Reducing Delay Data Dissemination using Mobile Sink in Wireless Sensor Networks

Dattatray S. Waghole, Vivek S. Deshpande

Abstract-Wireless Sensor Networks (WSNs) is a collection of sensor nodes, which is spread in environmental area. These sensor nodes sense the data, information, Temperature and environmental changes from environmental area. Later it will be provide sensing information to the Sink node. In Wireless Sensor Networks hop by hop and Multi-hop communication is done. A data packet is send to the sink node via hop to hop or Multi-hop communication. Important Parameters like congestion, energy, Average End-to-End Delay consider at the time of data packets communication from one node to sink node. Many times due to congestion above mention parameters Average End-to-End Delay will be increased and energy also loss at the instance of communication. Initial aim of this paper is reduce average End-to-End Delay using Movable Mobile Sink in uniform Random Wireless Sensor Network. Energy Consumption and Traffic control also other important parameters consider at the time of analysis. Movable mobile sink node reduces Average End-to -End Delay drastically when mobile Sink node moves from left side to Right side Direction. Mobile Sink is also moving different Direction so Mobile sinks collect the data moving through different direction. So, delay is reducing drastically for data packets collection from the networks. In this paper there solve energy consumption, congestion and Average End-to –End Delay problem for collection of data packets in the network.

Keywords - Average End-to-End Delay, Movable Mobile Sink. Energy Consumption, Wireless Sensor Networks (WSNs), Data Dissemination.

I. INTRODUCTION

Wireless Sensor network s is a set of different types of node which are distributed on different locations. Nodes are spread in specific area which is small size, minimum cost and better for sensing the data from deployed area. Reducing Delay and conservation of Energy is most important components or parameters for wireless Sensor Networks. Most of time many researcher concentration on energy consumption factor in network design and analysis. In much research use Directed Diffusion (DD) Technique in wireless sensor network with mobile nodes for data collection of data or information. In general any sensing node senses Temperature, Heat, Environmental changes from area. Many times due to congestion i.e. Traffic arrives in the network. So average End-to-End Delay will be Increased and Average energy also increased due to heavy traffic.

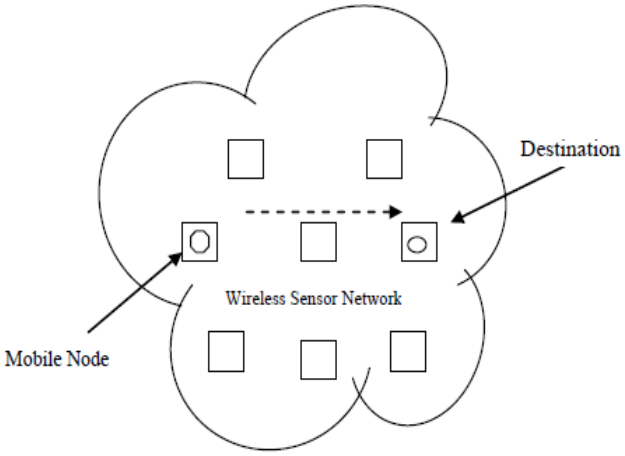
Manuscript received on March, 2013.

Dattatray S. Waghole, Department of Information Technology, MAEER's MIT College of Engineering, Pune, India.

Vivek S. Deshpande, Department of Information Technology, MAEER's MIT College of Engineering, Pune, India.

One mechanism proposes sink initiate routing algorithm it's better to support sink mobility for mobile sink in wireless sensor network. This mechanism have no effect on signal overhead of the wireless sensor networks [1] .our paper uses Movable Mobile Sink scenario which Is decrease average End-to-End delay. The Architecture for mobile collection of information or data packets, that concatenation of two different mechanisms for reducing latency or delay. One is Range Constrained Clustering algorithm (RCC) for end or stop point of mobile agent determination. Another one is Mobile Data Collection (MDC) between long distance and long range communication in wireless sensor network [2].

The some researcher's uses data dissemination protocol for impact of energy consumption in wireless sensor networks [3].in this paper decrease Average End-to-End Delay and consume energy drastically using the Movable Mobile Sink for Data packet collection. We analyse for different movable mobile sink direction in Wireless Communication. Movable mobile sink collect the data packets routing in network. So it should be shown good effect on Average End-to-End delay and Energy Consumption with traffic control. If speed of the movable mobile sink will be increased then Average End-to-End Delay for this network will be drastically decrease. Packet Delivery Ratio(PDR) will be give great result for mobile sink due to Mobile sink will be collect the data from whole Network .



Figur1: Mobile Sink in Wireless Sensor Network

As shown in Figure1 Mobile Sink in Wireless Sensor Network shows that collection of Mobile Nodes. This fig shows within number of mobile nodes one node is mobile Source Node and another one is Destination Node. Dotted Arrow shows that in this figure moving mobile node Direction Left-Side to Right-Side Direction of node. Mobile Sink Node move from left-side Direction to the right-side Direction for collection of data packets through network. Collection of Data packets or information starting from Mobile Sink Node to the Destination node.

II. RELEATED WORK

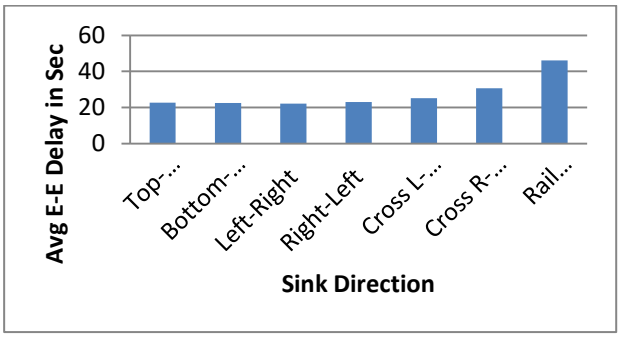
As we know, Wireless Sensor Networks (WSNs) have different important Parameters which are related with each other. Energy, Delay, Reliability, Congestion are the important parameters i.e. Quality of services of Wireless Sensor Networks. Which are independent for performance our paper is proposing the method of reducing Average End-to-End Delay drastically with Congestion control for different speed rate in Wireless Network.Author Jae-Wan Kim proposed one protocol name as Intelligent Agent-Based Routing (IAR) Protocol. Initially some algorithms give better advantage like support the Sink mobility. But in this paper solve the drawback like restriction of applicability. So author propose one algorithm for support sink mobility efficiently i.e. Sink-initiated routing algorithm in An Intelligent Agent-based Routing Structure for Mobile Sinks in WSNs.so, its great advantage is sink mobility supported algorithm unaffected from number of sources in its signal overhead. This algorithm has a one drawback like when sinks are movable then due to higher signal overhead this algorithm is not proper work efficient [1].

Arun k. Kumar author of Energy Efficient Mobile Data Collection in WSNs (EEMDC) with reducing delay proposed two algorithms i.e. they proposed new Architecture of mobile collection of data packets with get together for reducing delay for wireless Communication. One is Range Constrained Clustering (RCC) algorithm for covering all nodes from the wireless communication with minimizes total Stops. Because it determine number of stops of mobile agents. Another algorithm used for Mobile Data Collection (MDC) large and long distance (Range) wireless network communication .one great advantage is data packet delay is drastically reduce using algorithms or techniques. As like throughput per Round Trip Time is unaffected it's a one drawback of this mechanism [2].collection of data from sensor nodes and sends it to the Sink node is a method or process of data dissemination. Many authors use different protocols and mechanisms for data collection with mobile sink in wireless sensor networks. Author Guillaume Chelius propose the one new useful technique or protocol name as Line-Based Data Dissemination (LBDD) protocol for reducing delay as compared previous protocol and most important factor is energy consumption which is directly affected on lifetime of networks. Most important advantage for this protocol is it increases the network lifespan in wireless sensor network with mobile sink. There is one drawback is data persistence in case of malicious node [3].

For collection of data packets or data dissemination protocols or techniques are proposed by many authors for Static Sink. Data diffusion that means number of collected data packets should be collected in single data packet and send it to for the remaining process to the Destination node. This is one example of data dissemination protocol. Author Elyes Ben Hamida researches the technique for network lifetime and network connectivity, energy consumption. Main disadvantage is backbone based approach is required (need) for the maintain network structure [4].As like above mentioned drawback of malicious node i.e. misbehaviour of node. The author George Pavlou develop the algorithm and protocol for solve the dropped packets from the malicious nodes. This algorithm detecting misbehaviour of data packets forwarding in the network. The using the principle of flow conservation data packets enables for forwarding data. For receiving and sending the packets this algorithm not require high density network [3]-[5].Initially previous days at the time of data collection in Wireless Sensor Networks .Data packets should be travel hop-hop or through multi-hop sensor network to the Destination node. At that instance huge amount of energy should be lost in the communication. Some time nodes should be dead within the communication between sensor nodes. So network gives poor performance or lost communication. Then later for solve this situation researcher's search one new supporting technique which one node mobility technique for energy consumption [6][7].For long Range or long distance communication require more energy in that case more energy should be lost in the communication. So for Energy Aware in data packets collection i.e. in the process of data dissemination of mobile data collection (MDC) [8]. When more energy should be used from the communication network. Then some nodes should be not only die but also decrease the network lifespan for data collection in the WSNs [8][9]. In case of data packets security in the wireless mobile network or in Mobile Ad-hoc network (MANET) unauthorized access of data packets. Prevent the malicious nodes in the network due to malicious nodes drop the packets at the time of communication [10].

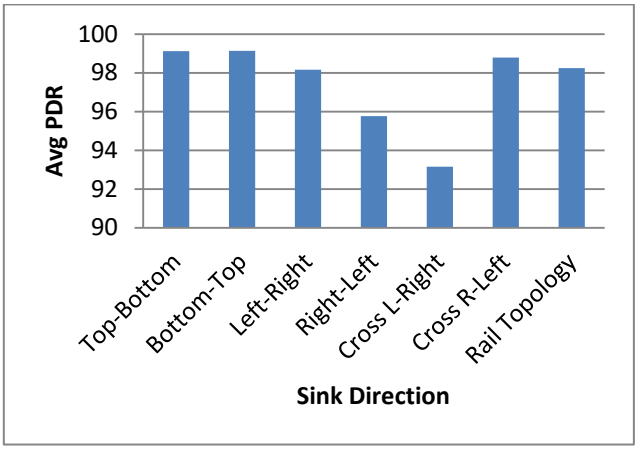
III. RESULT ANALYSIS

In this our simulation scenario included number of 30 sensor nodes with assuming one Movable Mobile Sink node. Using uniform Random network scenario 30 nodes are formed in the 1000*1000 m2 area. IEEE 802.11 media access control protocol (MAC) is used. The routing protocol Ad-hoc on demand routing protocol is used. Packet size is 50 bytes. Reporting Rate (RR) is 10packets/sec. Mobile movable sink is used for data dissemination. Sink should be Move from Left-side to the Right-side direction for data dissemination in the network.



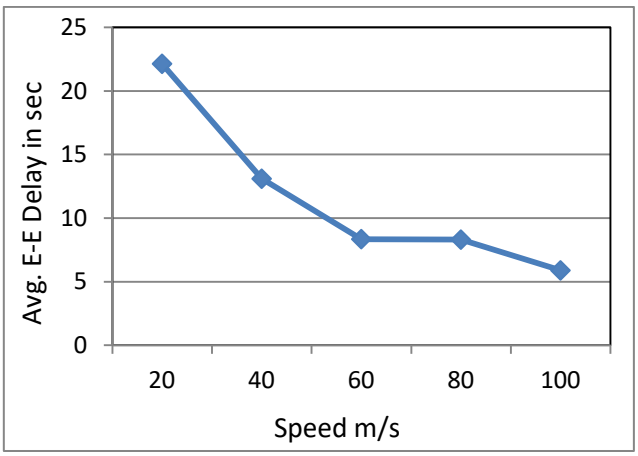
Figur1: Average E-E Delay as a function of Sink Direction.

In the Figure 1 End-to-End Delay depends on the sink direction path it will take more Delay for rail topology. while Right to Left Direction of the Sink gives threshold. So that we can have direction from top-bottom (T-B), Bottom-top (B-T), Left top –Right bottom (LT-RT) in cross direction path and Right top-Left bottom (RT-LB) cross direction of path it gives near about equally same delay. It will cover most of the data of the network while travelling path from left-right .maximum node at the time of travelling mobile node in any direction. Left to Right Direction of Mobile Movable Sink gives less E-E Delay in the Network.



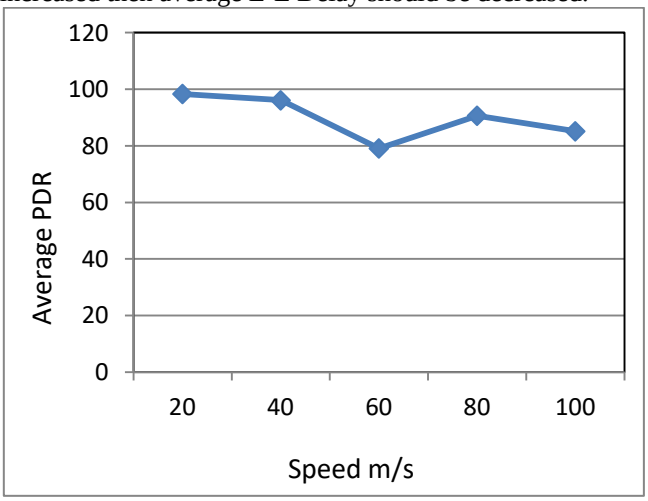
Figur2: Average PDR as a function of Sink Direction.

Cross Left-Right will be less Packet Delivery Ratio (PDR).Density of path from top left –Bottom right is sparse and Top-Bottom as well as Bottom-Up gives equal PDR for Wireless Network.



Figur3: Average E-E Delay function of speed for MAC 802.11

As shown in figure 3 graph of Average End-to-End Delay function for Different Speed shows that when mobile sink should be moves from Left-Right (L-R) direction then Average End-to-End Delay should be drastically decreases for different variation of speeds. If speed of the sink will be increased then average E-E Delay should be decreased.



Figur4: Average PDR function of speed for MAC 802.11

As shown in figure 4 Average Packet Delivery Ratio (PDR) for Sink Moves from Left to Right Direction should be better for variation of Speed of Sink in WSNs. When Speed of sink node will be increased then it's not more affected on Average Packet Delivery Ratio of Network. Movable sink will be collect more data from network.

IV. CONCLUSION AND FUTURE WORK

Left Direction to Right Direction movable mobile sink gives great Result for Average End-to-End Delay and Packet Delivery Ratio (PDR) using variation of Speeds. Rail topology requires more delay for collection of data. So rail topology gives very poor performance irrespective of other mobile movable direction. For left to right direction irrespective Speeds Average End-to-End Delay should be drastically decreases and PDR will be increased.

In future work us reducing average End-to-End delay, Congestion control and Energy Consume using Travels Salesman Problem and using Different techniques. Different more efficient protocol will be develop for faster without lost data dissemination. Loss of energy decreases the lifetime of wireless sensor network.

REFERENCES

1. Jae-Wan kim Jeong-Sik In, Kyeong Hur, Jin-Woo and Doo-Sleep Eom", An Intelligent Agent-based Routing Structure for Mobile Sink in WSNs", IEEE, Transaction on Consumer Electronics, VOL.56, No.4, pp. 2310-2316, November 2010.
2. Arun K. Kumar and Krishna M. Sivalingam", Energy-Efficient Mobile Data Collection in Wireless Sensor Network with Delay reducing using Wireless Communication", IEEE Communication Systems and Networks, 2010.
3. Elyes Ben Hamida and Guillaume Chelius", A Line-based Data Dissemination protocol for Wireless Sensor Networks with Mobile Sink", IEEE International Conference on Communication-ICC, pp.2201-2205, 2008.
4. Elyes Ben Hamida and Guillaume Chelius", Strategies for Data Dissemination to Mobile Sinks in Wireless Sensor Networks", IEEE Wireless Communication Magazine, VOL.15, No.6, pp.31-37, February 2008.
5. Oscar F.Gonzalez, Michael Howarth, George Pavlou", An Algorithm to Detect Packet Forwarding Misbehaviour in Mobile Ad-hoc Networks", 10 Th IEEE International symposium, pp.813-816, 2007.
6. E.Ekici, Y.Gu and D.Bozdag", Mobility-based communication in wireless sensor networks", IEEE Communications Magazine, vol.44, no.7, pp.56-62, July 2006.
7. Q.Wu,N.Rao,J.Barhen,S.lynger,V.Vaishnavi,H.QiandK.Chakrabatry", On computing mobile agent routes for data fusion in distributed sensor networks", IEEE Transaction on knowledge and Data Engineering,vol.16,no.6,pp.740-753, june 2004.
8. S.Kim, T.Abdelzaher and W.H. Kwon", Minimum Energy asynchronous Dissemination to Mobile sinks in Wireless sensor Networks", ACM Sensys, Los Angeles, CA, pp.193-204, November 2003.
9. W.Wang, V.Srinivasan, and K.C.Chua", Using mobile relays to prolong the lifetime of wireless sensor networks", In Mobicom, International Conference on Mobile computing and Networking. New York, NY, USA: ACM press, pp.270-283, 2005.
10. H.Yang, j.Shu, X.Meng and S.Lu", SCAN: self-organized network-layer security in mobile ad hoc network", IEEE journal on Selected Areas in Communication, vol.24, No.2, pp.261-273, February 2006.

AUTHORS PROFILE

Mr. Dattatray S. Waghole, Student of MIT College of Engineering, Pune. I have done B.E in Information Technology from MIT College of Engineering, Pune. I am Pursuing M.E in Information Technology from MIT College of Engineering, Pune. Now I am working on Delay in Wireless Sensor Networks. My area of interest is WSNs. Decreasing End-to-End Delay in Wireless Sensor Networks is my primary goal of Working.

Energy Consumption is relevant parameter of Delay. So, I am concentration on working of Energy consumption.

Mr. Vivek S. Deshpande, Dean, Research & Development, MIT College of Engineering, holds Bachelors and Masters of Engineering in Electronics and Telecommunications from Pune University, India in 1993. Currently he is doing a research in Wireless Sensor Networks, embedded systems and High Performance Computer Networks. He has got 6 patents on his name.

His 20 years of teaching and industrial experience is an asset to the organization. He is working as Associate Professor in Department of IT, His expertise in the field of Wireless computer Networks and Distributed system helps in guidance to the PG students.