ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 4, March 2017

Energy-Efficient Scheduling and Power Allocation in Downlink OFDMA Networks with Base Station Coordination

L.Abraham David
BCA & MSC (NT & IT)
St. John's College
Tirunelveli India
abraham.david806@gmail.com

J.Abalin Luther
B.Sc Computer Science
Rose Mary College
Tirunelveli India
abalinluther@gmail.com

Abstract— **Recently Wireless Sensor Networks (WSN) is one of the increasing technologies to provide a service to the network users. WSN is used to transfer the data among the network nodes. To transferring the data, network should provide better communication method among WSN and should provide efficient energy consumption. To achieve this problems many approaches like mobile sink protocol and some other strategies were developed to transfer data through mobile sink mechanisms. These approaches solved only the data transfer problem but fail in solving efficient energy consumption while routing. Sensor nodes usually have limited energy supply and they are impractical to recharge. How to balance traffic load in sensors in order to increase network lifetime is a very challenging research issue. Many clustering algorithms have been proposed recently for wireless sensor networks (WSNs). However, sensor networks with one fixed sink node often suffer from a hot spots problem since nodes near sink s have more traffic burden to forward during a multi- hop transmission process. The use of mobile sinks has been shown to be an effective technique to enhance network performance features such as latency, energy efficiency, network lifetime etc. Existing work employ one or more mobile sinks. These mobile sinks survey and collect sensed data directly from sensor nodes and thereby help sensor nodes save energy that otherwise would be consumed by multihop communications. In this project the system proposed a WRP, which is a heuristic method that finds a near-optimal traveling tour that minimizes the energy consumption of sensor nodes. It is guaranteed to find a tour if the latter exists. The proposed system defines the problem finding a set of RPs to be visited by a mobile sink.**

I. INTRODUCTION

Technology advancement s in the areas of micro-mechatronic system s and wireless networks, etc. has allowed the rapid development of wireless micro-sensors for wireless communications. Wireless Sensor Networks (WSNs) comprise massive amounts of sensor nodes which make up the network for monitoring the region of interest and feed data about the targets or events of interest back to the end-users. WSNs usually include tiny, inexpensive and resource limited devices which communicate with each other in a multi-hop manner. WSNs can be widely used to perform military tracking and surveillance, natural disaster relief, hazardous environment exploration and health monitoring, etc. Due to the fact that it is impractical, if not impossible, to recharge sensor nodes, it is very important to design energy efficient routing algorithms or protocols to improve the energy efficiency of sensors by balancing and minimizing the energy consumption, and thus prolong network lifetime for WSNs. In general, the sources of the energy consumption consist of three parts, namely sensing, processing and communication. We only consider the energy consumption during the communication process due to the fact that to transmit one bit of message consumes around 3,000 times more energy than to process the message. An unbalanced energy assumption phenomenon occurs when the one-hop neighboring sensors deplete their battery power, and those sensors far away may still have more than 90% of their initial energy unused. When comparing with sensors far from the sink, nearby sensors are shared by more sensor -to -sink paths, thus they have heavier message relay load s, and consume more energy. To solve this problem, many energy efficient routing algorithms and protocols have been proposed in recent years, including clustering based routing protocols, mobile sink based routing protocols, power -aware routing and multi -level transmission radii routing. Clustering has characteristics such as scalable, energy-efficient, lower latency, etc. Which make it a popular

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 4, March 2017

technique for WSN's the idea is to select a set of cluster heads from the set of nodes in the network, and then cluster the remaining nodes with these heads. The data gathered are transmitted through cluster heads to remote base stations or sink node s. However, sink nodes are always fixed, which could result in the neighboring nodes to dying much faster and causing network partition as well as isolated sensors. A typically clustered sensor network is illustrated.

The use of mobile sinks can potentially provide energy-efficient data collection with well -designed networking protocols for WSNs. When using the mobile sink in practice, the sink nodes can be attached to vehicles, animals or people that can move inside the region of interest. Usually, static sink nodes are not very efficient. Although single hop data collection is feasible in networks deployed in small regions, the multi-hop transmission manner is more commonly used in large sensor areas. Intuitively, mobile sinks gain advantages by mitigating the so -called hot spot problem, balancing energy among sensor nodes, prolonging network lifetime, reducing transmission latency, and improving network performance by periodically accessing some isolated nodes into the network. With the improvement level of advancement technologies in Wireless network, it has to provide it in an effective data transfer mechanism to the user. A network has allowed the rapid development for wireless communications. Wireless Sensor Networks (WSNs) embrace enormous amounts of sensor nodes which make up the networks for monitoring the region of process and feed data about the targets or result of importance back to the end-users. WSN usually contains small, inexpensive and resource limited devices to communicate with each other. WSNs can be commonly used to achieve military tracking and surveillance, dangerous environment exploration, natural disaster release and health monitoring, etc. The output of the WSN is reliant on the relationship between the upper bound on the data collected and the number of members belonging to each sub sinks or sub nodes. To exchanging the data, networks have to provide a better node for transferring the data between the nodes. Here better node can have an effective one to providing a service between the nodes. Here this is one of the worst factors. For transferring the data in cluster nodes, any one of the nodes have an efficient energy to transfer the data. Reducing energy consumption in WSN communications has involved increasing alertness recently.

They were many techniques like distributed data networks (i.e. antennas), heterogeneous network, multi-hop networks, etc. were developed for this issue. But some techniques provide superior result at the same time it failed in energy consumption for multiple data transfers. Recently, sink mobility has become an important research topic in WSN for energy conservation. The Mobile sink trajectory is random to gather information of significance sensed by the sensor nodes. Collecting effective data by consuming less energy can improve the network performance. And also fixed path node can progress the energy efficiency of single-hop but not in multi-hop and limited paths may cause communication problem to transfer the data. Energy consumption is one of the important factors in mobile sink nodes. In general, energy consumption consists of sensing, processing and transmitting the data. For transferring data we consider the energy consumption only at the communication process, because transmitting of message can take more energy than processing the message. For transferring the data an unbalanced energy problem may occurs due to reducing battery power and also some of initial energy unused. By using WSN, can share the data among sensor-to-sink paths, so they have heavier message transmit loads and also it consume more energy. The use of mobile sink protocols may provide better energy efficient data transferring mechanisms for WSN. For these issues this survey shows various energy efficient algorithms benefits and their drawbacks.

In wireless sensor network (WSN), data gathering causes more energy consumption. Also most of the existing literature work on data gathering process considers only distance and node density and skips reliability criteria. Hence in order to offer both reliability and energy efficiency, in this paper, we propose to design a Mobile Sink Based Reliable and Energy Efficient Data Gathering technique for WSN. In this process, a biased random walk method is used to determine the next position of the sink. Then, a rendezvous point selection with splitting tree technique is used to find the optimal data transmission path. When the data is sensed and ready for transmission, the sensor node encodes the data and communicates it to the sink. On receiving the encoded data from the sensors, the mobile sink decodes the messages and stores the resulting block in its local buffer. Once all blocks have been correctly decoded, the mobile sink reconstructs the original bundle. The increased packet losses in a specific region of the network can be prevented by increasing the pause time of the sink. By simulation results, we show that the proposed technique increases the reliability and energy efficiency.

Mobility of sink for energy efficient data collection in WSNs is mainly proposed to solve the problem in data collection. Mobile sink prevents tracking or detecting on it by adversaries during its data collection phase around the sensor field. This strategy aims to select a trajectory for mobile sink node, which in turn minimizes the total number of message communication from all static sensor nodes to the mobile sink node (including multi-hop relaying) and thereby reducing the possibility of being detected by the adversaries. The sink moves probabilistically, favoring to the less visited areas in order to cover the network area faster, while adaptively stopping more time in network regions that tend to produce more data. A mobile agent that moves closer to the nodes can help conserve energy since data is transmitted over fewer hops, thus reducing the number of transmitted packets. The extra energy spent for the operation and movement of the sink

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 4, March 2017

does not affect overall sensor network lifetime since the mobile sink is considered an external to the network factor. The two challenging issues in using mobile sinks are: seamless data collection and energy conservation. Since the location of the sink keeps changing, data reports from the sensor nodes can be lost because an existing path can become invalid when the sink moves. As sink location changes constantly, routing algorithms designed for static sink are no longer suitable. In paper, it reduces the possibility of detection on the sensor network and protects the mobile sink against tracking. But there is a problem of energy consumption. On the other hand, paper use biased, adaptive sink mobility scheme for data collection and adjusting the local network conditions which minimizes the energy consumption. But it selects the visiting schedule of the sink based on only the distance and node density. Moreover, it does not ensure reliability. In order to solve the above issues, we propose to design a Mobile Sink Based Reliable and Energy Efficient Data Gathering technique for WSN.

Data collection and Aggregation is most important task in the wireless sensor network energy saving can be achieved in wireless sensor networks by using mobile Sink (MS) capable of carrying data in unconstrained path. In large –density applications, the sensor node should be transmit the collected data to mobile sink within time constraint. In the existing system, to form a hybrid moving pattern in which a mobile-sink node only visits rendezvous points (RPs), as opposed to all nodes for data collection. Due to Processing overhead of Rendezvous point is not appropriate for large and delay sensitive applications. To overcome this problem, the proposed method is a Clustering Based Weighted Rendezvous Planning (CBWRP) algorithm for sensor networks. The sensor nodes are ordered into clusters.

Inside a cluster, nodes transfer data to cluster head (CH) through routing protocol. Cluster Head is elected for each cluster based on the High energy first (HEF) clustering algorithm. This algorithm is used for selecting cluster head with high ranking of residual energy of each sensor node. This algorithm is used for minimizes the energy depletion throughout sensor network. CH has a responsibility for collecting data from each sensor node and transmits data to nearest Rendezvous point. The travelling path of Mobile Sink (MS) to visit all Rendezvous point which can be considered as a NP Hard problem. This problem taken as delay-aware energy efficient path (DEETP) and solved as Weighted Rendezvous Planning (WRP) algorithm. WRP preferentially designates sensor nodes with the highest weight as a RP with distance of RP should be less than of maximum allowed tour length. WRP algorithm calculating weight for each sensor node which can be computed by hop distance and number of packets forwarded.

A wireless sensor network is a collection of nodes organized into a cooperative network. Every node has its own processing capability, may contain multiple types of memory (program, data and flash memories), have a RF transceiver (usually with a single omni-directional antenna), have a power source (e.g., batteries and solar cells), that mainly accommodates numerous sensors and actuators .Such systems can revolutionize the way to live and work. Currently, wireless sensor networks are beginning to be deployed at an accelerated pace. This can be considered as the Internet becoming a physical network. This new skill is stimulating with unrestrained prospective for numerous application areas. Most current deployed sensor networks involve relatively small amount of sensors, wired to a central processing unit in which every signal processing is performed.

II. LITERATURE SURVEY

F. García et.Al said Graph-theoretic techniques are used to investigate heuristics for guaranteeing full network connectivity in networks consisting of sensors with differing transmission ranges. Current security mechanisms in ad-hoc sensor networks do not guarantee reliable and robust network functionality.

Kantarc et.Al said The system used a distributed spanning tree protocol to collect and route data from nodes to the base station. The system do not have information about their coordinates.

Feng Xia et.Al said Taking advantage of well-established control theory and technology, feedback scheduling offers a promising approach to flexible resource management in dynamic and unpredictable environments. It only observing the state of the physical system is not sufficient.

Weifa et.Al said The Breadth-First-Search tree is used for data collection. It may not be suitable for the real sensor networks due to the difficulty on the flow control and its computational infeasibility with the growth of network size.

Raina et.Al saidThe shortest path tree mechanism(SPT) is used to choose the nearest sub sinks and transmits data from members. The energy efficiency of single hop sensor networks which may not be suitable due to the limits of path location and the communication power.

Wen et.Al said The optimal ME trajectory that visits each RP and the data sink. These assumptions cannot offer a holistic view of the typical properties of ad-hoc networks.

YoungSang et.Al said It is desirable to minimize disturbance to the targeted animal species, the mobile robot will trace predetermined paths and stop by a set of pre-arranged locations regularly for data collection. This is not possible in the MSM because no matter where the sink stops, every node must participate in the communication.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 4, March 2017

Wang et.Al said An ocean sensing and monitoring system is used to monitor ocean water conditions and other environmental parameters WSN-based marine environment monitoring has a broad coverage including a number of application areas. A battery has limited energy that cannot last a long life for sensor nodes. Batteries have environmental contamination and disposal issues since the chemical composition of a battery often involves toxic heavy metals.

Rom et.Al said As these trust management systems are mainly behaviour-based in order to compute the trust or reputation values mathematical tools are used Trust management systems for WSN could be very useful for detecting misbehaving nodes (faulty or malicious) and for assisting the decision-making process.

Sankardas et.Al said In particular, compromised nodes can be used to inject false data that leads to incorrect aggregates being computed at the base station Most existing aggregation algorithms and systems do not include any provisions for security, and consequently these systems are vulnerable to a wide variety of attack.

III. THEORY

In this network module Wireless sensor networks are composed of a number of sensor nodes that deployed in a field. Each sensor node has the capability to collect data and forward it to the sink through the multi hop communication.

In addition, it is equipped with a battery which is difficult to replace. We have to balance energy consumption of sensor nodes.

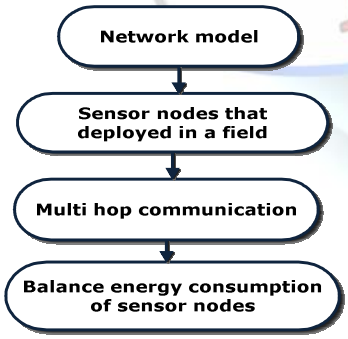


Fig .1. Multi Hop Communication

The mobile collector network introduced a multi-functional mobile collector called sencar. The SenCar periodically visits some pre-defined sensor positions called relay points. The SenCar gathers data directly from sensors by visiting the relay points in a periodic data gathering process.

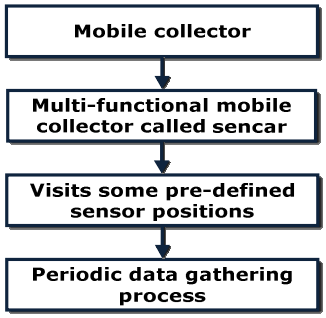


Fig .2. Sencar

Route discovery process collect data from the relay points we have to identify the route. The route discovery process gives the shortest path to reach the relay points for gathering data. In that route, the sencar travels and collect data from each relay points. Then it transfers data to the sink.

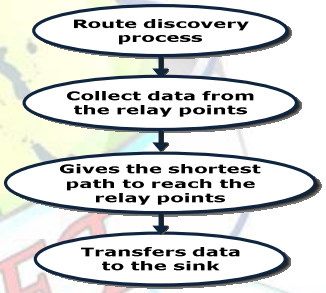


Fig. 3 . Relay Points

In this localization scheme is applied since the sencar sense the range every time to find out the path that relay nodes placed. Using this scheme, we will know the location of relay points which having the data to upload the sencar travels to that location and gathers data with less time consumption.

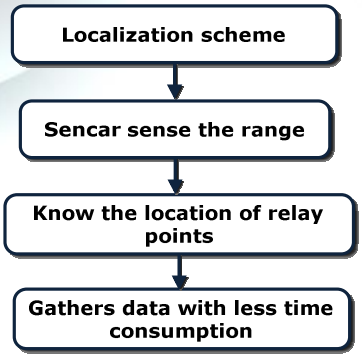


Fig. 4. Localization Scheme

Localization scheme reduces the data collection latency. And also it avoids the stopping time at relay points which does

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 4, March 2017

not have any data for uploading. It Increases the energy of sencar.

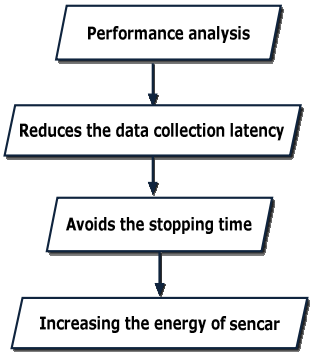
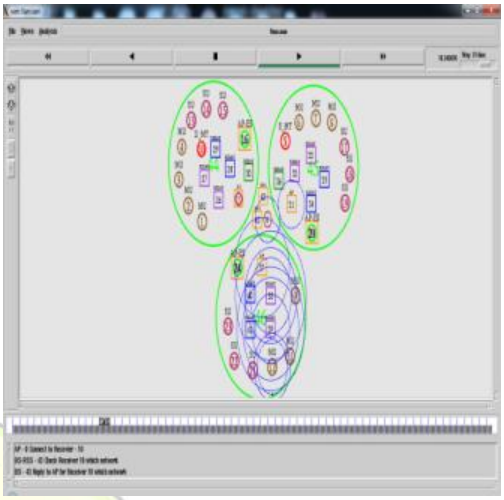
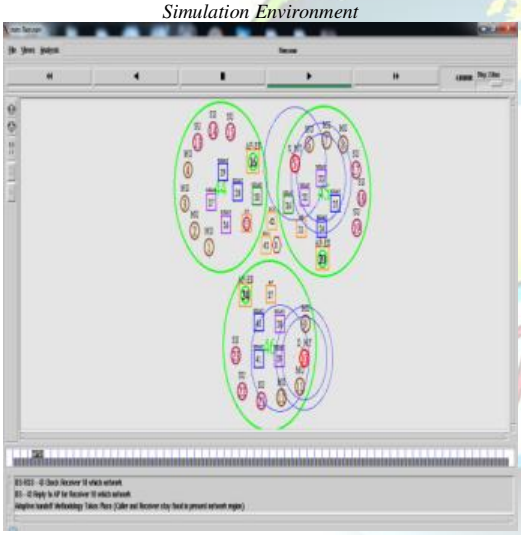


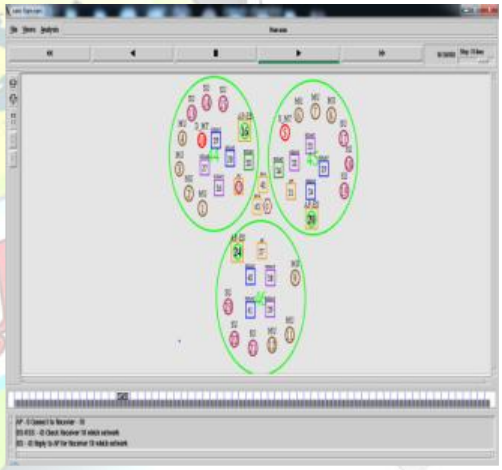
Fig . 5. Performance Analysis



IV. RESULT

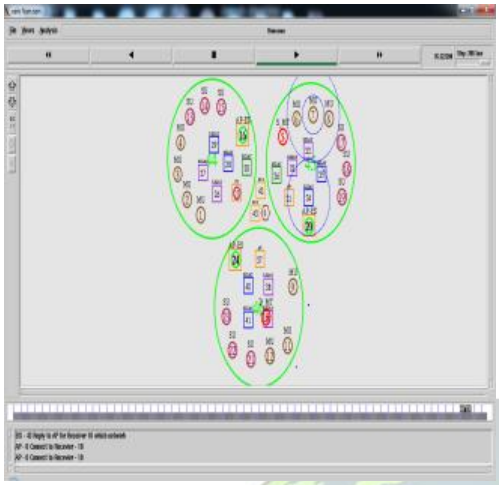
Simulation Environment





ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 4, March 2017



V. CONCLUSION

A WRP is a novel algorithm for controlling the movement of a mobile sink in a WSN. WRP selects the set of RPs such that the energy expenditure of sensor nodes is minimized and uniform to prevent the formation of energy holes while ensuring sensed data are collected on time. The proposed method is a Weighted Rendezvous Planning (WRP) algorithm for sensor networks. The sensor nodes are organized into clusters. Within a cluster, nodes transmit data to cluster head (CH) through routing protocol.HEF clustering algorithm is to choose the highest-ranking residue energy of sensor as a cluster head. This algorithm is used for minimizing energy depletion and maximizing the network lifetime. A mobile sink that preferentially visits areas of RP will prevent energy holes from forming in a WSN. The time complexity of our algorithm is dependent on how many times WRP calls the TSP solver to calculate a tour that visits all RPs. The highest weighted node will reduce the number of multihop transmissions and thereby minimizes the energy consumption. This method makes that the network lifetime can be efficiently prolonged and minimizes energy consumption. This system minimizes the number of multi hop transmissions in the data collection by the Mobile Sink (MS).

REFERENCES

[1] F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "Wirelesssensor networks: A survey," Comput. Netw. , vol. 38, no. 4, pp. 393–422,Mar. 2002.

[2] S. Diamond and M. Ceruti, "Application of wireless sensor network tomilitary information integration," in Proc. 5th IEEE Int. Conf. Ind. Inform., Vienna, Austria, Jun. 2007, vol. 1, pp. 317–322.

[3] I. Bekmezci and F. Alagz, "Energy efficient, delay sensitive, fault tolerantwireless sensor network for military monitoring," Int. J. Distrib. Sens.Netw., vol. 5, no. 6, pp. 729–747, 2009.

[4] A. Mainwaring, D. Culler, J. Polastre, R. Szewczyk, and J. Anderson,"Wireless sensor networks for habitat monitoring," in Proc. 1st ACM Int.Workshop Wireless Sens. Netw. Appl., New York, NY, USA, Sep. 2002,pp. 88–97.

[5] J. Zhang, W. Li, Z. Yin, S. Liu, and X. Guo, "Forest fire detection systembased on wireless sensor network," in Proc. 4th IEEE Conf. Ind. Electron.Appl., Xi'an, China, May 2009, pp. 520–523.

[6] L. Ruiz-Garcia, L. Lunadei, P. Barreiro, and I. Robla, "A review of wire-less sensor technologies and applications in agriculture and food industry:State of the art and current trends,"Sensors, vol. 9, no. 6, pp. 4728–4750,Jun. 2009.

[7] N. Wang, N. Zhang, and M. Wang, "Wireless sensors in agriculture andfood industry–recent development and future perspective," Comput. Elec-tron. Agriculture , vol. 50, no. 1, pp. 1–14, Jan. 2006.

[8] A. Wheeler, "Commercial applications of wireless sensor networks usingzigbee," IEEE Commun. Mag. , vol. 45, no. 4, pp. 70–77, Apr. 2007.

[9] W. Chen, L. Chen, Z. Chen, and S. Tu, "Wits: A wireless sensor networkfor intelligent transportation system," in Proc. 1st Int. Multi-Symp. Com-put. Comput. Sci. , Hangzhou, China, Jun. 2006, vol. 2, pp. 635–641.

[10] B. Hull, V. Bychkovsky, Y. Zhang, K. Chen, M. Goraczko, A. Miu,E. Shih, H. Balakrishnan, and S. Madden, "Cartel: A distributed mobilesensor computing system," in Proc. 4th Int. Conf. Embedded Netw. Sens.Syst. , New York, NY, USA, Oct. 2006, pp. 125–138.

[11] L. Yu, N. Wang, and X. Meng, "Real-time forest fire detection withwireless sensor networks," in Proc. Int. Conf. Wireless Commun., Netw.Mobile Comput., Wuhan, China, Sep. 2005, vol. 2, pp. 1214–1217.

[12] I. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "A surveyon sensor networks," IEEE Commun. Mag. , vol. 40, no. 8, pp. 102–114,Aug. 2002.

[13] J. Lian, K. Naik, and G. B. Agnew, "Data capacity improvement ofwireless sensor networks using non-uniform sensor distribution," Int. J.Distrib. Sens. Netw. , vol. 2, no. 2, pp. 121–145, Apr.–Jun. 2006.

[14] J. Li and P. Mohapatra, "An analytical model for the energy hole problemin many-to-one sensor networks," in Proc. 62nd IEEE Veh. Technol. Conf.,Dallas, TX, USA, Sep. 2005, vol. 4, pp. 2721–2725.

[15] J. Luo and J.-P. Hubaux, "Joint mobility and routing for lifetime elongation in wireless sensor networks," in Proc. IEEE INFOCOM, Miami, FL,USA, Mar. 2005, vol. 3, pp. 1735–1746.

[16] R. C. Shah, S. Roy, S. Jain, and W. Brunette, "Data mules: Modeling andanalysis of a three-tier architecture for sparse sensor networks," Ad HocNetw., vol. 1, no. 2/3, pp. 215–233, Sep. 2003.

[17] X. Li, A. Nayak, and I. Stojmenovic, Sink Mobility in Wireless SensorNetworks . Hoboken, NJ, USA: Wiley, 2010, pp. 153–184.

[18] E. Ekici, Y. Gu, and D. Bozdag, "Mobility-based communication In wire-less sensor networks," IEEE Commun. Mag. , vol. 44, no. 7, pp. 56–62,Jul. 2006.

[19] S. Jain, R. Shah, W. Brunette, G. Borriello, and S. Roy, "Exploitingmobility for energy efficient data collection in wireless sensor networks,"Mobile Netw. Appl., vol. 11, no. 3, pp. 327–339, Jun. 2006.

[20] I. Chatzigiannakis, A. Kinalis, and S. Nikoletseas, "Sink mobility protocols for data collection in wireless sensor networks," in Proc. 4th ACMInt. Workshop Mobility Manage. Wireless Access, Terromolinos, Spain,Oct. 2006, pp. 52–59.

[21] I. Chatzigiannakis, A. Kinalis, and S. Nikoletseas, "Efficient data propagation strategies in wireless sensor networks using a single mobile sink,"Comput. Commun., vol. 31, no. 5, pp. 896–914, Mar. 2008.

[22] J. Capella, A. Bonastre, J. Serrano, and R. Ors, "A new robust, energy-efficient and scalable wireless sensor networks architecture applied to

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 4, March 2017

awireless fire detection system," in Proc. Int. Conf. Wireless Netw. Inform.Syst. , Shanghai, China, Dec. 2009, pp. 395–398.

[23] Z. Wang, S. Basagni, E. Melachrinoudis, and C. Petrioli, "Exploiting sinkmobility for maximizing sensor networks lifetime," inProc. 38th Annu.Hawaii Int. Conf. Syst. Sci. , Hawaii, USA, Jan. 2005, p. 287a.

[24] S. Basagni, A. Carosi, E. Melachrinoudis, C. Petrioli, and Z. M. Wang,"Controlled sink mobility for prolonging wireless sensor networks life-time," Wireless Netw. , vol. 14, no. 6, pp. 831–858, Dec. 2008.

[25] Y.Bi,L.Sun,J.Ma,N.Li,I.A.Khan,andC.Chen,"Hums:Anautonomous moving strategy for mobile sinks in data-gathering sensornetworks," EURASIP J. Wireless Commun. Netw. , vol. 2007, pp. 64574-1–64574-15, 2007.

[26] Y. Yun and Y. Xia, "Maximizing the lifetime of wireless sensor networkswith mobile sink in delay-tolerant applications," IEEE Trans. MobileComput., vol. 9, no. 9, pp. 1308–1318, Sep. 2010.

[27] M. Gatzianas and L. Georgiadis, "A distributed algorithm for maximumlifetime routing in sensor networks with mobile sink," IEEE Trans. Wire-less Commun. , vol. 7, no. 3, pp. 984–994, Mar. 2008.

[28] J. Luo, J. Panchard, M. Pirkowski, M. Grossglauser, and J.-P. Hubaux,"Mobiroute: Routing towards a mobile sink for improving lifetime in sen-sor networks," in Distributed Computing in Sensor Systems , P. Gibbons,T. Abdelzaher, J. Aspnes, and R. Rao, Eds. Berlin, Germany: Springer-Verlag, 2006, pp. 480–497.

[29] M. Ma and Y. Yang, "Data gathering in wireless sensor networks withmobile collectors," in Proc. IEEE Int. Symp. Parallel Distrib. Process. ,Miami, FL, USA, Apr. 2008, pp. 1–9.

[30] S. Arora, "Polynomial time approximation schemes for euclideantrav-eling salesman and other geometric problems," J. ACM, vol. 45, no. 5,pp. 753–782, Sep. 1998.