RESEARCH ARTICLE OPEN ACCESS

Sensor Data Collection Process for Traffic Communication Reduction Technique using Wireless Sensor Networks

Jogi Naidu Kuriti , D.L.Mythri
[1,2] *Assistant Professor Department of Electronics and Communication Engineering, Dadi Institute of Engineering and Technology, Anakapalli Jawaharlal Nehru Technological University Kakinada.*

ABSTRACT:
now a days, many case studies exploit mobile sinks to collect large scale data-base sensor data for environmental observations or weather forecasting. Agent (Artificial intelligent) travels in sensing areas and collect data directly from each sensor. By using this, we can reduce communication traffic further than that for the case of constructing sensor networks. However, in many methods, the mobile sink collects data from all sensors that the mobile sink can communicate with. In this paper, we propose a communication traffic reduction method by agent approach for sensor data. In our proposed method, the agent broadcasts predicted sensor data to each sensor. Only sensors whose sensing data exceeds the admissible error margin from the predicted sensor data transmit their data. Therefore, the communication traffic can be reduced and at the time of implementation results demonstrated the effectiveness of our proposed method.
Keywords: Data Collection, sensor data, Traffic communication, mobile sink, communication traffic, wireless sensor network.

Date of Submission: 19-12-2017 Date of acceptance: 08-01-2018

I. INTRODUCTION

Now days, there has been an increasing interest on sensor data collection for the weather forecasting and environmental observations and many more. To realize these applications, we have to collect sensor data from many sensors. One of the ways to collect sensor data is to construct a wireless sensor network (WSN) and the sink node by using agent approach collects sensor data. Therefore, recent studies exploit mobile sinks such as taxies or buses equipped with a sink node and as far our proposed method is concern we used an agent based approach for collecting all such data in the sensing area that sensors are deployed and collect data from each sensor directly.

This sink is also act as an agent for collecting sensor data and passes this data to the base station .The communication traffic decreases compared with the traditional sensor network approach. Moreover, by using robot as a mobile sink, we can monitor dangerous area which is hard to visit. Although actual sensor value is not always the same as the predicted sensor value, many applications can accept a little error. For example, suppose the case that the agent collects temperature data from sensors for environmental observations.

The accuracy of the sensor data is 0.1 degree. In this case, we can accept the error within 0.1 degree. Admissible error margin means the error margin that the application can accept at the time of programming. That is, when the admissible error margin is 0.1 degree, the application can accept the error of ± 0.1 degree from actual sensor data value by using the agent because whatever the data which has to be collected by the agent is compared to the previous one. If it is same then no need to send it once again, since the redundant communication is eliminated, the communication traffic can be reduced.

The agent sends predicted sensor value to the sensors before they transmit their observed sensor value to the mobile sink. Each sensor compares their sensor value with the predicted sensor value that receives from the mobile sink and replies only when the observed sensor value exceeds the admissible error margin from the predicted sensor value. The communication traffic can be reduced because sensors do not have to transmit all data to that each sensor.

II. BACKGROUND:

2.1. Data Collection: Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes.

2.2. Sensor data: Sensor data is the output of a device that detects and responds to some type of input from the physical environment. The output may be used to provide information or input to another system or to guide a process.

2.3. Traffic communication: Traffic is measured by the Erlang, which is the unit of (telephone) traffic intensity defined as the number of (telephone) call arrivals per mean service time. One Erlang is equal to the number of call-seconds divided by 3600, which is equal to a fully loaded (voice) circuit over a one-hour period.

2.4. Mobile sink: Mobile Sink nodes are used in the wireless sensor networks to handle data collection and transmission process. Extended Sink Scheduling Data Routing (E-SSDR) is used to schedule sinks. The Delay bounded Sink Mobility (DeSM) is solved with centralized and distributed scheduling schemes.

2.5. Communication: Communication is sending and receiving information between two or more people. The person sending the message is referred to as the sender, while the person receiving the information is called the receiver.

2.6. Traffic: Continues Flow of attempts to make contact, calls, and messages over a circuit, line, or network, measured usually in bits per second (BPS).

2.7. Wireless sensor network: A wireless sensor network (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to monitor physical or environmental conditions. A WSN system incorporates a gateway that provides wireless connectivity back to the wired world and distributed nodes.

III. EXISTING WORK:

We have studied that he key idea in this model is to develop mobile entities present in an application scenario. They call these entities MULEs (Mobile Ubiquitous LAN Extensions) because they "bring" data from sensor [2] to access point. For example, in a city traffic monitoring application vehicles can act as MULEs; in a habitat monitoring scenario, the role can be served by animals; in a national park monitoring scenario. MULEs are assumed to be capable of limited wireless communication and can replace data as they pass by sensors and access points as a result of their motion. Thus MULEs pick up data from sensors, buffer it and later on drop off the data at an access-point.

The MULE architecture provides connectivity by adding an intermediate layer of mobile nodes to the existing relationship between sensors and access-points. This effort is only a first step in accepting the feasibility of with mobility in sensor networks. It is clear that much more work remains to be complete to fully understand the cost effectiveness of this approach.

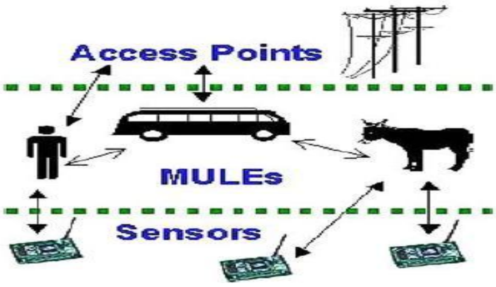

Fig2. The three tiers of the MULE architecture

In [3] paper, they have offered a routing protocol, MobiRoute, to sustain wireless sensor networks (WSNs) with a mobile sink. This can prove theoretically, that moving the sink can improve network lifetime without sacrificing data delivery latency. By inventively simulating MobiRoute with TOSSIM (in which real implementation codes are running),they have demonstrated the benefit of using a mobile sink rather than a static one. They have pretended both general networks with nodes located in point lattices and a special in-building network with nodes forming a ring. The results are very promising: a mobile sink, in most cases, improves the network lifetime with only a modestly degraded reliability in packet delivery. We are in the process of performing full-scale field tests with the in-building network. They will also improve MobiRoute based on the skill obtained from the field tests.

In [4] we have studied that the density of the network increases due to increasing number of nodes. Bearing in mind the approach of fixed round trip time for data mule, there are more nodes from which data has to be collect, in the same amount of time. This leads to loss of data due to buffer overflows at the nodes. If the second approach of stopping at each node is used, the data mule will take a longer time to complete a round.

In this case, although at time of each service, the buffer of a node is empty, it may not be possible for the data mule to return to this node before its buffer fills again. Again this leads to loss of data. Another issue arises if the network is deployed over a larger area. The distance over which the data mule moves increases. The battery capability may not be sufficient for moving this length, requiring recharge on the path. These problems can be addressed by using multiple data mules. A slight solution would be dividing the area into equal parts and having one data mule in each. This solves the problem if the nodes are uniformly randomly deployed, so that each mule gets approximately same number of nodes to service. For instance, consider the area shown in Figure 3, with 4 mules. Each mule covers the similar area. Now each mule can independently run the same single mule algorithms presented in the previous section.

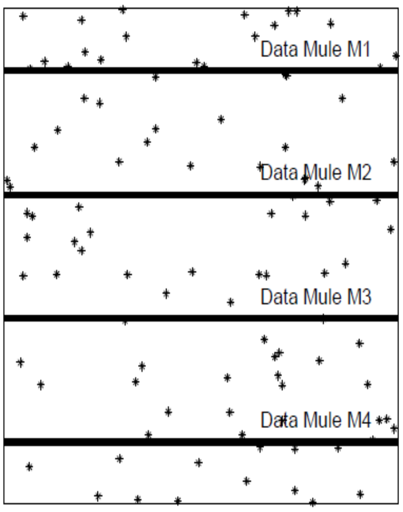

Figure: Multiple data mules covering an area

we have studied that, the main objective [7] of our proposed algorithm is to efficiently convey all the traffic destined for the sink and improve the network lifetime. we have investigated the impact of sink mobility on network lifetime. In a typical WSN, all the data generate in the network are routed to a static sink.

Nodes near the sink tend to deplete faster in their energy which might cause holes in the network thus limiting the network lifetime. With the introduction of mobile sink, the nodes around the sink always changes, thus balancing the energy consumption in the network and improving the network lifetime. Proposed algorithm was able to balance the improvement of the network lifetime with the reliability of the network.

Termite-hill is a routing algorithm for wireless sensor networks that is inspired by the termite behaviors. The principles of swarm intelligence are used to describe rules for each packet to follow which results in developing routing behavior. The algorithm finds its way for improved performance in the reduction of control traffic.

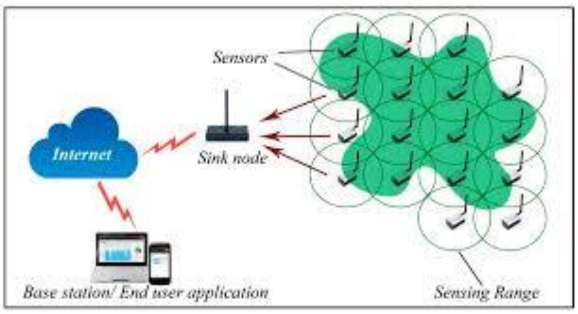

Figure: Wireless Sensor Networks

In they enable a user to issue a query to be swamped to the network to build data forwarding and aggregation plans. Such flooding-based systems can be made more energy efficient by exploiting the spatial correlation in sensor data. Clusters base prediction model while CAG [5] forms clusters using real-time sensor values in sensor data while CAG takes advantage of spatial correlation to form clusters.

CAG exploits semantic transmit in order to reduce the communication [7] overhead by leveraging spatial correlation, the characteristic of the data distribution. CAG achieves efficient in-network storage and processing by allowing a unified mechanism between query routing (networking) and query processing (application). Instead of gathering and compressing all the data (lossless algorithm), CAG generates synopsis by filtering out insignificant elements in data streams to reduce response time, storage, computation, and communication costs.

IV. PROPOSED WORK

We propose a communication traffic reduction method by delivering a predicted sensor data. In our proposed method, we assume that the mobile sink which act as a agent goes around a fixed route in the sensing area. The mobile sink stops and uploads collected data to the base station when it returns to the base station. Our proposed method divides the sensing area into some areas.

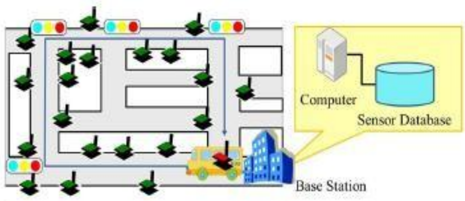

Figure: A sensing system using a mobile sink.

The mobile sink sends predicted sensor value to the sensors before they transmit their observed sensor value to the mobile sink. Each sensor compares their sensor value with the predicted sensor value that receives from the mobile sink and replies only when the observed sensor value exceeds the admissible error margin from the predicted sensor value. The communication traffic can be reduced because sensors do not have to transmit all data that each sensor has to be given.

In this paper, we proposed a sensor data collection method with a mobile sink (i.e Agent) for communication traffic reduction by delivering predicted sensor value. In our proposed DPV method, the mobile sink delivers coefficients of predicted sensor value planes calculated from stored sensor data. When sensors receive these coefficients, the sensor computes predicted sensor value by using their position information and time. After that, only sensors whose sensing data exceeds the admissible error margin from the predicted sensor value transmit their data. From experimental results, we confirmed that the DPV method reduces the communication traffic compared with comparative approach.

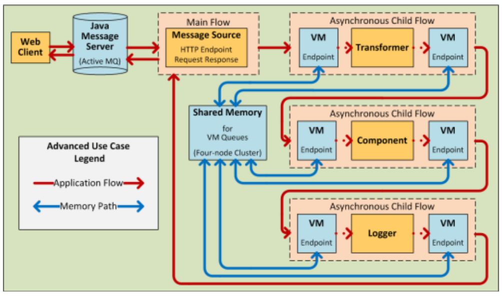

Figure: Sensor Network Architecture.

The main purpose of this paper is to use efficient energy, and by using agent base approach we are collection data from the sink which is act as a cluster head of the sensor network. In the previous paper data is collected by sink but this sink node is act as a dummy sink node, but in our algorithm data is collected by the sink i.e. agent. Agent is an intelligent agent so whatever data can come together is by removing the false positive. The agent has to collect all sensors data and send to the base station. In next round it can compare the previous data and according to that DPV method can utilize. Our experimental result can given a three major parameter i.e. a) Energy efficiency b) Delay c) Throughput. By comparing with and without using algorithm and this can be done on the Linux platform under NS-2 stimulation.

V. CONCLUSION AND FUTURE RESULTS

We have proposed and described a sensor data collection method with a mobile sink for communication traffic reduction by delivering predicted sensor value and the data is collected by the agent. In our proposed DPV method [7], the mobile sink delivers coefficients of predicted sensor value planes calculated from stored sensor data.

When sensors receive these coefficients, the sensor computes predicted sensor value. The agent has to collect all the sensor data and send it to the base station with the help of admissible error margin that had to be set at the time of programming. And finally the result shows the graph related to the energy efficiency, delay and throughput.

REFERENCES

[1] J. Shen and L. Hao, *Zigbee MCU Principal and Application based on STM32W Radio Frequency*, Beijing University of Aeronautics And Astronautics Press, September 2010.

[2] W. Zhang, L. Feng, and Z. Wen, "Research on home networking with Zigbee," *Journal of Hefei University of Technology*, vol. 28, pp. 755- 759, 2005.

[3] Sushant Jain, Rahul C. Shah, Sumit Roy "Exploiting Mobility for Energy Efficient Data Collection in Wireless Sensor Networks" Mobile Networks and Applications 11, 327–339, 2006.

[4] R.C. Shah, S. Roy, S. Jain, and W. Brunette, "Data MULEs:modeling a three-tier architecture for sparse sensor networks," Proc. Int. Workshop on Sensor Network Protocols and Applications (SNPA'03), pp.30–41, May 2003.

[5] J. Luo, J. Panchard, M. Piorkowski, M. Grossglauser, and J.-P. Hubaux, "MobiRoute: routing towards a mobile sink for improving lifetime in sensor networks," Proc. IEEE Int. Conf. on Distributed Conmputing in Sensor Systems (DCOSS'06), pp.10–11, June 2006.

[6] David Jea, Arun Somasundara, Mani Srivastava "Multiple Controlled Mobile Elements (Data Mules) for Data Collection in Sensor Networks".

[7] A.M. Zungeru, Li-Minn Ang "Termite-hill: Routing Towards a Mobile Sink for Improving Network Lifetime in Wireless Sensor Networks", 3rd International Conference on Intelligent Systems Modelling and Simulation, 2012

[8] SunHee Yoon and Cyrus Shahabi "Exploiting Spatial Correlation Towards an Energy Efficient Clustered AGgregation Technique (CAG)" IEEE 2005

[9] Seino, W., Sakashita, S., Yoshihisa, T., Hara, T. and Nishio,S. "A Communication Protocol to Improve Fairness and Data Amount on Sensor Data Collection with a Mobile Sink," Proc. Int. Conf. on Broadband, Wireless Computing, Communication and Applications (BWCCA'2010), pp.33–40, Nov. 2010.

[10] Y. Wang and G. Shen, "ZigbeeWireless Sensor Network Technology and Application," *Ship Electronic Engineering*, 10th ed, vol. 28, pp. 32-34, 2008.

Author Profiles:

JOGI NAIDU KURITI working with Dadi Institute of Engineering & Technology (DIET) - Anakapalli, affiliated with Jawaharlal Nehru Technological University-Kakinada. He is completed Bachelor of Technology in ECE from Biju Patnaik University, Odisha. He is completed in Master Degree in ECE from Sathyabama University, India.

He has 9 years good teaching experience with taught various subjects on good knowledge on VLSI design, IC applications, Digital communications, Satellite communication, Cellular mobile communication, Electronic devices and circuits, Low power VLSI design CPLD and FPGA, EDC, RVSP, and along with ECE subjects. He rapidly published 7 research papers in reputed International and national level conferences\Journals\Magazines, He was attended and organized 2 FDP/ 3 Conferences, 2 workshops. He is Participated and active member in academic, curriculum and administrative works in various organizations.

D.L.MYTHRI working with Dadi Institute of Engineering & Technology (DIET) - Anakapalli, affiliated with Jawaharlal Nehru Technological University-Kakinada. She is completed Bachelor of Technology in ECE from JNT University, Kakinada. She is completed in Master Degree in ECE from JNT University, Kakinada, and Andhra Pradesh, India.

She has 5 years good teaching experience with taught various subjects on good knowledge on EDC,OC,Pulse and Digital Circuits(PDC), Embedded Systems(ES), Microprocessors and Microcontrollers(MP &MC), Cellular And Mobile Communications, VLSI and along with ECE subjects. She published 3 research papers in reputed International and national level conferences\Journals\Magazines, attended 2 conferences, 4 workshops. She was Participated and active member in academic, curriculum and administrative works in existing resources Organization.

International Journal of Engineering Research and Applications (IJERA) is **UGC approved** Journal with Sl. No. 4525, Journal no. 47088. Indexed in Cross Ref, Index Copernicus (ICV 80.82), NASA, Ads, Researcher Id Thomson Reuters, DOAJ.

Jogi Naidu Kuriti "Sensor Data Collection Process for Traffic Communication Reduction Technique using Wireless Sensor Networks." International Journal of Engineering Research and Applications (IJERA) , vol. 8, no. 1, 2018, pp. 83-87.