Eng. thesis, Indian Institute of Science, Bangalore, India, Jan. 1999.

[13] J. Padhye, V. Firoiu, and D. Towsley, "A stochastic model of TCP Reno congestion avoidance and control," Univ. of Massachusetts, Amherst, MA, CMPSCI Tech. Rep. 99-02, 1999.

[14] *Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification*, IEEE Std. 802.11, 1997.

[15] S. M. Metev and V. P. Veiko, *Laser Assisted Microtechnology*, 2nd ed., R. M. Osgood, Jr., Ed. Berlin, Germany: Springer-Verlag, 1998.

[16] J. Breckling, Ed., *The Analysis of Directional Time Series: Applications to Wind Speed and Direction*, ser. Lecture Notes in Statistics. Berlin, Germany: Springer, 1989, vol. 61.

[17] S. Zhang, C. Zhu, J. K. O. Sin, and P. K. T. Mok, "A novel ultrathin elevated channel low-temperature poly-Si TFT," *IEEE Electron Device Lett.*, vol. 20, pp. 569–571, Nov. 1999.

[18] M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, "High resolution fiber distributed measurements with coherent OFDR," in *Proc. ECOC'00*, 2000, paper 11.3.4, p. 109.

[19] O. Younis and S. Fahmy, "Heed: A hybrid, energy-efficient, distributed clustering approach for ad hoc sensor networks," *IEEE Trans. Mobile Comput*., vol. 3, no. 4, pp. 366–379, Oct.– Dec. 2004.

[20] M. Ye, C. Li, G. Chen, J. Wu, and M. Y. E. Al, "EECS: An energy efficient clustering scheme in wireless sensor networks," in Proc. IEEE Int. Perform. Comput. Commun. Conf., 2005, pp. 535–540.

[21] D. K. Goldenberg, J. Lin, and A. S. Morse, "Towards mobility as a network control primitive," in Proc. 5th ACM Int. Symp. Mobile Ad Hoc Netw. Comput., 2004, pp. 163–174.

[22] C. Tang and P. K. McKinley, "Energy optimization under informed mobility," IEEE Trans. Parallel Distrib. Syst., vol. 17, no. 9, pp. 947–962, Sep. 2006.

