A Review On Compressive Sensing

Ms. Neha Deshmukh[1], M.tech, Computer Science and Engineering Department, G.C.O.E, Amravati, India, neha4969@gmail.com

Prof. A.V.Deorankar[2], Asso.Prof., Computer Science and Engineering Department, G.C.O.E Amravati, India, avdeorankar@gmail.com

Abstract— Wireless sensor networks consists of spatially distributed sensor nodes. These sensor nodes communicates with each other for transferring data from one node to another. Energy is consumed by the sensor nodes while transfer of data. So the energy consumption is high in wireless sensor networks. To reduce the energy consumption the compressive sensing method is given known as compressive sensing. Clustering is made in wireless sensor network for effective communication. Compressive sensing method used to reduce the energy consumption by the sensor nodes so that the energy consumed by the wireless sensor network should be less.

Keywords— Compressive sensing, congestion, Wireless sensor network, clustering

1.INTRODUCTION

A wireless sensor networks is a network consisting of group of nodes called as sensor nodes and one sink node or also known as base node. In wireless sensor networks sensor nodes needs to send the data to the base node or called as sensor nodes. This energy is consumed by the sensor nodes to send the data and receiving the data.

Traditional data gathering and processing method is to use the multi-hop route to transmit data from one sensor to another. Finally the data will be transmitted to the sink node according to the route. Disadvantage of traditional method lies in the unbalanced energy consumption for each sensor and some redundant data transmissions. The sensor closer to the sink will consume more energy than other sensors.

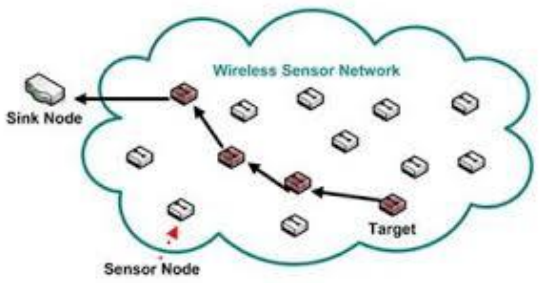

Fig.1.1. Wireless Sensor Network

To avoid the redundant data transmissions, some researches introduce data fusion methods to process data in WSNs. More completed routing protocols and much higher computation ability will be needed for each sensor.

Sometimes data fusion methods cannot solve unbalanced energy consumption problems. A novel method named compressive sampling theory (CS) has received more attentions at present. In this paper, we investigate compressive data gathering and original signal compressive data gathering and original signal reconstruction in wireless sensor networks (WSNs). By adopting the Compressive Sampling theory, the energy consumption can be balanced and the redundant data transmissions can also be avoided.

Fig 1.1 shows the wireless sensor network in which the target node sends the collected data to the sink node by multihop routing. It does not do direct transmission from target node to sink node. It uses multihop routing for data transmission. The other nodes in the network are called as sensor nodes and the base node is called as sink node.

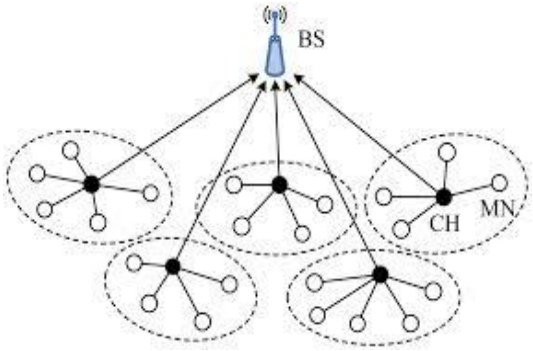

Fig.1.2. Clusters in Wireless Sensor Network

Fig 1.2 shows the cluster formation in wireless sensor network. The clusters are formed in wireless sensor network and the cluster head is selected for each sensor network. Now the transmission is carried out from sensor nodes to sink node. The data transmitted from sensor node to cluster head

of that cluster and then the data is transmitted from cluster head to sink node. The former transmission takes place without using hybrid CS approach and the later is used by using hybrid CS approach.

2.LITERATURE REVIEW

The compressive sensing approach is studied in various papers. The literature review of papers with their drawbacks is given below.

Ruitao Xie and Xiaohua Jia in 2014 [1] proposed a hybrid compressive sensing approach to reduce the data transmission in wireless sensor network. They proposed a hybrid CS method, to find the optimal size of clusters that can lead tominimum number of transmissions and proposed a centralized clustering algorithm. Within a cluster, data are collected to the cluster heads by shortest path routing; at the cluster head, data are compressed to the projections using the CS technique. Finally, They present a distributed implementation of the clustering method. Extensive simulations confirm that the method can reduce the number of transmissions significantly. When the number of measurements is 10th of the number of nodes in the network, the simulation results show that the method can reduce the number of transmissions by about 60 percent compared with clustering method without using CS. The factor of energy consumption is not considered here.

Shivendra Dubey and Chetan Agrawal in 2013 [2] gives the survey of various data collection techniques in wireless sesnsor network. The flexibility, fault tolerance, low-cost and quick development characteristics of wireless sensor networks creates many latest and exciting application areas for remote sensing. Here a number of techniques are explored to improve the aggregated data gathering over a tree topology in wireless sensor network. They also evaluate the efficiency of dissimilar channel assignment schemes and interference models, and recommend schemes for both constructing specific routing tree topologies that improve the data gathering rate for both aggregated and raw-data converge cast. In this paper only survey of various data collection techniques is given.

Fengyuan Ren and Jiao Zhang in 2011 [3] proposes a energy balanced routing protocol for data gathering in wireless sensor network. This paper focuses on routing that also balances the energy consumption. It borrows the concept of potential in classical physics to build a virtual hybrid potential field to drive packets to move toward the sink through the dense energy area and steer clear of the nodes with low residual energy so that the energy is consumed as evenly as possible in any given arbitrary network deployment. Their numerous simulation results show that the proposed solution EBRP makes significant improvements in energy consumption balance, network lifetime, and throughput as compared to the commonly used energy efficient routing algorithm. It only find routes for each data source to the same sink so lack of understanding of time-varying potential field.

Liu Xiang,Jun, Luo and Athanasios Vasilakos [4] in 2011 investigated the energy efficient aspect of applying compressed sensing (CS) to data collection in wireless sensor networks (WSNs) and solution techniques to obtain both the optimal and the near optimal aggregation trees. They first defined the problem of minimizing energy consumption through joint routing and compressed aggregation. They further proposed two solution techniques to obtain both the optimal (for small scale problems) and the near-optimal (for large scale problems) aggregation trees. They didn't focus on to reducing energy consumption by involving network partion.

Bashir Yahya, Jalel Ben-Othman [5] in 2009 proposes an energy efficient mobility aware medium access control protocol to reduce energy consumption by sensor nodes. It combines the benefits of contention based and scheduled based protocols to achieve a significant amount of energy savings. It adjusts the frame length according to mobility information of the sensor nodes and the number of nodes that have data to send. this avoids wasting slots by excluding the nodes which are expected to leave or join the cluster and those nodes which have no data to transmit from the TDMA schedule, and to switch nodes to sleep mode when they are not included in the communication process. They studied the performance of our protocol and compared it against MMAC protocol. They don't focus on minimizing congestion in the wireless sensor network.

S. Chen, Y. Wang, X.-Y. Li, and X. Shi [6] in 2009 studied the theoretical limitations of data collection with respect to delay and capacity of sensor network. For communication scenarios with or without aggregation, they prove that the asymptotical upper bound of delay rate and capacity, and propose a collection method to achieve the upper bound within a constant fact. Only focus on data collection capacity of randomly deployed sensor network.

S. Lee, S. Pattem, M. Sathiamoorthy, B. Krishnamachari, and A. Ortega in 2009 proposed energy efficient compressive sensing using spatially-localized sparse projection and to keep transmission cost low the measurement of clusters of adjacent sensors is taken , so framework for efficient data gathering is given. It outperforms over state of the art CS techniques because it achieves power savings with localized aggregation. They proposed methods to quantify the level of "energy overlap" between the data gathering clusters and the elementary basis on which the signals are represented, which allows us to to design efficient clusters once the bases for the signal are known. They didn't focus on design of optimal clustering scheme.

3.CONCLUSION

In the above papers the compressive sensing approach is given. They have given the compressive sensing approach which works in wireless sensor network. In wireless sensor networks the data transmission is carried out from sensor node to base node so using CS approach i.e. the transmission

from nodes to cluster head is without using CS approach and from cluster head to base node is by using CS approach. The reviews are given above with its drawbacks. Every paper proposes a method or a theoretical approach which has some drawbacks in it. They don't focus on some aspects which can be useful for it. So the drawbacks are given which can be their future work.

REFERENCES

[1] RuitaoXie and XiaohuaJia, Fellow, IEEE, Computer Society" Transmission-Efficient Clustering Method for Wireless Sensor Networks Using Compressive Sensing" ieee transactions on parallel and distributed systems, vol. 25, no. 3, march 2014)

[2] Shivendra Dubey and Chetan Agrawal"a survey of data collection techniques in wireless sensor network",. 2013. ISSN: 22311963,International Journal of Advances in Engineering Technology, Sept. 2013

[3] FengyuanRen, Member, IEEE, Jiao Zhang, Tao He, Chuang Lin, Senior Member, IEEE, and Sajal K. Das, Senior Member, ieee,"EBRP: Energy-Balanced Routing Protocol for Data Gathering in Wireless Sensor Networks", ieee transactions on parallel and distributed systems, vol. 22, no. 12, december 2011.K. Elissa, "Title of paper if known," unpublished.

[4] L. Xiang, J. Luo, and A. Vasilakos,"Compressed Data Aggregation for Energy Efficient Wireless Sensor Networks," Proc. IEEE Sensor, Mesh, and Ad Hoc Comm. and Networks (SECON '11), pp. 46-54, June 2011.

[5] Bashir Yahya, Jalel Ben-Othman, IEEE,"An Adaptive Mobility Aware and Energy Efficient MAC Protocol for Wireless Sensor Networks" in IEEE international conference on computers and communication, july 2009.

[6] S. Chen, Y. Wang, X.-Y. Li, and X. Shi, "Data Collection Capacity of Random-Deployed Wireless Sensor Networks," Proc. IEEE GLOBECOM, pp. 1-6, Dec. 2009.

[7] S. Lee, S. Pattem, M. Sathiamoorthy, B. Krishnamachari, and A. Ortega, "Spatially-Localized Compressed Sensing and Routing inMulti-Hop Sensor Networks," Proc. Third Int'l Conf. GeoSensor Networks (GSN '09), pp. 11-20, 2009.

[8] Bashir Yahya will appear in Wiley series, "Energy efficient MAC protocols in Wireless Sensor Networks" in 2009

[9] J. Haupt, W. Bajwa, M. Rabbat, and R. Nowak, "Compressed Sensing for Networked Data," IEEE Signal Processing Magazine, vol. 25, no. 2, pp. 92-101, Mar. 2008.

[10] D Zeinalipour-Yazti, H. Papadakis, M. D. Dikaiakos, "Mobile sensor network Data Management" Parallel processing letter journal, sept. 2008.

[11] D. Donoho, "Compressed Sensing," IEEE Trans. Information Theory, vol. 52, no. 4, pp. 1289-1306, Apr. 2006.

[12] C. Luo, F. Wu, J. Sun, and C.W. Chen, "Compressive Data Gathering for Large-Scale Wireless Sensor Networks", Proc. ACM MobiCom, pp.145-156, Sept.2009

[13] Allred J., Hasan A.B. Gray P, Mohseni K., "Sensor Flock: An AirborneWireless sensor network of Micro-air Vehicles", in 2007.

[14] Nittel S., Trigoni N., Nural A., "A drift-tolerant model for data management in ocean sensor networks", in 2007.