ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2016

A Review on Enhancement of Lifetime of Wireless Sensor Network using Prediction Based Mobile Sink Path Determination: a Review

Arshpreet Kaur, Amandeep Singh

Student, Department of Computer Science & Engineering, Baba Farid College of Engineering and Technology, Deon, Bathinda, India

Lecturer, Department of Computer Science & Engineering, Baba Farid College of Engineering and Technology, Deon, Bathinda, India

ABSTRACT: In this research work we are considering wireless sensor network consists of various wireless sensor nodes. We are considering two types of the nodes like moving nodes and stationary nodes. Stationary nodes will always collect the information from its environment. Moving nodes has fixed path of movement. After specific time period moving nodes positioned themselves at fixed positions so that stationary node can transfer the data to these moving nodes and moving nodes are considered to be more energetic as compared to the stationary nodes. Our aim is to maximize the life time of the network by scheduling the moving nodes.

KEYWORDS: WSN, Base station, Mobile sink, Static sink, Energy maximization.

I. INTRODUCTION

Wireless sensor networks (WSNs) are most important technology in this century. WSN composed of various nodes called as sensors. WSN is a network in which nodes are deployed at physical area of interest or very close to that area for monitoring that particular area. The locations of sensors need not to be pre-planned. Embedded microprocessors and radio transceivers are combined with sensors nodes. Sensor nodes are used for sensing the data, processing the data and for communication purpose. These deployed sensors are connected with wireless connection. Sensors sense the information of particular area in which they are deployed and forward that information to the common point for further processing on that information. Sensor nodes are used for sensing the data, processing the data and for communication purpose. These deployed sensors are connected with wireless link. Sensors sense the information of particular area in which they are deployed and forward that information to the common point for further processing on that information. Nowadays, WSN become very useful infrastructure to extract the data from environment and also to monitor environmental parameters [*Bahmanyar Esfandiari Far et al., 2014*]. WSN is a platform which is provided to sensor nodes for sensing and monitoring a particular region. There are many applications of WSN like hospitality, environmental monitoring, and homeland security [*Abdul Wahid Ali et al., 2015*].

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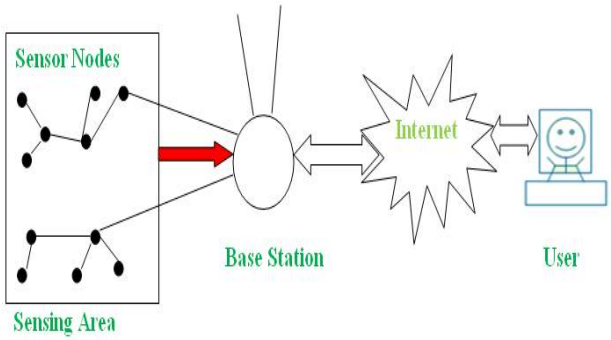

Figure 1.1 A general layout of a wireless sensor network

Sensor Node Structure:

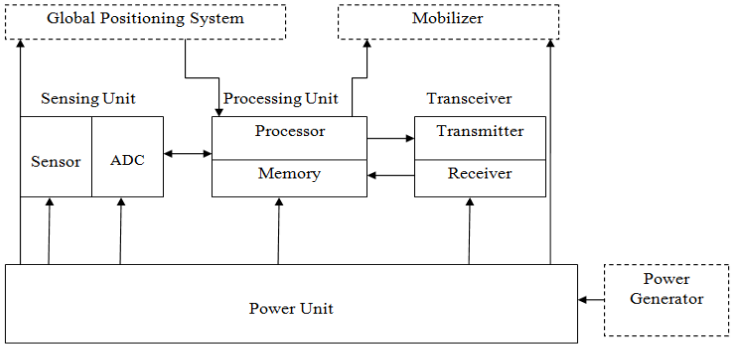

Figure 1.2 Components of sensor node[*Ian F. Akyildiz et al., 2002*]

There are four basic components of sensing node:
1)\Sensing-unit 2) Transceiver
(3)Processing unit
4) Power unit
Sensing unit consist of one or more sensors and analog to digital converter. When the sensing task is completed the raw data usually in analogous form, which is not understandable by the computer. So ADC converts analog data to digital format. These digital signals then delivered to processing unit. The processing unit is composed of a micro-controller or micro-processor having memory which gives excellent control to sensor node. In local memory the resultant data is cached and according to turn the sensor node transmit the data. Transceiver unit join the node to the network. The power unit consists of a battery for power supply used to operate all other module of network. As the battery is main source of power in sensor node and the secondary supply of power can be harvest from solar panels which can be added to node, it is depend upon the environment in which sensor will deployed [*Jennifer Yick et al., 2008*]. Depending upon the application sensor node consists additional components like global positioning system (GPS) for finding the location information for network. A motor is used for providing movement to sensor node. All these modules should be assembled into a small module with low power consumption and low production cost which is further processed by processing unit.

III. LITERATURE SURVEY

ZhengBing Zhou et al. (2015) proposed a three phase energy heuristic technique. Firstly, the network area split into grid cells. These grid cells are equal in geographical area. The grid cells allocate to clusters by k-dimensional key algorithm. The energy utilization of every cluster is similar when they gather data. The size of cluster is modifying by assigning grid cells in them. Energy expenditure of sink motion is taking into account. Therefore, the consumed energy in every cluster is roughly stabilized by considering energy utilization in data collection, sink motion. The technique

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result in perfect grid splitting in a restricted time repetition and the lifetime of network is increased.

Punyasha Chatterjee et al. (2015) proposed a technique for deployment of multi sink in the network. A given bound D is taken for cluster diameter and accordingly a distributed greedy cluster formation algorithm is used to construct predefined number of clusters in the network. The lifetime of network is inversely proportional to diameter of cluster and cost depends upon number of clusters that is sinks. With this approach the cluster diameter less than bound D and the delay of network is reduced.

Francesco Restuccia et al. (2015) proposed a technique for optimizing network lifetime of WSN where the sink mobility is uncontrollable and mobile sinks are randomly deployed with QOS condition. Swarm Intelligence Based Sensor Selection Algorithm optimize lifetime of network and encounters the defined QOS constraint. With the help of SISSA bounds for energy utilization, number of message exchanged and convergence time are derived. SISSA is scalable as well as energy efficient.

Omer Cayirpunar et al. (2015) proposed a framework called Mixed Integer Programming to specify different mobility design on wireless sensor network lifetime. The sensor nodes broadcast the data traffic to static base station which is useful for prolonging the network lifetime. Some nodes reduce their energy level sub optimally. Base station mobility is suggested as cure for suboptimal energy reduction. When the relocation of base station carried out burden of transferring the data is shared by huge set of nodes. From which the suboptimal energy dissipation can be reduced. Results shows that Gaussian & Spiral patterns for mobility gives enhancement in network lifetime better than random pattern for mobility of base station.

Deepa V.Jose et al. (2015) proposed an energy efficient routing protocol to increase the network lifetime of WSN. For maintaining the life of network the way available is to use the energy effectively. Protocol stack composed of various layers. Each layer has different capabilities to increase the network lifetime. This proposed technique will discuss the role of network layer this layer having very important role in routing. Communication consumes more energy as compare to sensing and processing. Mobile Assisted Algorithm is approach using mobile sinks.

Chu-Fu Wang et al. (2014) proposed Energy Aware Sink Relocation mechanism for the mobile sinks. There are various protocols available which are used to enhance the network lifetime. Sink relocation is method in which the sink is relocated instead of staying in one location. When sink stay in particular location it can be dangerous for lifetime of nearby sensing node. EASR method also integrates the energy aware routing resulting in enhancing the performance and also prolongs the network lifetime.

V. Devasvaran et al. (2014) proposed a protocol which is energy efficient, for WSN exhibit mobile base station. This protocol is based on clustering approach. The roles of nodes within the cluster are changed. So that the burden of cluster head for transferring the data to base station should be reduced.

Bahmanyar Esfandiari Far (2014) proposed a sink mobility mechanism for optimizing network lifetime as well as energy consumption. This approach use 2-level fuzzy logic. The mobile sink move to successful top cluster and hence reduce energy utilization. In 1st fuzzy level, the appropriate nodes are selected depend upon their energy and no. of neighbors. In 2nd fuzzy level with help of 2-phase parameter, set of eligible nodes are globally estimated. Results shows, square route gives better performance than sink movement with other methods. It saves more energy in whole network.

Xiangli Zhang et al. (2013) proposed a mechanism which is used to gather the data efficiently by mobile sink from the sensor nodes. With the help of novel partition algorithm an effective gathering scheme is introduced in which the region can be divided into different zones. The data collection latency of the zones should be balanced. Traveling salesman problem (TPS) is modeled as partitioning problem, which is used to stabilize the data collection latency among all zones. Each zone is assigned with different mobile sinks. These sinks parallel collect the data. As a result, this mechanism gives better data collection method as compared with network with no partition.

Farzad Tashtarian et al. (2013) proposed a theory for controlling the mobility of sink in event-driven application to bring out the extreme lifetime of WSN. In event driven applications the mobile sink with limited velocity has to gather the catches data from particular group of sensor nodes. This problem is NP hard. This approach is more effective for controlling the mobility.

Wang Liu et al. (2012) proposed a Mobility Assisted Data Collection model in which the parameter like mobile sink, velocity of mobile sink and journey path of the mobile node is included. Many other MADC schemes does not discuss about the factors like throughput ability which is maximum data gathering rate & lifetime which will be related with certain data gathering rate. This approach explores behavior of WSN with respect to one and more mobile sink. Result shows network with mobile sink performed well as compare to network with static sink. MADC parameter can also be adjusted to enhance data gathering rate and lifetime is increased.

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Shuai Gao et al. (2011) proposed a scheme called Maximum Amount Shortest Path (MASP). This scheme conserves the energy and increase the throughput of the network. Zone partition scheme based two phase communication protocol is design for implementation of MASP scheme. MASP is for path constrained, mobile sink. There is mapping between sub sink and nodes which leads to maximum data collection by sinks and to balance energy utilization. MASP enhances the energy efficiency.

Wei Wang et al. (2008) proposed the study of mobile relays which are having appropriate resources and static sensors. Mobile relays having more energy than static sensors. Relays moves around dynamically and helps to lessen the burden of sensors which are having more network traffic and lifetime of sensor can be increased. The dense network with one relay node improve lifetime as compare to static network. Joint mobility routing algorithms also enhance the network lifetime. The main benefit of this approach, it require number of nodes have aware to location of mobile relay. Mobile relay approach is effective as compare to static energy setup methods.

Z. Maria Wang et al. (2005) proposed a method for fairly balancing the energy utilization among the nodes. This linear program generates the problems of finding the stopping time and movement of the sink that get maximum time. This method increase whole network lifetime reducing energy consumption.

Shashidhar Rao Gandham et al. (2003) proposed energy efficient and network lifetime enhancement method for network by deploying multiple mobile stations. The lifetime of sensor network is divided into equal period of time called round. At start of round the base station is relocated. Flow based routing is used for energy-efficient routing. New location is determined by integer linear program. Multiple base stations improve the lifetime of the network.

IV. COMPARISON ANALYSIS

Sr no.	Author	Title & Year	Technique Used	Results
1	ZhangBing Zhou et al.	An Energy-Balanced Heuristic for Mobile Sink Scheduling in Hybrid WSN,2015	Three phase energy-balanced heuristic	Network lifetime is increased.
2	Punyasha Chatterjee et al.	Multiple Sink Deployment in Multi-Hop Wireless Sensor Network to Enhance Lifetime,2015	A novel multi-sink node deployment technique is used, to generate clusters distributed greedy cluster formation algorithm is used.	Average delay of the network is reduced.
3	Francesco Restuccia et al.	Lifetime Optimization with QoS of sensor Networks with Uncontrollable Mobile Sinks,2015	Swarm Intelligence based Sensor Selective Algorithm (SISSA)	QoS constraints guaranteed adequately by SISSA
4	Omer Cayirpunar et al.	Optimal Base Station Mobility Patterns for Wireless Sensor Network Lifetime Maximization, 2015	Mixed Integer Programming framework is used to define impact of different mobility patterns on WSN is used.	Gaussian, Spiral sink mobility patterns gives higher network lifetime as compare to Grid and random patterns.

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5	Deepa V.Jose et al.	Mobile Sink Assisted Energy Efficient Routing Algorithm for Wireless Sensor Networks, 2015	Mobile Sink Assisted (MSA) algorithm is used.	MSA approach gives better performance results as compare to LEACH, Artificial Bee Colony algorithm, modified LEACH and shortest hop.
6	Chu-Fu Wang et al.	A Network Lifetime Enhancement Method for Sink Relocation and Its Analysis in Wireless Sensor Networks, 2014	Energy-Aware Sink Relocation (EASR) strategy for sink relocation is used.	EASR increase the network lifetime.
7	V. Devasvaran et al.	Energy Efficient Protocol in Wireless Sensor Networks using Mobile Base Station, 2014	Energy Efficient protocol, For WSN which use mobile base station is used.	Enhances the network lifetime as compare to WSN using static Base station.
8	Bahmanyar Esfandiari Far et al.	Wireless Sensor Network Energy Minimization Using Mobile Sink, 2014	Sink mobility scheme using two level fuzzy logic is used.	Square root mechanism gives better results and reduces energy consumption as compare to sink movement in random manner.
9	Xiangli Zhang et al.	A Data Gathering Scheme for WSN/WSAN Based on Partitioning Algorithm and Mobile Sinks, 2013	Data gathering scheme is used by dividing the network into different zones with proper data gathering latency.	Partitioning the network into zones for gathering data gives better results as compare to no partition mechanism.
10	Farzad Tashtarian et al.	On Maximizing the Lifetime of Wireless Sensor Networks in Event-driven Applications with Mobile Sinks, 2013	Convex optimization model motivated by Support Vector Regression technique is used to discover optimal approach for mobile sink.	Network lifetime is increased.
11	Wang Liu et al.	Performance Analysis of Wireless Sensor Networks With Mobile Sinks, 2012	Mobility Assisted data Collection (MADC) mechanism is used.	MADC improves the performance of WSN.

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12	Shuai Gao et al.	Efficient Data Collection in Wireless Sensor Networks with Path-Constrained Mobile Sinks, 2011	Maximum Amount Shortest Path (MASP) scheme is used to network throughput and save energy.	With MASP energy used efficiently.
13	.Wei Wang et al.	Extending the Lifetime of Wireless Sensor Networks Through Mobile Relays, 2008	Mobile Relays are used.	Network lifetime is increased.
14	Z. Maria Wang et al.	Exploiting Sink Mobility for Maximizing Sensor Network Lifetime, 2005	Linear Optimization model is used to find which group of nodes should be visited by the sink.	Enhances the network lifetime.
15	Shashidhar Rao Gandham et al.	Energy Efficient Schemes for Wireless Sensor Networks with Multiple Mobile Base Stations, 2003	Integer linear Program is used to find out energy efficient routing and new places for base stations	By applying multiple base stations the network lifetime is enhanced.

V. CONCLUSION

This paper performs the review on techniques that are used for improving the lifetime and reducing the energy consumption in wireless sensor networks. The energy consumed for transferring data between sensor nodes is large than that of sink movement and data gathering. In case of static sink the sensor nodes which are near to sink will consume most battery power and reduce the network lifetime of network. So, with the use of sink relocation method this problem will solved because in this method the energy consumption of particular group of sensor nodes can be avoided because the sink position is changed after gathering data from group of sensor nodes.

REFERENCES

1. ZhangBing Zhou, Chu Du, Li Shu, Gerhard Hancke, Jianwei Niu , and Huansheng Ning, “An Energy-Balanced Heuristic for Mobile Sink Scheduling in Hybrid WSNs”, IEEE Transactions On Industrial Informatics (2015), 1-12.
2. Punyasha Chatterjee, Nabanita Das, “Multiple Sink Deployment in Multi-Hop Wireless Sensor Networks to Enhance Lifetime”, Application and Innovations in Mobile Computing (2015), 48-53.
3. Francesco Restuccia and Sajal K. Das, “Lifetime Optimization with QOS of Sensor Networks with Uncontrollable Mobile Sinks”, (2015).
4. Omer Cayirpunar, Esra Kadioglu-Urtis, and Bulent Tavli, “Optimal Base Station Mobility Patterns for Wireless Sensor Network Lifetime Maximization”, IEEE Sensors Journal, (2015), 1-12.
5. Deepa V. Jose, Dr.G.Sadashivappa, “Mobile Sink Assisted Energy Efficient Routing Algorithm For Wireless Sensor Networks”, World of computer science and Information Technology, Vol.5, No. 2, (2015), 16-22.
6. Abdul Wahid Ali, Parmanand, “Energy Efficiency in routing protocol and data collection approaches for WSN: A Survey”, International Conference on Computing, Communication and Automation, (2015), 540-545.
7. Chu-Fu Wang, Jau-Der Shih, Bo-Han, and Tin-Yu Wu “A Network Lifetime Enhancement Method For Sink Relocation and Its Analysis in Wireless Sensor Network”, IEEE Sensor Journals, VOL. 14, NO.6,(2014), 1932-1943.
8. V.Devasvaran, N.M. Abdul Latiff, and N.N. Nik Abdul Malik, “Energy Efficient Protocol in Wireless Sensor Networks using Mobile Base Station”, IEEE 2nd International Symposium on Telecommunication Technologies, (2014), 56-60.
9. Bahmanyar Esfandiari Far, S.Alirezaee, S.Makki, “Wireless Sensor Network Energy Minimization Using the Mobile Sink”, 7th International Symposium on Telecommunications, IEEE, (2014), 1184-1188.
10. Xiangli Zhang, Hanrong Bao, Kun Yan, and Hongmei Zhang, Jin Ye, “A Data Gathering Scheme for WSN/WSAN Based on Partitioning Algorithm and Mobile Sinks”, IEEE International Conference on High Performance Computing and Communications & IEEE International Conference on Embedded and Ubiquitous Computing (2013), 1968-1973.
11. Farzad Tashtarian, M.H. Yaghmaee Moghaddam, Khosrow Sohraby, and Sohrab Effati “On Maximizing the Lifetime of Wireless Sensor Networks in Event-driven Applications with Mobile Sinks” ,IEEE,(2013),1-13.
12. Wang Liu, Kejie Lu, Jianping Wang, Guoliang Xing, and Liusheng Huang “Performance Analysis of Wireless Sensor Networks With Mobile Sinks”, IEEE Transactions on Vehicular Technology, VOL. 61, NO. 6, 2012, 2777-2788.
13. Shuai Gao, Hongke Zhang, and Sajal K. Das “Efficient Data Collection in Wireless Sensor Networks with Path Constrained Mobile Sinks”, IEEE Transaction on Mobile Computing, VOL. 10, No. 5, (2011), 592-608.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

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(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2016

14. Wei Wang, Vikram Srinivasan, and Kee-Chaing Chua, "Extending the Lifetime of Wireless Sensor Networks through Mobile Relays", IEEE/ACM Transactions on Networking, VOL. 16, NO.5, (2008), 1108-1120.
15. Jennifer Yick, Biswanath Mukherjee, Dipak Ghosal, "Wireless Sensor Network Survey", Elsevier, (2008), 2292-2330.
16. Z. Maria Wang, Stefano Basagni, Emanuel Melachrinoudis and Chiara Petrioli "Exploiting Sink Mobility for Maximizing Sensor Networks Lifetime", 38th Hawaii International Conference on System Sciences", (2005), 1-9.
17. Shashidhar Rao Gandham, Milind Dawande, Ravi Prakash and S.Venkatesan "Energy Efficient Schemes for Wireless Sensor Networks with Multiple Mobile base Stations", IEEE, (2003), 377-381.
18. Ian F. Akyildiz, Weilian Su, Yogesh Sankarasubramaniam, and Erdal Cayirci "A Survey on Sensor Networks", IEEE Communication Magazines, (2002), 102-114.