International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 3 Issue 2, February - 2014

Survey on Dynamic Clustering for Energy Efficient Data Aggregation Technique using Secure Data Encoding Scheme for WSN

Sunanda V K
Student of Comp.Science Mtech(IV Sem),EWIT

Jyothi R
Assistant Professor of Comp.Science,EWIT

***Abstract*— This paper gives One of the methods of data collection in a WSN is through forming multiple clusters of the sensor nodes with one cluster head (CH) in each cluster. The objective of this work is to develop an energy efficient data collection environment for a large scale, randomly deployed cluster based wireless sensor networks by using a virtual grid based mechanism to localize the clusters and stabilize the cluster sizes in the network. Proposed strategies are extending virtual grid based system using data encoding scheme and also providing securities to the clusters.**

I. INTRODUCTION

Wireless sensor networks (WSNs) have been used for numerous applications including military surveillance, facility monitoring and environmental monitoring. WSNs have a large number of sensor nodes with the ability to communicate among themselves and also to an external sink or a base-station. The sensors periodically sense the data, process it and transmit it to the base station. The frequency of data reporting and the number of sensors which report data usually depends on the specific application.

Data aggregation is defined as the process of aggregating the data from multiple sensors to eliminate redundant transmission and provide fused information to the base station. Data aggregation usually involves the fusion of data from multiple sensors at intermediate nodes and transmission of the aggregated data to the base station (sink). Data aggregation attempts to collect the most critical data from the sensors and make it available to the sink in an energy efficient manner with minimum data latency. Data latency is important in many applications such as environment monitoring where the freshness of data is also an important factor.

The functionality of the sensor network should be extended as long as possible. In an ideal data aggregation scheme, each sensor should have expended the same amount of energy in each data gathering round. A data aggregation scheme is energy efficient if it maximizes the functionality of the network.

The main idea is to perform data aggregation such that there is uniform energy drainage in the network. One of the most common hierarchies of data collection is cluster based. In a dynamic cluster based WSN the cluster heads (CHs) collect data from their cluster member nodes, aggregate into one packet and forward the packet to a central collecting node i.e. the sink node. Usually the CHs selected, in these cases are not evenly distributed in the region therefore the loads are not evenly distributed among the clusters.

II. RELATED WORK

The systematic collection of sensed data from multiple sensors to be eventually transmitted to the base station for processing. Since sensor nodes are energy constrained, it is inefficient for all the sensors to transmit the data directly to the base station. Data generated from neighbouring sensors is often redundant and highly correlated. In addition, the amount of data generated in large sensor networks is usually enormous for the base station to process. Hence, we need methods for combining data into high quality information at the sensors or intermediate nodes which can reduce the number of packets transmitted to the base station resulting in conservation of energy and bandwidth. This can be accomplished by data aggregation.

Data aggregation is defined as the process of aggregating the data from multiple sensors to eliminate redundant transmission and provide fused information to the base station. Data aggregation usually involves the fusion of data from multiple sensors at intermediate nodes and transmission of the aggregated data to the base station (sink).

Data aggregation attempts to collect the most critical data from the sensors and make it available to the sink in an energy efficient manner with minimum data latency. Data latency is important in many applications such as environment monitoring where the freshness of data is also an important factor. It is critical to develop energy efficient data aggregation algorithms so that network lifetime is enhanced. There are several factors which determine the energy efficiency of a sensor network such as network architecture, the data aggregation mechanism and the underlying routing protocol.

A. Eliciting Truthful measurements from Sensors on Internet of Things

Wireless sensor networks (WSN's) rely on various resource constrained nodes with limited energy, range, memory and computational power it is necessary to conserve battery energy so as to extend the life time of the given WSN deployment[1].

In any WSN application measured data is gathered at regular intervals and the same is sent to the Base station (BS) by using neighbouring nodes. By forming clusters of nodes in theWSN, the measured data from the nodes can be aggregated and the aggregated value can be sent towards the BS instead of

sending every measurement value and thereby reducing energy consumed by the nodes[1].

B. Clustering in WSN

Grouping sensor nodes into clusters has been widely adopted to satisfy the above scalability objective and generally achieve high energy efficiency and prolong network lifetime in large-scale WSN environments[2].

The corresponding hierarchical routing and data gathering protocols imply cluster-based organization of the sensor nodes in order that data fusion and aggregation are possible, the cluster heads can communicate with the sink directly via long range transmissions or multi hopping through other cluster heads. Hybrid Energy Efficient Distributed Clustering Approach (HEED).

HEED is a hierarchical, distributed, clustering scheme in which a single-hop communication pattern is retained within each cluster, whereas multi-hop communication is allowed among CHs and the BS [2]. The CH nodes are chosen based on two basic parameters, residual energy and intra cluster communication cost. Residual energy of each node is used to probabilistically choose the initial set of CHs.

C. Energy Efficient Differential Data Aggregation in Dynamic Cluster Based WSN

Clustered Diffusion with Dynamic Data Aggregation (CLUDDA).CLUDDA performs data aggregation in unfamiliar environments by including query definitions within interest messages. The interest messages of a new query initiated by the sink contain the query and also a detailed definition of the query [3]. The query definition describes the operations that need to be performed on the data components in order to generate a proper response. This new format of the interest message has some interesting features such as interest transformation and dynamic aggregation [3].

D. Energy Efficient Unequal Clustering Algorithm for WSN

A designated node (cluster head) in each cluster transmits the fused data from several sensors in its cluster to the sink. This reduces the amount of information that is transmitted to the sink. The data fusion is performed periodically at the cluster heads [4].

Low Energy Adaptive Clustering Hierarchy (LEACH).The LEACH protocol is distributed and sensor nodes organize themselves into clusters for data fusion. A designated node (cluster head) in
each cluster transmits the fused data from several sensors in its cluster to the sink. This reduces the amount of information that is transmitted to the sink. The data fusion is performed periodically at the cluster heads. LEACH is suited for applications which involve constant monitoring and periodic data reporting. The two main phases involved in LEACH are: setup phase and steady state phase. The setup phase involves the organization of the network into clusters and the selection of cluster heads. CH nodes evenly throughout the network. It produces approximately equal-sized clusters [4].

E. An Energy Efficient Routing Algorithm for Heterogeneous WSN

Grid based clustering approaches the basic idea is to divide the whole region into equally sized virtual grids with one CH per grid. Generally, CHs are selected based on the energy levels of nodes within the grid [5].

The centralized control system is the most straightforward method to apply in the Grid based clustering approaches the basic idea is to divide the whole region into equally sized virtual grids with one CH per grid [5]. Generally, CHs are selected based on the energy levels of nodes within the grid. These algorithms have been developed from the perspective of the development of efficient routing strategies in the networks.

Since a grid is considered as a cluster therefore the clusters are now much localized compared to a dynamic cluster based protocol. But the total network energy consumed in these protocols is very high relative to dynamic cluster based protocols. In some of the grid cluster based protocols, they select one node per grid as a CH which stays active until it runs out of energy therefore there is no rotation of CHs made. While there is a rotation of CHs which is based on back off timer. This is calculated on the basis of residual energy levels of each node with in a grid.

Another significant probabilistic clustering algorithm was earlier proposed (Energy Efficient Hierarchical Clustering EEHC).The main objective of this algorithm was to address the shortcomings of one-hop random selection algorithms such as LEACH by extending the cluster architecture to multiple hops. It is a distributed, k-hop hierarchical clustering algorithm aiming at the maximization of the network lifetime. Initially, each sensor node is elected as a CH with probability "p" and announces its election to the neighbouring nodes within its communication range. The above CHs are now called the "volunteer" CHs.Next, all the nodes that are within "k"-hops distance from a "volunteer"
CH, are supposed to receive the election message either directly or through intermediate forwarding.
Consequently, any node that receives such CH election message and is not itself a CH, becomes a member of the closest cluster [5].

Additionally, a number of „forced" CHs are elected from nodes that are neither CH nor belong to a cluster. Specifically, if the election messages do not reach a node within a present time interval t, the node becomes a "forced" CH assuming that it is not within k hops of all volunteer CHs.

III. CONCLUSIONS

This paper presents a comprehensive survey of data aggregation algorithms in wireless sensor networks. All of them focus on optimizing important performance measures such as network lifetime, data latency, data accuracy and energy consumption. Efficient organization, routing and data aggregation are the three main focus areas of data aggregation algorithms. Although, many of the data aggregation techniques presented look promising, there is significant scope for future research. Combining aspects such as security, data latency and system lifetime in the context of data aggregation is worth exploring. A systematic study of the relation between energy efficiency and system lifetime is an avenue of future research.

Security is another important issue in data aggregation applications and has been largely unexplored. Integrating security as an essential component of data aggregation protocols is an interesting problem for future research. Data aggregation in dynamic environments presents several challenges and is worth exploring in the future. Another interesting domain of research is the application of source coding theory. The sensor data are usually highly correlated and energy efficiency can be achieved by joint source coding and data compression.

REFERENCES

[1] Boi Faltings ,Jason Jingshi Li and Radu Jurca, ―Eliciting truthful measurements from a community of sensors,‖ 3rd International Conference on the Internet of Things (IOT), pp. 47 – 54, 2013

[2] David Lake, Ammar Rayes, and Monique Morrow, ―The Internet of Things,‖ The Internet Protocol Journal, vol. 15, issue. 3, Sept 2012.

[3] Rabia Noor Enam,-Energy Efficient Differential Data Aggregation in a Dynamic Cluster Based WSN,IEEE conference on Computer Science ,2013

[4] H. Yuan , Y. Liu, ―A new energy-efficient unequal clustering algorithm for wireless sensor networks,‖ IEEE conference on Computer Science and Automation Engineering (CSAE), vol. 1 pp. 431 – 434, 2011.

[5] L. Han ―LEACH-HPR: An energy efficient routing algorithm for Heterogeneous WSN,‖ IEEE International

Conference on Intelligent Computing and Intelligent Systems (ICIS), vol. 2, pp. 507-511, 2010.