Transmission of Data in Wireless Sensor Network using Adaptive Clustering

Arham Alam[1] Sachin Chaudhary[2]
[1]M.Tech Scholar [2]Assistant Professor
[1,2]Department of Computer Science
[1,2]Utter Pradesh Technical University, India

Abstract— Sensor networks present unique opportunities for a broad spectrum of applications such as industrial automation, situation awareness, tactical surveillance for military application and environmental monitoring, chemical/biological detection etc. Sensor Network can monitor ambient condition such as temperature, sound, light and others. Information is collected from many sensor devices for further consumer application in the Sensor Network. For selecting a cluster head, k-means algorithm will be used to find the cluster centre. For hop to hop packet forwarding, AODV protocol has been used at network layer. All the simulations of the proposed idea will be simulated on Berkeley's ns2 network simulator and the performance of the proposed scheme has been evaluated. Due to wireless nature of sensor network, secure data transmission is a major issue for wireless sensor network. Clustering is a technique which increases network lifetime and reduces power consumption of sensor nodes in WSN. In this paper, we study an authenticated way to data transmission for cluster based WSN. Our results show that performance of proposed protocols is better than existing secure protocols.
Key words: Wireless Sensor Network, Adaptive Clustering

I. INTRODUCTION

Wireless sensor network (WSN) is a network that consists of several sensor nodes that are randomly distributed on a geographical area. These sensor nodes are used to monitor the physical and environmental conditions like temperature, pressure, humidity etc. WSN consist of hundreds or even thousands of sensor devices. Each node is capable of data sensing, processing and communicating [1]. Sensor nodes relay the sensed data to the Base station (BS).BS transmits that data to the users as shown in figure 1. Users can get the information from base station through satellite or internet. BS in WSN acts as an interface between sensor nodes and user [2]. WSN are used in many applications like health care monitoring, industrial monitoring, military applications, environmental and earth sensing.

II. BACKGROUND

A. A Data Transfer in Wireless Sensor Networks Using AODV Protocol B.Manimekala, M.Kayalvizhi [3]

This study implements the proposed management protocols including Clustering Mechanism for constructing cluster headers to solve the problems of clustering and broadcast storm, the suitable protocol to provide low cost communications between clusters. The Location information of the sensor nodes will be collected from source and the cluster heads were elected/ selected based on the locations of the active sensor nodes in network. For selecting a cluster head, k-means algorithm will be used to find the cluster centre. The nearby sensor nodes of a cluster- head then will forward their data to sink only via the cluster-head. For hop to hop packet forwarding, AODV or DSDV protocol may be used at Network Layer Protocol. That is to forward a packet from a sensor node to a cluster-head or cluster head to sink; normal routing protocols may be used. The proposed clustering based application layer protocol reduces the number of management nodes in a large-scale sensor network. All the simulations of the proposed idea will be simulated on ns2 network simulator and the performance of the proposed scheme will be evaluated.

B. Optimal Design on Clustering Routing Protocol for Wireless Sensor Network by Rui WU, Kewen XIA, Yanjun ZHANG, Guodong (2013)

Following to the incomplete power for antenna nodes in wireless antenna system (WAS), the cluster used for nodes become a successful system to keep power, but it is early to come into view the occurrence of sightless nodes since of ignoring the condition in sequence for national nodes in formative cluster-head, for that cause lead to squander power. So a narrative cluster procedure base on evolutionary calculation is deliberate in agreement by means of the end of power economy optimization, which includes the building of health purpose by means of the in order of national nodes inside the come together power and the sharing, and formative cluster-head.

C. Node Clustering in Wireless Sensor Networks: Recent Developments and Deployment Challenges by Ossama Younis, Marwan Krunz, and Srinivasan Ramasubramanian (2006)

In this paper, the challenges in clustering a WSN have been highlighted and the design rationale of the different clustering approaches has been discussed along with the classification of the proposed approaches based on their objectives and design principles. Several key issues that affect the practical deployment of clustering techniques in sensor network applications have also been discussed. This paper states that large-scale deployment of wireless sensor networks (WSNs) and the need for data aggregation necessitate efficient organization of the network topology for the purpose of balancing the load and prolonging the network lifetime. Clustering has proven to be an effective approach for organizing the network into a connected hierarchy.

III. PROBLEM FORMULATION

Group communication in wireless sensor networks (WSNs) is emerging as an important communication paradigm. A WSN is typically organized as a hierarchical tree network, with leaf sensor nodes sending data to a root base station collection point via a multi-hop wireless routing network. Each micro sensor node is resource-constrained, with severe

limitations on its energy lifetime, memory, CPU, and radio bandwidth. It is often important for the base station to communicate to groups of resource-constrained sensor nodes. To reduce energy consumption, most sensor nodes send their sensing data to their aggregator. Aggregators will use data fusion function and transmit fused data to BS. Obviously, aggregators have more energy since, normally, the distance between BS and an aggregator is farther than the distance between an aggregator and a sensor node. Thus, for balancing energy consumption in a whole network, aggregators are randomly selected in each round. Sensor nodes select a node as an aggregator. An aggregator broadcasts to ask neighbours to join their cluster. Other sensor nodes select their aggregator by measuring signal strength from aggregators. One of the most important challenges of WSNs design is develop a method or protocol so that the randomly deployed numerous sensor nodes behave in a collaborative and organized way. Each sensor node wants to maximize its own utility function. In addition, the entire network needs balance in resource assignments to perform in a way that is useful and efficient. Network routing protocol design becomes far more critical to WSNs performance than that of from conventional communication networks. Among numerous proposed network routing protocols in past years, hierarchical routing protocols greatly contribute to system scalability, lifetime, and energy efficiency. The algorithm presented in this paper considers nodes with lowest-energy.

IV. PROPOSED WORK

Gathering sensed information in an energy efficient manner is critical to operate the sensor network for a long period of time. In wireless sensor networks, data fusion helps to reduce the amount of data transmitted between sensor nodes and the base station. The basic idea of clustering routing is to use the information aggregation mechanism in the cluster head to reduce the amount of data transmission, thereby, reduce the energy dissipation in communication and in turn achieve the purpose of saving energy of the sensor nodes. In the clustering routing algorithms for wireless networks, LEACH (low-energy adaptive clustering hierarchy) is well-known because it is simple and efficient. LEACH divides the whole network into several clusters, and the run time of network is broken into many rounds. In each round, the nodes in a cluster contend to be cluster head according to a predefined criterion. In LEACH protocol, all the sensor nodes have the same probability to be a cluster head, which makes the nodes in the network consume energy in a relatively balanced way so as to prolong network lifetime.

Prolonging the lifetime of a sensor node powered by battery in both homogeneous and heterogeneous wireless sensor networks is a massive challenging area of research now-a-days. To achieve this target many research works including low energy adaptive clustering hierarchy and its variants use clustering techniques to reduce energy spent by keeping most of the nodes in sleeping mode whenever possible. To save energy of cluster heads, relay node based schemes use independent relay nodes as cluster heads. These schemes, however, still suffer from the problems of relay node placement, blind spots and immature death of cluster heads. The proposed scheme also maintains the efficiency of energy utilization through controlling the size of cluster in a distributed manner for the first time. Simulation results prove the superiority of the proposed scheme over the relay node based scheme with an improvement of 6%-30% extra network lifetime and significant reduction of packet loss during communications. Clustering and transmission range adjustment are major approaches to energy saving in wireless sensor networks. Connected dominating set (CDS) as a special clustering structure is widely used as a virtual backbone in a wireless sensor network. In clustered wireless sensor networks, traffic load has a great impact on the energy saving effect of a clustering algorithm. The scheme deals with the problems of manufacturing expenditure of the hardware and battery energy of the nodes and it is an extension to clustering technique. In all-purpose using single hop communication within a cluster involving the communication of sensor nodes and the cluster heads may not be the best option. In such cases it may be valuable to utilize multihop communication among the nodes in the cluster to reach the cluster head.

V. EXPERIMENTAL RESULTS

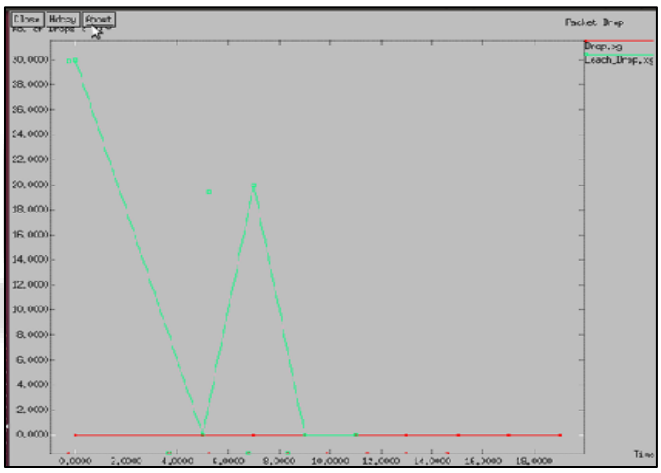

Fig. 1: graph of packet drop

Experimental results show that the proposed protocol effectively save the energy costs, balance the node energy consumption and prolong the lifetime of the network. In clustering wireless sensor networks, balancing the consumed energy and increasing the life time is the primary purpose of the routing protocol design.

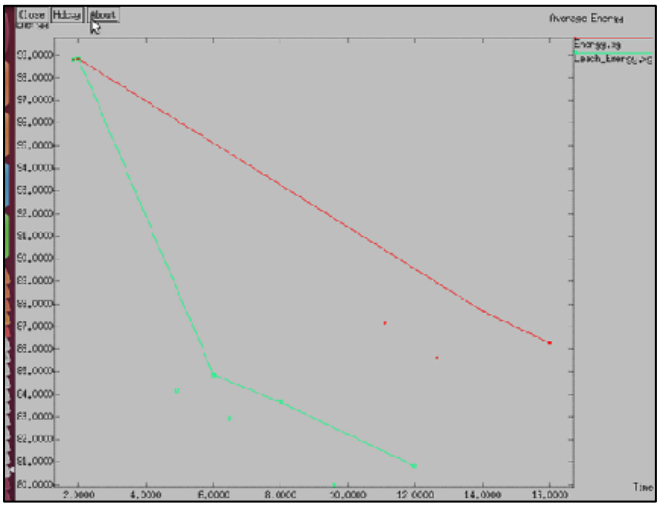

Fig. 2: graph of average energy

Clustering has been well received as one of the effective solutions to enhance energy efficiency and scalability of large-scale wireless sensor networks. The goal of clustering is to identify a subset of nodes in a wireless sensor network, and then all the other nodes communicate with the network sink via these selected nodes. However, many current clustering algorithms are tightly coupled with exact sensor locations derived through either triangulation methods or extra hardware such as GPS equipment. However, in practice, it is very difficult to know sensor location coordinates accurately due to various factors such as random deployment and low-power, low-cost sensing devices. Therefore, how to develop an adaptive clustering algorithm without relying on exact sensor location information is a very important yet challenging problem. In this paper, we try to address this problem by proposing a new adaptive clustering algorithm for energy efficiency of wireless sensor networks. Compared with other work having been done in this area, our proposed adaptive clustering algorithm is original because of its capability to infer the location information by mining wireless sensor energy data. Furthermore, based on the inferred location information and the remaining (residual) energy level of each node, the proposed clustering algorithm will dynamically change cluster heads for energy efficacy. Simulation results show that the proposed adaptive clustering algorithm is efficient and effective for energy saving in wireless sensor networks.

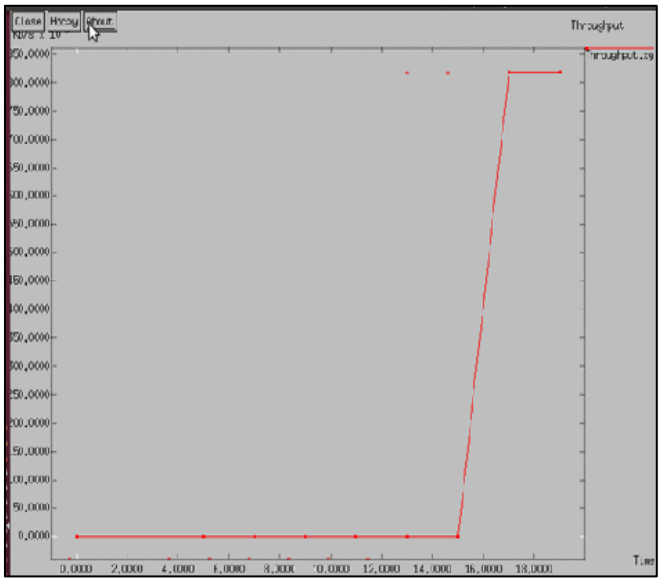

Fig. 3: graph of throughput

Experimental results are associated with implementation of topology control approach to enhance throughput in wireless sensor network. A wireless sensor network is characterized by limited energy supply and large nodes. To maximize the network lifetime of wireless sensor network the topology control is the considered to be the important process. Every attempt is being made to reduce the energy consumption and to enhance throughput of the wireless sensor node. Topology Control aims at network-wide goals, for example, extending network-lifetime minimizing average delay. Network topology control is about the management of network topology to support network-wide requirements. Topology Control Algorithms can be divided into transmission-power-based algorithms and duty-cycle-based algorithms according to their energy saving approaches. Two energy efficient topology control algorithms will be used by utilizing both clustering and adjusting transmission power.

VI. CONCLUSION

The main scope of this research is to device a new clustering based data transfer protocol for sensor network for efficient data transfer in sensor network. The proposed clustering based data transfer protocol has been successfully implemented and evaluated under Network Simulator ns2. The performance of the network was tested with different simulation parameters and the simulation was repeated for different number of sensor nodes in the network. According to the trace analysis, the arrived results were significant and more comparable. While comparing the proposed method with a normal method, the proposed data transfer mechanism provided very good packet delivery ratio with very low routing load. The graphs and tables show the enhancement in performance while using the proposed method. But in future works, one may address the possibility of deciding the number of clusters by some indirect means. In the proposed algorithm, for getting the location information, the same old flooding was used and for further message passing, the proposed clustering based method was used. Future works may address the possibilities of

removing the classical flooding phase which is used to discover location information. The whole experiments were done on Network Simulator. The future works may address the issues for real implementation which may involve real GPS for resolving location information. Sensor networks present unprecedented opportunities for a broad spectrum of applications such as industrial automation, situation awareness, tactical surveillance for military applications, environmental monitoring, chemical/biological detection etc.

REFERENCES

[1] A Data Transfer in Wireless Sensor Networks Using AODV Protocol B.Manimekala1, M.Kayalvizhi2 Assistant Professor, Department of MCA & Software Systems, V.L.B.Janakiammal College of Arts and Science, Coimbatore, TamilNadu, India
[2] Yao-Chung Chang, Zhi-Sheng Lin and JiannLiang Chen, "Cluster Based Self-Organization Management Protocols for Wireless Sensor Networks", IEEE Transactions on Consumer Electronics, FEBRUARY 2006.
[3] W. Heinzelman, A. Chandrakasan, and H. Balakrishnan, "Energy-Efficient Communication Protocols forWireless Microsensor Networks," In Proceedings Hawaaian International Conference on Systems Science, January 2000
[4] J. Hill, R. Szewczyk, A.Woo, S. Hollar, D. Culler, and K. Pister, "System Architecture Directions for Network Sensors," In Proceedings of the 9th International Conference on Architectural Support for Programming Languages and Operating Systems, November 2000.
[5] C. Intanagonwiwat, R. Govindan, and D. Estrin, "Directed Diffusion: A Scalable and Robust Communication Paradigm for Sensor Networks," In Proceedings of the 6th Annual ACM/IEEE International Conference on Mobile Computing and Networking (MOBICOM), August 2000.
[6] C. Intanagonwiwat, D. Estrin, R. Govindan, and J. Heidemann, "Impact of network density on data aggregation in wireless sensor networks," Technical Report 01-750, University of Southern California, November 2001.
[7] Intel Research Oregon. Heterogeneous sensor networks. Technical report, Intel Corporation,2003.WebPage.http://www.intel.com/research/exploratory/hetero geneous.htm.
[8] Brad Karp and H. T. Kung, "GPSR: Greedy perimeter stateless routing for wireless networks," In Proc. ACM/IEEE MobiCom, August 2000.
[9] H. Suzuki and F. A. Tobagi, "Fast Bandwidth Reservation Scheme with Multi link Multi path routing in ATM networks," In Proceedings of IEEE Infocom, 1992.
[10] CITRIS, Center for Information Technology Research in the Interest of Society.
[11] J. Broch, D. Maltz, D. Johnson, Y. Hu, and J. Jetcheva, "A Performance Comparison of Multi-hop Wireless Ad Hoc Network Routing Protocols". In Proc. Of 4th Annual ACM/IEEE International Conference on Mobile Computing(MOBICOM), ACM, October 2005
[12] Elizabeth M. Royer, and C.-K. Toh. "A Review of Current Routing Protocols for Ad-Hoc Mobile Wireless Networks," In IEEE Personal Communications Magazine, April 1999.

