International Journal on Recent and Innovation Trends in Computing and Communication
Volume: 5 Issue: 3

ISSN: 2321-8169
32 – 35

A Efficiency & Latency based Compression of Hierarchical Network and Flat Network

Dr. Dilip Sharma
Department of Electronics & Communication Engineering
Ujjain Engineering College Ujjain, Sanwer Road Ujjain, India
drdilipsharma72@gmail.com

Dinesh Dahima
PG Scholar, Department of Electronics & Communication Engineering
Ujjain Engineering College Ujjain, Sanwer Road Ujjain, India
dahima26786@gmail.com

Abstract — Wireless Sensor Network (WSN) compromised of maximum number sensor nodes which cooperatively send data to base station. These networks are worn in various applications outline such as habitat monitoring, environment, military, and security, etc. As the sensor nodes are broadly operated over battery driven, an efficient utilization of power is essential. Therefore, to increase the lifetime of a sensor network, power efficient methods has to be fitting to choose and aggregate data. It's essential because of the majority.

Keywords: *Hierarchical Network, Flat Network, Reliable data aggregation, aggregation methods, Wireless sensor networks, efficiency, throughput.*

*****

1. Introduction

Wireless Sensor Networks (WSNs) are now-a-days used in various applications such as habitat monitoring, weather forecasting, antiterrorism, data gathering, intelligent control, traffic management and environmental observation. The WSN consist one or more sensors, a processing unit with processing and program memory, a limited power supply, and a wireless transceiver to transmit the sensed data to sink node in the form of Signals [9, 13]. The sensors can be deployed at specific locations or can be randomly scattered in places where the human intervention is less [2, 8]. These scattered sensor nodes has the capabilities to collect data and route data back to the sink node by a multi-hop infrastructure less architecture as shown in Figure 1[5]. During the multi-hop, energy conservation is the important factor in sensor network. An extensive quantity of energy is consumed when the data is send by its transceiver. Therefore, it is necessary to reduce the number of packets transmitted among the network and to sink node. This can be done by combining the data at the intermediary node into high quality information before transmission [6, 12]. It results is energy conservation in the sensor nodes and efficient bandwidth utilization of the sensor network. In this context, data aggregation is recognized as an efficient technique for combining the data. It carries out the process of aggregating the data from multiple sensors, and provides the sink node with aggregated information. Data aggregation achieves efficient bandwidth utilization by eliminating the redundant data getting transmitted. Another significant factor which influences data aggregation is, it delivers the most critical data in an energy efficient manner with minimum data latency [5, 1-2].

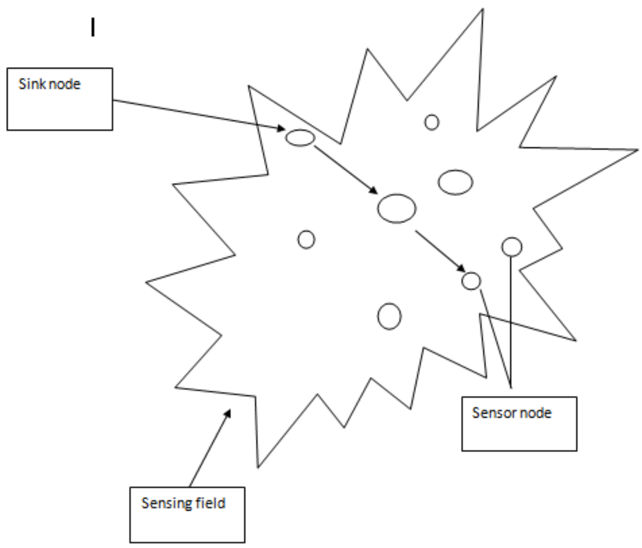

Fig.1: A typical wireless sensor network

1.1 Routing Protocol

The main objective is to reduce the energy expenditure and the next hop to route the data to the sink node should be chosen to promote aggregation. This approach is referred as data-centric routing. The data forwarding is done based on the position of the most suitable aggregation points, the data type, the priority of the information, and so. One of the approaches is centralized data aggregation. It is an address centric approach, where the data from each node is sent to a central node via the shortest possible route using a multi-hop wireless protocol [2, 4]. The sensor node identifies a leader in the network and sends the data packets to it, which is the powerful node among all other existing nodes. However, it has some disadvantages like heavy time consumption, limited ability to meet user needs, inflexibility, increased dependence and vulnerability [5, 1, 13].

Then the other one is a decentralized approach, there is no single centralized node. All nodes are connected to its neighbor node and each node performs the aggregation function locally among them. Thereby all gets equal priority to perform the aggregation function. This approach is more scalable and tolerant of dynamic changes and node failures. It is also called as multi data aggregator model. Finally, the in-network approach uses a multi-hop mechanism to aggregate the data intermediate.

1.2 Aggregation Functions

It is the most important functionalities that aggregation techniques should provide is the ability to combine data coming from different nodes6. There exists several aggregation functions and are closely related to the specific sensor application. Nevertheless they are based on some common paradigms such as lossy/lossless aggregation functions and duplicate sensitive/insensitive aggregation functions. Both lossy and lossless aggregation function compresses and merges the data. The main difference is, in lossy aggregation, is the original values cannot be recovered and accuracy of the data is lost in transmission. In contrast, in lossless the weakness of lossy aggregation is overcome. In certain cases, the intermediate node may receive redundant information. It can be handled by duplicate sensitive/insensitive aggregation functions. If the result of aggregation function depends based on the redundant data, duplicate insensitive aggregation is used, otherwise duplicate sensitive is used

2. RELATED WORK

In this section, we present the important works on secure data aggregation in wireless sensor networks and trust based security systems In wireless sensor network domain, secure data aggregation problem is studied extensively. The security mechanism detects node misbehaviors such as dropping or forging messages and transmitting false data. In random sampling interactive proofs are used to check the correctness of the aggregated data at base station. Federal communications commission (FCC) in United States.[1]

There are centralized trust based systems for Internet such as These systems keep reputation values at a centralized trusted authority and therefore they are not feasible in wireless sensor network domain. Decentralized trust development systems are studied in mobile and ad-hoc networks.[1]

Recently, trust development systems RFSN DRBT, and statistical trust establishment are proposed for wireless sensor networks.

3. CLASSIFICATION OF DATA AGGREGATION PROTOCOLS

The performance of the various data aggregation protocols is mainly influenced by the network architecture. The classification of the different architectural attributes of sensor networks is illustrated. This work gives a high level description of what is considered typical sensor network architecture along with its components. Therefore the aggregation methods proposed based on the network architecture are discussed. In general, they can be classified as structured, structure-less and other types of network architectures. In structured aggregation, it uses specific architecture for performing data aggregation. The architecture is majorly classified as flat and hierarchical and location based aggregation as depicted in Figure.

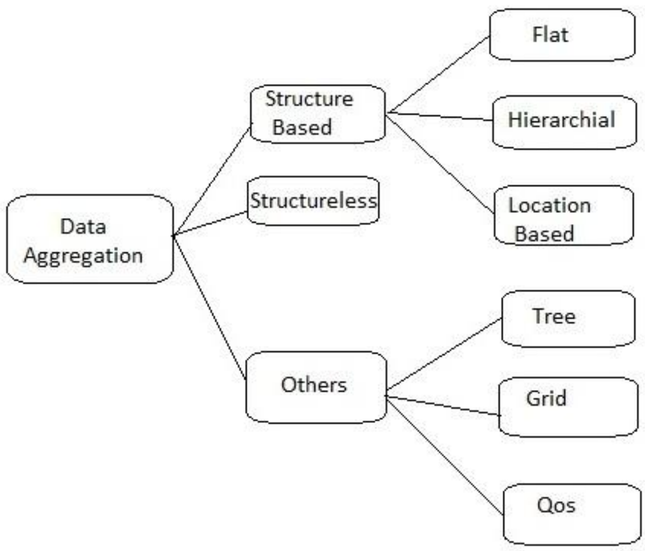

Fig.2: Types aggregation methods.

3.1 Flat Network

In flat networks, the sensor nodes typically show the like role and sensor nodes collaborate well-adjusted to achieve the sensing task. Data aggregation selects a data-centric routing and query-based access. For an instance, in flooding the base station broadcasts an objection to all the sensor nodes in the network in flat networks, one by one sensor node show the equal aspect and is equipped for almost the equal battery power. In these networks, data aggregation is proficient by data-centric routing point the sink commonly transmits an analysis message to the sensors.

3.2 Hierarchical Network

The data at intermediate or special nodes is overcome of sink node in flat networks by fusing it. It shortens the number of messages transmitted to the sink, by that developing the energy efficiency of the network. A flat network can outcome in excessive communication and computation load at the sink node come from in a quick depletion of its battery power. The ending of the sink node resolve the performance of the network. Thus, an aspect of scalability and energy efficiency, certain hierarchical data aggregation access has been expected. Hierarchical data aggregation affect data fusion at special nodes, which shorten the no. of messages transmitted to the sink. Increase the energy efficiency of the network.

3.3 Cluster based Aggregation

This methodology uses clustering; reservation based scheduling & node heterogeneity. In cluster based aggregation, the network is attaching a cluster heads to observe data aggregation. The prime equitable of this way is to observe energy efficient data aggregation in wide range networks. That, the sensors nodes broadcast the data to the local cluster head and it address the aggregated data to the sink node, rather of precisely transfer to the sink node.

3.4 Chain based Aggregation

Chain based data aggregation is a hierarchical method of aggregation that design chain architecture energy and is constantly appropriate. The particular sensor node can connect with its neighbors. Token passing way is used for picking the head. Before the token is collected, that node sends the data to the aggregator node completely reaching the base station.

3.5 Location based Approach

The addresses of the sensor nodes are determined on the location. The nodes position is determined using the incoming signal strength.

3.6 Structure less Aggregation

It is quiet valuable and having its importance in applications which are based on event where case field adjustment exact frequently. The main failing of structure less data aggregation is preparing the routing result for performing data aggregation.

4. Comparison

4.1 Efficiency: The process of the sensor network should be compressive as possible. In an ideal data aggregation scheme, one by one sensor should have put out the same amount of energy in one by one data gathering round. Data aggregation program is energy efficient if it enlarges functionality of the network. Become reduce the energy consumption of one by one sensor. That design is occupied by the network lifetime whatever evaluate the energy efficiency of the network. Network lifetime, data accuracy, and latency are some of the essential performance measures of data aggregation algorithms.

$$\text{Efficiency} = \frac{\text{No. of transmitted bits}}{\text{Total time taken for transmission}}$$

4.2 Latency: It is described as the delay involved in data transmission, routing and data aggregation. It can be deliberate as the time delay b/w the data packets accepted at the sink and the data generated at the source nodes.

Latency = |Time required for generation data at the source node - Time required for generation the data packets accepted at the sink |

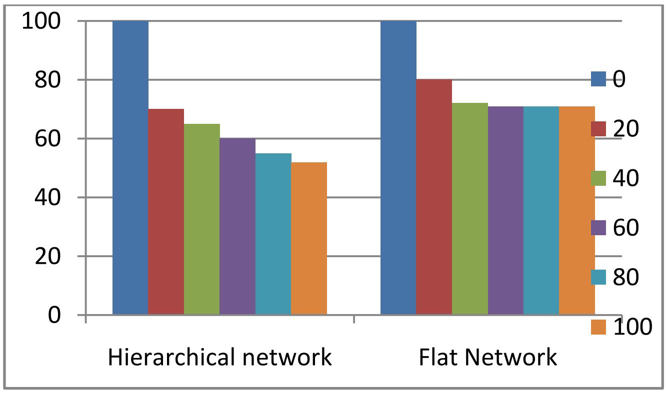

Fig. 3: Comparison between Hierarchical and Flat Network on the basis of Latency

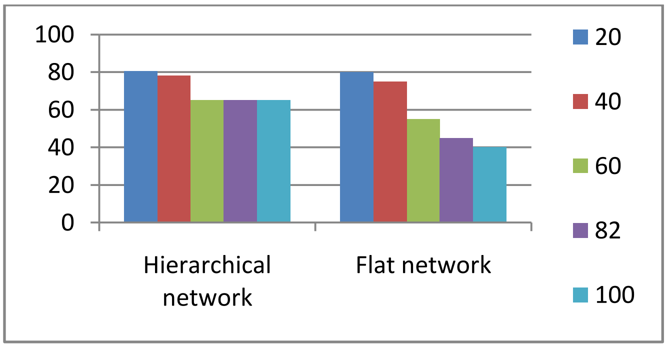

Fig. 4: Comparison between Hierarchical and Flat Network on the basis of Throughput

4.3Throughput: It can be stated as the rate of successfully delivered packets in the network to the rate of received file by a host over a period of time is called as Throughput. Unit of the throughput is bits per time.

ISSN: 2321-8169
32 – 35

$$\text{THROUGHPUT} = \frac{\text{the rate of successfully delivered packets}}{\text{the rate of received file by a host}}$$

5. CONCLUSION

We have presented a comprehensive survey of data aggregation 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 tree construction are the three main focus areas of data aggregation. We have described the main features, the advantages and disadvantages of each data aggregation. We have also discussed special features of data aggregation such as security and source coding. 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 for data gathering networks. The sensor data are usually highly correlated and energy efficiency can be achieved by joint source coding and data compression. Although some research has been pursued in this direct, there is significant scope for future work.

REFRENCES

[1] Suat Ozdemir ,” Functional Reputation Based Data Aggregation for Wireless Sensor Networks”, IEEE 2008

[2] Tamara Pazynyuk, JiangZhong Li, George S. Oreku,” Reliable Data Aggregation Protocol for Wireless Sensor Networks”,IEEE 2008

[3] R. Rajagopalan and P.K. Varshney, “Data aggregation techniques in sensor networks: A survey”, IEEE 2006.

[4] Hong Luo, Qi Li, Wei Guo , “RDA: Data Aggregation Protocol for WSNs”, Beijing Key Laboratory of Intelligent Telecommunications Software and Multimedia, IEEE2006

[5] SSasirekha, S.Swamynathan, “A Comparitive study and analysis of data aggregation technique in WSN”, ISSN 2015

[6] Yi Yang, Xinran Wang, Sencun Zhu, and Guohong Cao, “SDAP: A Secure Hop by Hop Data Aggregation Protocol for Sensor Networks”, Department of Computer Science & engineering, The Pennsylvania State University, ACM 2006

[7] H. C¸ am, S. Ozdemir, P. Nair, and D. Muthuavinashiappan, and H.O. Sanli, “Energy-Efficient and secure pattern based data aggregation for wireless sensor networks”, Special Issue of Computer Communications on Sensor Networks, Feb.2006.

[8] A. Srinivasan, J. Teitelbaum, H. Liang, J. Wu, and M. Cardei, “Reputation and Trust-Based Systems for Ad Hoc and Sensor Networks”, n Algorithms and Protocols for Wireless Ad Hoc and Sensor Networks, A. Boukerche (ed.), Wiley and Sons, 2008.

[9] S. Ganeriwal and M. Srivastava, “Reputation-based framework for high integrity sensor networks”, in Proc. of the 2nd ACM workshop on Security of ad hoc and sensor networks, October 2004 pp. 66-77.

[10] A. Srinivasan, J. Teitelbaum and J. Wu, “DRBTS: Distributed Reputation based Beacon Trust System”, In the 2nd IEEE International Symposium on Dependable, Autonomic and Secure Computing (DASC06), Indianapolis, USA, 2006.

[11] M. Raya, P. Papadimitratos, V.D. Gligor, and J.P. Hubaux. Data-Centric Trust Establishment in Ephemeral Ad Hoc Networks, Proc. of INFOCOM, pp. 1912-1920, 2008.

[12] A. Josang and R. Ismail, The Beta Reputation System, Proc. 15th Bled Conf. Electronic Commerce, 2002.

[13] B. Przydatek, D. Song, and A. Perrig, ”SIA : Secure information aggregation in sensor networks”, Proc. of SenSys’03, Nov 5-7, Los Angeles,CA, 2003.