Journal of Engineering and Applied Sciences 13 (Special Issue 7): 5612-5614, 2018
ISSN: 1816-949X

A Reliable Data Gathering Techniques in Wireless Sensor Networks Using Collectible Nodes

T. Paramaguru and S. Gowri
Department of Information Technology, Sathyabama University, Chennai, India

Abstract: In general, the sensor nodes are constrained by their limited battery power for their energy. The objective is to increase the network life time by gathering and uploading data in a reliable manner. In order to maximize the sensor network life span, the energy management techniques are necessary to minimize the total power consumption of all the nodes in the network. When the sink node seeks data and the node which gathers sensory information which communicates with other connectednodesin the network may affect due to the search of polling point and in turn energy may get wasted. So, our proposed work is to find an exact node efficiently by using a collectible node called CONODE to collect the data at regular intervals of time. Firstly, cluster head is chosen for each cluster by selecting the node which is having the highest energy level and then the Not_Event nodes called CONODE are placed in the range of each cluster. The Not_Event nodes does not sense any event, it has the information about all the sensor nodes event name and its id. Whenever the sink request for the data, the Not_Event node check its buffer and provide its address of its CH and the CH node gathers the data from its members and send that data to the base station. If the data is available at different cluster all the data's are gathered and fused at fusion centre. The implementation of CONODE is done by region based approach. And also in the case of node failure in the network, i.e., the emergency case, the CONODE collects the data immediately from the particular node. The proposed idea simplifies the previously proposed methods and reduces latency in data collection and improves network lifetime. In the current study, we have proposed an idea to minimize the energy by iterative allocation of CONODE and maximize the data gathering by using a ping pong algorithm. Extensive simulation results have been obtained and analyzed to demonstrate the performance.

Key words: Not_Event Node (CONODE), data gathering, Ping-Pong framework, wireless sensor network, demonstrate, energy

INTRODUCTION

Nowadays wireless sensor networks are providing tremendous benefits to many application such as industrial, military application, etc. The sensors are distributed in environmental fields to detect the physical conditions such as humidity, temperature, forest fire etc. and pass the sensory data through the network to the main location. Generally the sensor nodes are limited in memory and power, the data gathering in Wireless Sensor Network (WSN) becomes as a major issue now a days. Most of the energy of senor node is consumed on two major tasks that is while sensing the fields and while uploading data to the data sink. On the other hand, the energy consumption is non uniform among sensors on uploading data. It mainly depends on the location of the destined data sink and the network topology. As a result, the energy of the sensors near the sink is depleted much sooner than others, since, these sensors need to relay much more packets from the sensors far away from the sink (Zhao *et al*., 2011; Zhang *et al*., 2009). Therefore, efficient aggregation of the information from scattered sensors is an important and challenging issue in WSNs. A cluster-based wireless sensor network idea is used to detect forest fire in real-time mode (Zhao and Yang, 2010). Many other applications of wireless sensor technologies in agriculture and food industry are reviewed as per current trends following are the some important challenging (Ruiz-Garcia *et al*., 2009) issues in cluster based WSNs: limited energy, network lifetime, cluster formation and CH selection, synchronization, data aggregation and node mobility. So, in our proposed work, we introduced a scheme to reduce the power consumption in WSN data gathering and uploading in a reliable manner.

MATERIALS AND METHODS

The proposed system ensures that prolong lifetime of the network and consumes low energy of each and every

Corresponding Author: T. Paramaguru, Department of Information Technology, Sathyabama University, Chennai, India

node in the network. The data which is gathered is forward to destination from source in secure and fastest way. When the sink node is interested in data then the sink node sends its interest to all the Not_Event nodes present which is also called Collectible Nodes (CONODEs).

Cluster head formation: Sensor nodes are grouped in to clusters. Each cluster has cluster head, i.e., among all the sensor node one of the node in the cluster become cluster head. The cluster head is formed to save the energy of the nodes and also the lifetime of the network. The cluster head communicates with all the other nodes in the cluster and also with another cluster through gateway. Through election process cluster head is elected in each cluster by LEACH (Low-Energy Adaptive Clustering Hierarchy) protocol (Wu *et al*., 2007). Thus, by selecting the cluster head, the energy is saved and data can be transmitted from source to destination in a shorter time period.

Collectible Nodes (CONODEs): The word collectible means that some people want to collect something as a hobby. Here, the node which collects the meta data information from all the sensor nodes of the clusters. Each CONODE is assigned for collecting some particular event's name and each CONODE has information about all the neighbor CONODEs event name and id of all the sensor nodes in the network. Let's say, for example, if the sensor node detects humidity related event means then the name of the event is humidity and its sensor id (a unique id) is passed to the CONODE which is nearer to the cluster (within the range of the cluster) and that CONODE collects and saves (id, name of event) in its own buffer but not the whole information of humidity only it stores name of the event.

Whenever the sink node requests for "Humidity" data to all the CONODEs then the intended CONODE checks its buffer to know the cluster addresses and sends the request to the destined Cluster Head (CH). Once the request reaches the CH, then CH gets the related data as response to the request and forwards to the CONODE and then finally the CONODE forwards to the sink. In this manner, data communication takes place.

Ping Pong framework: This methodology uses Ping Pong framework. This PP framework detects whether the opposite end is still available or not. The Ping refers to a request and Pong refers to a response. Whenever, the CONODE sends sink's request to the CH, the CH gets the event name along with the energy level packet as a response. If the energy level is low then the CONODE collects all the data from the draining node and saves it in its own buffer. So, by this way the data never lost and QOS is obtained, less energy consumed, since, CONODE is working together for transmissions instead of transmitting to all the node in its way (less number of transmission to all the nodes). Even the nodes are several hop away from BS the communication is always two hop (it is scalable to large no. of nodes). The region-division and tour planning algorithm is used to find the short data gathering time by considering the whole sensing field in the single SenCar (Zhao and Yang, 2010). By considering the weight of the polling point and divide them into different regions based on the weight which is not discussed here.

RESULTS AND DISSCUSSION

System implementation: The following Fig. 1-4 show the connection from sink to Not_Event nodes and the request is transfer to the intend cluster by referring its buffer.

The following Fig. 1-4 show that, the performance of the network behavior based on the energy consumption, throughput and data latency.

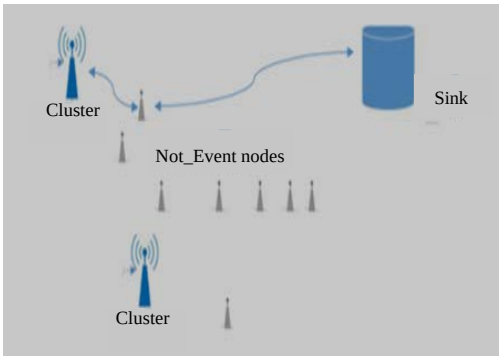

Fig. 1: System architecture

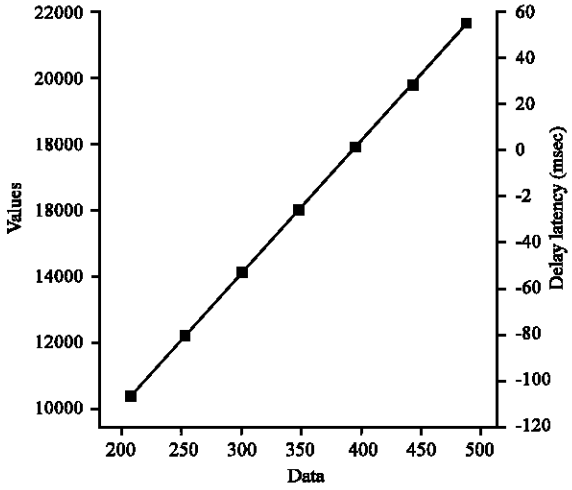

Fig. 2: Data latency

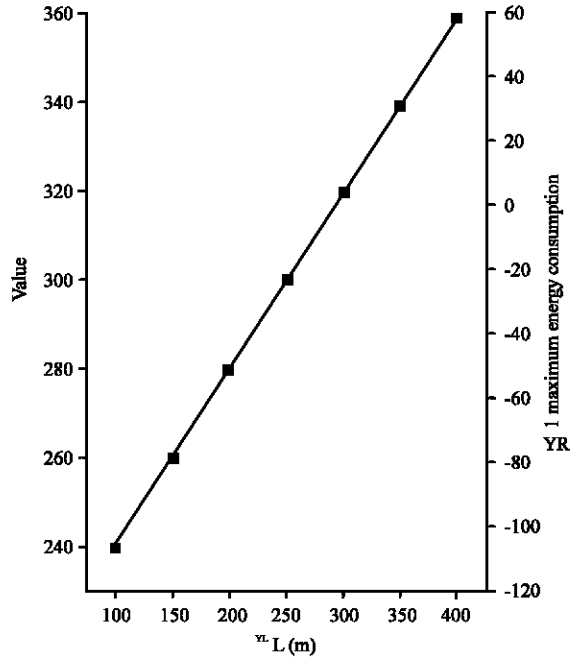

Fig. 3: Maximum energy consumption

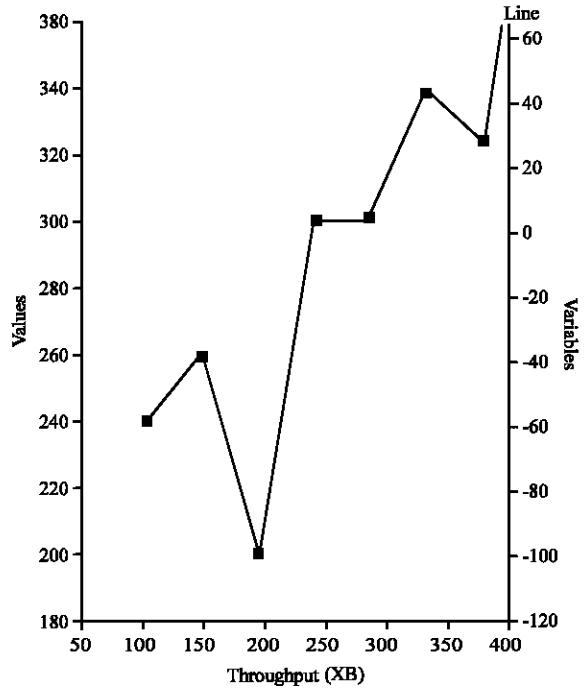

Fig. 4: Throughput performance

CONCLUSION

In this study, we have proposed a Ping-Pong (PP) framework for mobile data collection in a WSN. Our performance study demonstrates the effectiveness of the proposed framework. The results shows that this framework can greatly reduce the energy consumption. In addition to that quality of service metrics such as delay, data latency are also improved.

RECOMMENDATIONS

The proposed system can be de deployed in any location. But in case of dense foliage each and every location needs to be analyzed efficiently to find a node position. In our future study, the localized trust based model is used to detect a nodes.

REFERENCES

Ruiz-Garcia, L., L. Lunadei, P. Barreiro and I. Robla, 2009. A review of wireless sensor technologies and applications in agriculture and food industry: State of the art and current trends. Sensors, 9: 4728-4750.

Wu, H., Y. Wang, H. Dang and F. Lin, 2007. Analytic, simulation and empirical evaluation of delay/fault-tolerant mobile sensor networks. IEEE. Trans. Wirel. Commun., 6: 3287-3296.

Zhang, J., W. Li, Z. Yin, S. Liu and X. Guo, 2009. Forest fire detection system based on wireless sensor network. Proceedings of the 4th IEEE Conference on Industrial Electronics and Applications ICIEA 2009, May 25-27, 2009, IEEE, Xi'an, China, ISBN: 978-1-4244-2799-4, pp: 520-523.

Zhao, M. and Y. Yang, 2010. Data gathering in wireless sensor networks with multiple mobile collectors and SDMA technique sensor networks. Proceedings of the 2010 IEEE Conference on Wireless Communications and Networking (WCNC), April 18-21, 2010, IEEE, Sydney, Australia, ISBN: 978-1-4244-6396-1, pp: 1-6.

Zhao, M., M. Ma and Y. Yang, 2011. Efficient data gathering with mobile collectors and space-division multiple access technique in wireless sensor networks. IEEE. Trans. Comput., 60: 400-417.