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Wireless Sensor Network: A Review

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Abstract— Wireless Sensor Networks (WSN) consists of nodes with limited power deployed in the area of interest. Nodes cooperate to collect, transmit and forward data to a base station. In WSN, clustering and scheduling techniques ensure collecting data in an energy efficient manner. In this work, we have reviewed many papers relating to clustering and scheduling of sensor network. After reviewing many papers and considering the latest one as the base paper we believe that the work done in it is the latest one, modifications in the work is suggested in report. This review give the basic description of wireless sensor network and their importance in energy efficiency and give a brief about most famous protocol is describes leach and their improved version

Keywords— WSN, LEACH PROTOCOL, OPTIMIZATION TECHNIQUE.

I. INTRODUCTION

Wireless sensor network is an emerging field for research in today's world. Wireless sensor networks have vast potential for usage of sensor networks in different areas like military area, disaster management, sensing environment conditions such as temperature, humidity etc. Wireless sensor network is a collection of huge number of micro sensor nodes, which are generally deployed in such an environment where unattended operation is required by the application. Limitation of unchangeable power source (i.e. battery) has challenged the researchers to develop energy efficient protocols for the extending the lifetime of wireless sensor network.

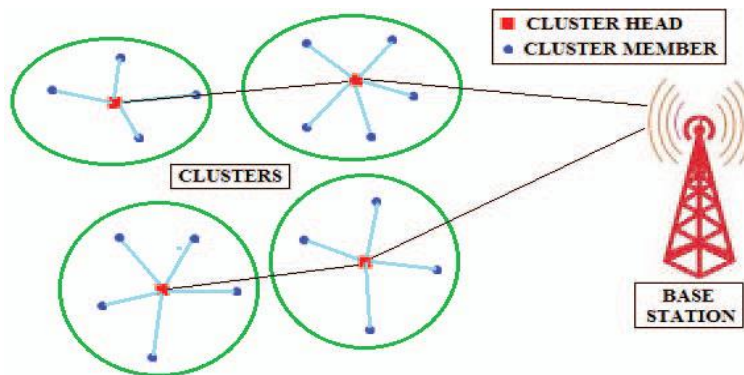


Figure: 1.1 Wireless sensor network architecture

In wireless sensor networks, as number of sensor nodes are used for communication, which mainly forms a sensing field, and sink.

1.1 Associated Problems

There are some design issues of clustering protocols which must be considered in order to design an efficient clustering/routing protocol. Some common issues are as follows:

- **Fault tolerance:** In WSNs some sensor node may fail due to lack of power or environmental interferences. This failure of sensor nodes should not affect the performance or functionality of WSN and the ability to sustain this node failure without any interruption is called fault tolerance.
- **Operating Environment:** The WSNs can be setup in different operating environments like in bottom of ocean, in a home or in a building, attached to a fast moving vehicle, in forests, etc. the characteristics of WSNs like lifetime, stability, should be different for different environments.
- **Power Consumption:** The transmission power required by multi-hop routing protocol should be less. The less the energy consumption is the more the lifetime of sensor nodes and therefore, as well as WSN network.
- **Data Aggregation:** Data aggregation is combination of data from different sources by using computation as it is less energy consuming than communication. In WSNs, sensor node generates significant amount of data, similar packets from multiple nodes can be aggregated so that number of transmissions would be reduced and energy efficiency would be increased.
- **Quality of Service:** The quality of service required by the application could be the length of time, energy efficiency, the data reliable, collaborative-processing and location-awareness. All of these factors will affect the selection of routing protocols for particular application.
- **Data Latency and Overhead:** There is some data latency caused by data aggregation, and multi-hop relays and also some routing protocols create excessive overheads to implement their algorithms, which is not suitable for some applications.
- **Node Deployment:** Node deployment affects the performance of the routing protocol and is application dependent. The deployment is of two types: deterministic or self-organizing. In deterministic, the sensors are manually placed and data is routed through predetermined paths. In self-organizing systems, the sensor nodes are scattered randomly and the position of sink or the cluster head becomes an issue to energy efficiency of network.

1.2 Overview of Potential Solution

The routing protocols in WSNs can be divided into two categories: flat routing and clustering routing and this classification is based on network structure. In flat routing all nodes have same functionalities. They perform same tasks and the data transmission is done by multiple hops. On other hand, in a clustering or hierarchical protocol, nodes have different tasks and they are divided into groups called clusters. The clustering protocol is best solution that can resolve most of the problems mentioned above.

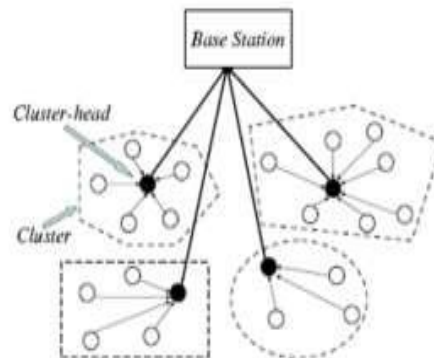


Figure: 1.2 Clustering in WSNs

In each cluster there is a cluster head (CH) which communicates with base station (BS), and other nodes called member nodes which collect and send data to the cluster head (Figure 1.4). The selection scheme for cluster head must be energy efficient and it must also be capable of maintaining overall stability of network.

1.3 Key Benefits of Potential Solution

Clustering routing protocols have a variety of advantages as follows:

- **More Scalability:** The CHs are responsible for data aggregation, information dissemination and network management. Clustering topology can localize the route set up within the cluster and thus reduce the size of the routing table stored at the individual sensor nodes.
- **Data Aggregation/Fusion:** Data aggregation/fusion is a technique for WSNs to save energy. The most popular data aggregation/fusion method is clustering data aggregation, in which each CH aggregates the collected data and transmits the fused data to the BS. Usually CHs are formed a tree structure to transmit aggregated data by multi-hopping through other CHs which results in significant energy savings.
- **Less Energy Consumption:** In clustering routing scheme, data aggregation helps to dramatically reduce transmission data and save energy. Moreover, clustering with intra-cluster and inter-cluster communications can reduce the number of sensor nodes performing the task of long distance communications, thus allowing less energy consumption for the entire network. In addition, only CHs perform the task of data transmission in clustering routing scheme, which can save a great deal of energy consumption.

- **More Robustness:** Clustering routing scheme control the network changes comprising node mobility and unpredicted failures, etc. A clustering routing scheme only needs to cope with these changes within individual clusters, thus the entire network is more robust and more convenient for management. In order to share the CH responsibility, CHs are generally rotated among all the sensor nodes to avoid the single point of failure in clustering routing algorithms.
- **Collision Avoidance:** In multi-hop clustering model, a WSN is divided into clusters and data communications between sensor nodes comprise two modes, *i.e.*, intra-cluster and inter-cluster, respectively for data collection and for data transmissions. Accordingly, resources can be allocated orthogonally to each cluster to reduce collisions between clusters and be reused cluster by cluster.
- **Fault-Tolerance:** Fault-tolerance is an important challenge in WSNs. In order to avoid the loss of significant data from key sensor nodes, fault-tolerance of CHs is usually required in this kind of applications, thus effective fault-tolerant approaches must be designed in WSNs. Re-clustering is the most intuitive method to recover from a cluster failure, though it usually disarranges the on-going operation. Assignment of CH backup is a viable scheme for recovery from a CH failure.
- **Guarantee of Connectivity:** Sensor nodes usually transmit data to one or more BSs via a single-hop or multi-hop routing in WSNs, thus sensor nodes that cannot communicate with any other sensor node will get isolated and their data can never be transmitted to the BS. Therefore, guarantee of connectivity is an essential goal of clustering routing protocols in WSNs. An important example is when some information concerning all the sensor nodes needs to be collected by a designated fusion node in clustering routing protocols.

II. LITERATURE REVIEW

An **In[1]Pawan Singh Mehra et al** (2015) presents Clustering is one of the efficient techniques which not only help in protraction of lifetime of wireless sensor network but also make it scalable and robust. Subdivision of network into group of sensor nodes with a coordinator is called a cluster. Cluster members collect the physical data by sensing the environment and forward it to the coordinator which is generally termed as Cluster Head (CH). The period for which the network is functional is termed as persistent period in our paper. Simulation results show that the proposed scheme is comparatively more energy efficient, scalable & robust and has longer persistent period.

In[2]Sujee et al (2015) proposed that Wireless Sensor Network (WSN) technology used to sense various types of physical and environmental conditions with the availability of small and low-cost sensor nodes. Main drawback in WSN is limited battery power in the sensor nodes. Here, first analysed the basic distributed clustering routing protocol LEACH, which is in a homogeneous environment, then analysed with the heterogeneity concept in nodes to increase the life of WSN. Simulation results were obtained using MATLAB that shows the LEACH heterogeneous environment significantly reduces energy consumption and increases the total lifetime of the WSN than LEACH homogeneous environment.

In[3]Tavleen et al (2014) proposed that wireless sensor networks have become an important research area in the field of computers and electronics in the last decade. The original motivation for the development of wireless sensor networks was military applications such as battlefield surveillance. However there are number of other applications of wireless sensor networks such as healthcare monitoring, forest fire detection, environment monitoring, home automation.

In[4]Jyoti Rajput et al (2014) that Wireless Sensor Network Data Aggregation is an important technique to achieve power efficiency in the sensor network. In some application such as: wireless sensor network, data mining, cloud computing data aggregation is widely used. Because sensor node has limited battery power so data aggregation techniques have been proposed for wireless sensor networks. In this survey paper they described various protocols for securing aggregated data in wireless sensor networks.

In[5]Salim EL KHEDIRI Nejah NASRI et al (2014) described the LEACH-C. It is similar to LEACH protocol. In this, instead of nodes randomly self- selecting as a CH, the in LEACH performs a centralized algorithm. The sink collects location data from the nodes and they broadcast its decision of which nodes are to act as CH. The overall performance LEACH is better than LEACH. But once the energy cost of communicating with the sink becomes higher than the energy cost for cluster formation, LEACH-C no longer provides good performance. Sinks may be located far from the network in most WSN applications.

In[6]Amit Sharma et al (2014)said that In WSN, it is too difficult to initialize the sensor nodes and manage the sensor networks due to the large number of sensor nodes, which may number tens of thousands. Moreover, in order to save energy, sensor nodes carry out data aggregation and compression before sending data to the base station, and execute energy efficient routing. So in this research work Amit Sharma Dr. S. N. Panda et al analyzed that cluster based routing technique is the best energy efficient routing technique comparing to any other techniques.

In[7]Joyce jose et al (2013) uses the data aggregation is a widely used energy-efficient mechanism in wireless sensor Networks (WSNs), by avoiding the redundant data transmitting to base station. The privacy of a sensor data ensures, it is known only to itself and the integrity guarantees sensor data has not tampered during data aggregation. The Integrity Protecting Privacy preserving Data Aggregation (IPPDA) protocols ensures robust and accurate results at the base station.

In[8]Abdulsalam et al (2013) proved that Weighted Low Energy Adaptive Clustering Hierarchy Aggregation (W-LEACH), is a centralized data aggregation algorithm. As in LEACH, W-LEACH is consists of two phases. In the setup phase, W-LEACH first calculates a weight value, α , and assigns it to each sensor. The selection of CH is based on the calculated weights, such that the higher the weights the better the chance for them to be CHs. unlike LEACH, W-LEACH does not take into consideration whether or not this sensor was a CH for previous near rounds In steady-state phase, the candidates for sending data to CHs are also chosen based on their weights, such that sensors with less weight are better candidates to send data to their CHs to make sure that the areas with low densities and far from their CHs are covered.

In[9]Sharma et al (2012) a distance based Cluster head selection algorithm is proposed for improving the sensor network life time. This protocol achieves a good performance in terms of lifetime by balancing the energy load among all the nodes. This clustering technique helps to prolong the life of wireless sensor network, especially in hostile environment where battery replacement of individual sensor nodes is not possible after their deployment in the given target area. Therefore, the proposed technique to distribute the role of the cluster head (CH) among the wireless sensor nodes in the same cluster is vital to increase the lifetime of the network. This algorithm uses a distance based method for providing the cluster head selection. Clustering techniques also provide good load balancing, and in-network data aggregation.

In[10]Monica R Mundada et al (2012) paper, "A study on Energy Efficient Routing Protocols in Wireless Sensor Networks" study routing protocols in WSNs are application specific, it was led to the development of a various protocols. According to network structure, routing techniques can be classified into three categories: data-centric, hierarchical and location based routing. In this it present a survey of state-of-the-art routing techniques in WSNs according to all the three categories and epitomize these routing techniques and bring out the advantages and disadvantages according their application domain. Conclusion shows that it was highly scalable and thus used in a number of applications and uses the sensor nodes intelligently to route data. It optimizes the logic behind these protocols and followed by the constraints.

In[12]Yajie Ma, YikeGuo et al (2011) proposed an –local spatial clustering algorithm for sensor networks. By measuring the spatial correlation between data sampled by different sensors, the algorithm constructs a dominating set as the sensor network backbone used to realize the data aggregation based on the information description/summarization performance of the dominators. In order to evaluate the performance of the algorithm a pattern recognition scenario over environmental data is presented.

In[13]El khediri et al (2010) says "Synchronization issues in Wireless Sensor Network", talked about LEACH (Low-Energy Adaptive Clustering Hierarchy) in which they utilized random based rotations of local cluster. It is used to distribute the energy for balancing the load. LEACH was used to enable scalability and robustness for non static networks and add data fusion into the routing protocol for reducing the amount of data. It was able to transmit to base station and performs experiments with larger number of nodes (thousands), and also to conduct test other node.

In[15]Arijit Ukil et al (2010)said that it is more important in the case of Wireless Sensor Networks (WSNs) where collected data often requires in-network processing and collaborative computing. In this paper, analyzes a scenario where data aggregation needs to be done in privacy-preserved way for distributed computing platform. There are number of data sources which collect or produce data. The data collected or produced by the sources is private and the owner or the source does not like to reveal the content of the data. But the collected data from the source is to be aggregated by an aggregator, which may be a third party or part of the network, where the data sources belong.

In[16]Jamal N. Al-Karaki Ahmed E Kamal (2009) explained that LEACH randomly selects a few sensor nodes as cluster heads(CHs) and rotate this role to evenly distribute the energy load among the sensor in the network. In LEACH, the cluster head nodes compress data arriving from nodes that belong to the respective cluster, and send the aggregate data to BS in order to reduce the amount of information that must be transmitted to base station.

III. CONCLUSION

In this review paper the term Wireless sensor network is discussed. All the previous techniques that generate problems in the clustering/routing protocol are discussed. From above discussion it is clear that fault tolerance is the major problem that occur in the clustering the data. After that a potential solution for such type of problems is also discussed. Along with those key benefits of the given potential solutions is also discussed. A purely LEACH that better utilizes the most valuable network resource (energy) in WSN is reviewed.

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REFERENCES

- [1]Mehra, Pawan Singh, M. N. Doja, and Bashir Alam. "Energy efficient self organising load balanced clustering scheme for heterogeneous WSN." *Energy Economics and Environment (ICEEE), 2015 International Conference on*. IEEE, 2015.
- [2] Sujee, R., and K. E. Kannammal. "Behavior of LEACH protocol in heterogeneous and homogeneous environment." In *Computer Communication and Informatics (ICCCI), 2015 International Conference on*, pp. 1-8. IEEE, 2015.
- [3]TavleenKaur, JaspreetKaur, "A Survey on Enhancing Network Lifetime ofNodes in Wireless Sensor Networks," International Journal for Research in Applied Science, Vol. 2 Issue III, March 2014,ISSN: 2321-9653
- [4] Jyoti Rajput and Naveen Garg "A Survey on Secure Data Aggregation in Wireless Sensor Network," International Journal of Advanced Research in Computer Science Volume 4, Issue 5, May 2014

- [5]Salim EL KHEDIRI, Nejah NASRI, Anne WEI ,Abdennaceur KACHOURI “A New Approach for Clustering in Wireless Sensors Networks Based on LEACH,” International Workshop on Wireless Networks and Energy Saving Techniques (WNTEST), Procedia Computer Science 32 (2014) 1180 – 1185
- [6]AmitSharma, Dr.S. N. Panda, Dr.Ashu Gupta “IMPLEMENTATION OF ENERGY EFFICIENT AND SECURED PROTOCOL FOR DEPLOYMENT IN WIRELESS SENSOR NETWORKS,” International Journal of Enterprise Computing and Business SystemsISSN (Online) : 2230-8849 ,Volume 4 Issue 2 July 2014
- [7] Joyce Jose, M. Princy “Integrity Protecting and Privacy Preserving Data Aggregation Protocols in Wireless Sensor Networks,” I. J. Computer Network and Information Security, 2013, 7, 66-74
- [8] Abdulsalam, Hanady M., Bader A. Ali“W-leach based dynamic adaptive data aggregation algorithm for wireless sensor networks,” International Journal of Distributed Sensor Networks 2013
- [9]Kumar, Bhawnesh, and Vinit Kumar Sharma. "Distance based Cluster Head Selection Algorithm for Wireless Sensor Network." *International Journal of Computer Applications* 57.9 (2012).
- [10] Monica R Mundada ,SavanKiran , ShivanandKhobanna, Raja NahushaVarsha and Seira Ann George, “A study on Energy Efficient Routing Protocols in Wireless Sensor Networks”, International Journal of Distributed and Parallel Systems (IJDPS) Vol.3, No.3, 2012.
- [11]Aderohunmu, Femi A., Jeremiah D. Deng, and Martin K. Purvis. "A deterministic energy-efficient clustering protocol for wireless sensor networks." *Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP), 2011 Seventh International Conference on*. IEEE, 2011.
- [12]Yajie Ma, YikeGuo, XiangchuanTian, and MoustafaGhanem “Distributed Clustering-Based Aggregation Algorithm for Spatial Correlated Sensor Networks” IEEE SENSORS JOURNAL, VOL. 11, NO. 3, MARCH 2011
- [13] El khediri, N.Nassri, A. Kachouri, “Synchronization issues in Wireless Sensor Network”, twenty-third International IEEE Conference of Microelectronics, Tunisia,2011.
- [14] Kavi K. Khedo, Rajiv Perseedossand AvinashMungur " A Wireless Sensor Network air pollution monitoring system” international journal of wireless and mobile network(IJWMN), [6]ArijitUkil “Privacy Preserving Data Aggregation in Wireless Sensor Networks,” 2010 Sixth International Conference on Wireless and Mobile Communications.Vol.2,No. 2,2010
- [15]ArijitUkil “Privacy Preserving Data Aggregation in Wireless Sensor Networks,” 2010 Sixth International Conference on Wireless and Mobile Communications.