Indian Journal of Communications Technology and Electronics (IJCTE)
Vol.2.No.1 2014pp 45-48
available at: www.goniv.com
Paper Received :05-03-2014
Paper Published:28-03-2014
Paper Reviewed by: 1. John Arhter 2. Hendry Goyal
Editor : Prof. P.Muthukumar

DETECTING BATTER POWER DEPLETION PROBLEM IN N COVERED WIRELESS SENSOR NETWORK

E.Dheivanai A.KavithaV.Komathi, S.Archana
Department of Computer Science Engineering
SKP Engineering College
Thiruvannamalai, TamilNadu

ABSTRACT

In wsn, sensors nearer the sink are responsible for forwarding the data to it on behalf all other sensors in the network. Sensors nearer the immobile sink are suffered from a severe batter power depletion problem. Those sensors are very critical to this problem as they act as the points of contact between the sink and the rest of the sensors in the network. In this wsn we see about the n active sensors point in a field is connected by at least n sensor. It is easy to check that the sensors around the sink severely suffer from a battery power depletion problem. In order to change the neighbors of a sink over time, our solutions suggest the use of *mobile proxy sinks* that collect data from source sensors and drop them off at an immobile sink. First, we present our basic results for the design of active connected n covered wsn. Second we analysis the performance of joint mobility and routing in this type of network and also investigate the best mobility strategy of mobile proxy sinks to minimize the total energy consumption. Third we propose joint each mobility and routing schemes based on the number of immobile sinks and mobile proxy sinks and evaluate their performance by simulation. Then we extended it into the 3dimensional wsn.

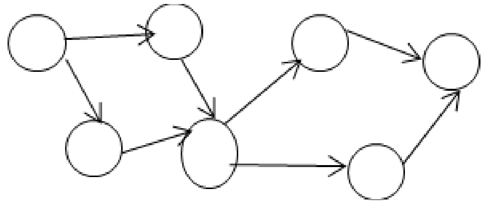
Keywords: Wireless sensor networks, *n*-coverage, connectivity, central gathering point, energy sink-hole problem.

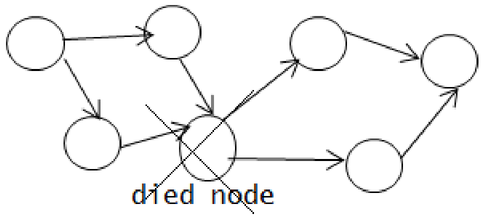
1. INTRODUCTION

Tiny low powered sensors makes the Wireless sensor networks, they communicate each other and report their data to central gathering point for future reference and analysis. Coverage and connectivity are the basic concepts in wsn. The connectivity is ensured among the n connected active sensors. This network is said to be duty-cycled wsn. In this wsn the sensors deplete their energy and die.

1.1 Effect of the Batter power depletion problem

- The wsn can be divided into two sub networks due to the die of the single sensor.





-The immobile sink surrounding area may not be a n covered region because those sensors

2. RELATED WORK

2.1 Connected n-coverage

Xing et al. [25] suggest coverage and connectivity, the first proposed protocol is connected coverage protocol. Huang et al. [11] define the relationship between the coverage and connectivity of sensors.

2.2 Energy sink-hole problem

Energy efficiency is proved by Leone et al. [14**]** by using non-uniform sensor distribution. He also proposed a blind algorithm to compute energy balancing problem. Energy efficiency is proved by Olariu and Stojmenovic [20].

3. DEFINITIONS AND MODULES

Energy sink hole:

Sensors power depletion may have a serious problem that affects the network performance. In particular, this problem gets aggravated in the case of immobile WSNs when some specific sensors deplete their energy. Indeed, the sensors nearer the sink are very critical to this problem as they act as the points of contact between the sink and the rest of the sensors in the network. The death of those sensors may yield a coverage hole around the immobile sink, which prohibits the data from reaching it. This phenomenon is known as the energy sink-hole problem.

Coverage Quality:

There are two fundamental concepts in the design of WSNs, namely coverage and connectivity. In fact, data collection and routing suggest that a deployment field be covered and that the network be connected however, some applications require n-coverage , where each point in a field is covered by at least n sensors while all those sensors are connected. This problem is referred to as connected n-coverage in WSNs. The challenge is to select a minimum subset of sensors to remain active in order to n-cover a field and ensure connectivity between all active sensors.

Central Gathering point:

A wireless sensor network (WSN) consists of tiny, low-powered sensors that communicate wirelessly with each other and report their data to the sink (i.e., central gathering point), for further analysis and processing.

In duty-cycled connected n-covered wireless sensor networks, where each point in a field of interest is covered by at least n sensor. In order to change the neighbors of a sink over time, our solutions suggest the use of mobile proxy sinks that collect data from source sensors and drop them off at an immobile sink.

Energy Module:

In Network model,we consider static WSNs with constant data reporting to the sink, where all the source sensors and sink are static. Moreover, all those source sensors are randomly and uniformly distributed in a circular field of diameter D. In addition, we assume that all the sensors and the sink are aware of their geographic locations via some localization technique.

In Energy model,we consider static WSNs with constant data reporting to the sink, where all the source sensors and sink are static. Moreover, all those source sensors are randomly and uniformly distributed in a circular field of diameter D. In addition, we assume that all the sensors and the sink are aware of their geographic locations via some localization technique.

Joint mobility and Routing:

Sensor Field Deployment Decomposition We divide a circular field of interest of diameter D into n concentric circular, where n = D/R with R being the radius of the sensors communication range. Our proposed data collection schemes are based on this decomposition. To ensure energy-efficient data collection, we need to specify the mobility trajectory of the mobile proxy sink and how data is being collected from source sensors. The mobile proxy sink will have circular trajectories interrupted by short linear moves.

4. CONNECTED *n*-COVERAGE

Helly's Theorem [3]: Let *E*be a family of convex sets in R^nsuch that for $m \geq n+1$ any *m* members of *E* have a non-empty intersection. Then, the intersection of all members of *E* is non-empty.

Lemma 1 [1] is an instance of Helly's Theorem [3] in a two-dimensional space that characterizes the intersection of *k* sensing disks, with $n = 2$ and $k = m$.

Lemma 1 [1]: Let $k \geq 3$. The intersection of *k* sensing disks is not empty if and only if the intersection of any three of those *k* sensing disks is not empty.

Distributed protocols was suggested by Huang et al. at[11].to assure coverage and connectivity. M. Bai*et al.* [2] proposed an optimal deployment strategy toachieve coverage and 2-connectivity regardless of therelationship between sensing and communication radiiof the sensors. Gupta *et al.* [9] proposed centralizedand distributed algorithms for connected sensor coverso the WSN self-organizes its topology in response to aquery and activate the necessary sensors to process thequery. Zhang and Hou [29] proposed an optimalgeographical density control protocol to keep a smallnumber of sensors active regardless of the ratio of thesensors' communication range to their sensing range.

5. ENERGY SINK HOLE PROBLEM

Short-path routing protocol[7] is used to report the source sensors data to the sink constantly. Source sensors nearer the sink consume higher energy compared to all other source sensors in the network. To compute thesource sensors maximum average energy consumption, use a model that is similar to the one in[6].

6. JOINT MOBILITY AND ROUTING

6.1 1 Immobile Sink – 1 Mobile Proxy Sink

In this model 1 immobile sink and 1 mobile proxy sink are available. The lagging of transfer the data is solved by using the mobile proxy sink.

6.2 1 Immobile Sink – *n* Mobile Proxy Sinks

In this model 1 immobile sink and n mobile proxy sink are available. The lagging of data transfer is solved by using the n mobile proxy sinks.

6.3 *n* Immobile Sinks – 1 Mobile Proxy Sink

In this model n immobile sink and 1 mobile proxy sink are available. The lagging of transfer the data is solved by using the single mobile proxy sink.

6.4 *n* Immobile Sinks – *n* mobile proxy sinks

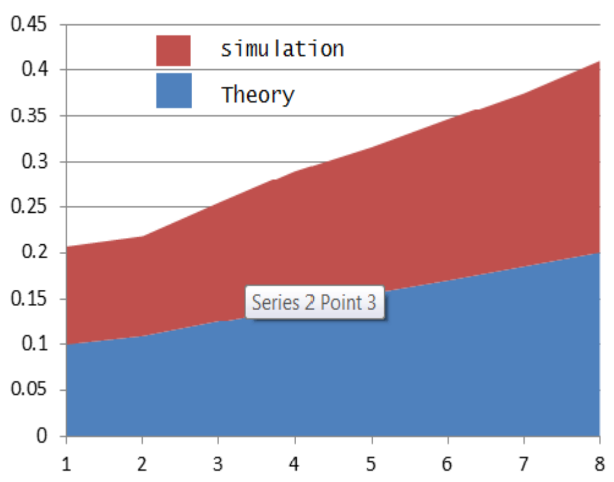
In this model n immobile sink and n mobile proxy sink are available. The lagging of transfer the data is solved by using the n mobile proxy sink.These are the categories under the joint mobility and routing

7. SIMULATION RESULTS

The simulation results of our data collection protocols using a high-level simulator written in *C* language.

7.1 Simulation Environment

Let assume circular deployment field of radius D = 1000 m. We assume that the radii of the sensing and communication ranges of all the sensors (including both of the source sensors and mobile proxy sinks) are r = 50 m and R = 100 m, respectively. Thus, the number of concentric circular bands is $n = D/R = 10$. Moreover, we consider the free-space model, where α=2. In addition, according to the energy model given in [28], the energy consumption in transmission, reception, idle, and sleep modes are 60 mW, 12 mW, 12 mW, and 0.03 mW, respectively. We suppose that the initial energy of each source sensor is 60 Joules, while that of each mobile proxy sink is 100 Joules.



8. CONCLUSION

In this paper, we investigated the problem of energy sink-hole in duty-cycled connected *k*-covered WSNs. First, we proposed a three-tier architecture that has immobile source sensors, immobile sinks, and mobile proxy sinks. Then, we computed the optimum proxy sink mobility strategy with a goal to minimize the total energy consumption due to data transmission by source sensors and its reception by a mobile proxy sink.

We extend our plan to study delay in our proposed data collection protocols.

REFERENCES

[1] H. M. Ammari and S. K. Das, "Centralized and clustered *k*-coverage protocols for wireless sensor networks," *IEEE TC*, 61(1), 2012.

[2] X. Bai, S. Kumar, D. Xuan, Z. Yun, and T. Lai, "Deploying wireless sensors to achieve both coverage and connectivity," *Proc. ACMMobiHoc*, 2006.

[3] B. Bollobás, *The Art of Mathematics: CoffeeTime in Memphis*, Cambridge Univ. Press, 2006.

[4] N. Bulusu, J. Heidemann, and D. Estrin, "GPSless low cost outdoor localization for very small devices," *IEEE PCM*, 7(5), 2000.

[5] E. Efthymiou, S. Nikoletseas, and J. Rolim, "Energy balanced data propagation in wireless sensor networks," *WINET*, 12, 2006.

[6] Y. Ganjali and A. Keshavarzian, "Load balancing in ad hoc networks: single-path routing vs. multipath routing," *Proc. IEEE Infocom*, 2004.

[7] J. Gao and L. Zhang, "Load balanced short path routing in wireless networks," *Proc. IEEEInfocom*, 2004.

[8] W. Guo and G. Wu, "An energy-balanced transmission scheme for sensor networks," *Proc.ACMSenSys*, 2003.

[9] H. Gupta, Z. Zhou, S. Das, and Q. Gu, "Connected sensor cover: Self-organization of sensor networks for efficient query execution," *IEEE TON*, 14, 2006.

[10] W. Heinzelman, A. Chandrakasan, and H. Balakrishnan, "An application-specific protocol architecture for wireless microsensor networks," *IEEE TWC*, 1(4), 2002.

[11] C. Huang, Y. Tseng, and H. Wu, "Distributed protocols for ensuring both coverage and connectivity of a wireless sensor network," *ACM TOSN*, 3(1), 2007.

[12] A. Jarry, P. Leone, O. Powell, and J. Rolim, "An optimal data propagation algorithm for maximizing the lifespan of sensor networks," *Proc. DCOSS*, LNCS 4026, 2006.

[13] L. A. Klein, "A boolean algebra approach to multiple sensor voting fusion," *IEEE TAES*, 29(2), 1993.

[14] P. Leone, S. Nikoletseas, and J. Rolim, "An adaptive blind algorithm for energy balanced data propagation in wireless networks, *Proc. DCOSS*, LNCS 3560, 2005.

[15] J. Li and P. Mohapatra, "Analytical modeling and mitigation techniques for the energy hole problem in sensor networks," *Elsevier PMC*, 3, 2007.

[16] J. Lian, K. Naik, and G. Agnew, "Data capacity improvement of wireless sensor networks using non-uniform sensor distribution," *IJDSN*, 2-2, 2006.

[17] J. Luo and J.-P.Hubaux, "Joint mobility and routing for lifetime elongation in wireless sensornetworks," *Proc. IEEE Infocom*, 2005.
[18] V. P. Mhatre, C. Rosenberg, D. Kofman, R. Mazumdar, and N. Shroff, "A minimum cost heterogeneous sensor network with a lifetime constraint," *IEEE TMC*, 4(1), 2005.
[19] D. Nicules and B. Nath, "Ad-hoc positioning system using AoA," *Proc. IEEE Infocom*, 2003.
[20] S. Olariu and I. Stojmenovic, "Design guidelines for maximizing lifetime and avoiding energy holes in sensor networks with uniform distribution and uniform reporting," *Proc. IEEEInfocom*, 2006.
[21] O. Powell, P. Leone, and J. Rolim, "Energy optimal data propagation in wireless sensor networks," *Journal of Parallel and DistributedComputing*, 3(67), pp. 302-317, Mar. 2007.
[22] T. Sun, L. Chen, C. Han, and M. Gerla, "Reliable sensor networks for planet exploration" *Proc.IEEE NSC*, 2005.
[23] Habib M. Ammari "Investigating the Energy Sink-Hole Problem in Connected*k*-Covered Wireless Sensor Networks" IEEE TC,2013
[24] X. Wu, G. Chen, and S. K. Das, "Avoiding energy holes in wireless sensor networks with nonuniform node distribution," *IEEE TPDS*, 19(5), 2008.
[25] G. Xing, X. Wang, Y. Zhang, C. Lu, R. Pless, and C. Gill, "Integrated coverage and connectivity configuration for energy conservation in sensor networks," *ACM TOSN*, 1(1), pp. 36-72, 2005.
[26] S. Yang, F. Dai, M. Cardei, and J. Wu, "On connected multiple point coverage in wireless sensor networks," *IJWIN*, 13(4), 2006.
[27] M. Yarvis, N. Kushalnagar, H. Singh, A. Rangarajan, Y. Liu, and S. Singh, "Exploiting heterogeneity in sensor networks," Proc. *IEEEInfocom*, 2005.
[28] F. Ye, G. Zhong, J. Cheng, S. Lu, and L. Zhang, "PEAS: A robust energy conserving protocol for long-lived sensor networks," *Proc. ICDCS*, 2003.
[29] H. Zhang and J. Hou, "Maintaining sensing coverage and connectivity in large sensor networks," *AHSWN*, 1(1-2), pp. 89-124, 2005.
[30] H. Zhang, H. Shen, and Y. Tan, "Optimal energy balanced data gathering in wireless sensor networks," *Proc. IEEE IPDPS*, 2007.
[31] Y. Zou and K. Chakrabarty, "A distributed coverage- and connectivity-centric technique for selecting active nodes in wireless sensor networks," *IEEE TC*, 54-1, 2005.
[32] Y.-C. Wang and Y.-C.Tseng, "Distributed deployment schemes for mobile wireless sensor networks to ensure multi-level coverage," *IEEETPDS*, 19(9), 2008.