

A review of centralized dynamic clustering for wireless sensor network

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Abstract : In this paper we are presenting a review of centralized dynamic clustering for wireless sensor network. Sensors have limited resources in terms of memory, energy and computational resources. Clustering has been proposed by researches to group a number of nodes to form a cluster that managed by cluster head. In order to minimize the energy consumption involved by communications in *wireless sensor networks*, the use of *clustering* has proven to be effective. In order to overcome the energy loss involved by communications in *wireless sensor networks* (WSN), the use of *clustering* has proven to be effective. The *sensor* nodes are restricted in power, memory and computational resources. There is a need to design protocols that adapt much better to the constraints of the *sensor network* environment. Wireless Sensor Network (WSN) is a multi-hop sensor network system in which sensor nodes are deployed in monitoring area to sense some environmental parameters. WSN is used to bridge the gap between physical world of humans and virtual world of electronics.

IndexTerms – Dynamic, Clustering, Network, Wireless, Sensor.

I. INTRODUCTION

In wireless sensor network (WSN) the sensor nodes are often grouped into individual disjoint sets called a cluster. Each cluster comprises of Cluster Head (CH) and its members [1]. CHs are nodes that consume more energy than cluster members when they involve in aggregating, processing and routing data. CHs collect data from the sensors. Clustering is especially important for sensor network applications where a large number of ad-hoc sensors are deployed for sensing purpose. In the network if each and every sensor node starts to communicate then all sensors will be engaged in data transmission hence network will enter into enormous congestion and data collisions. This situation will lead to drain limited energy from the network. Sensors have limited resources in terms of memory, energy and computational resources. Clustering has been proposed by researches to group a number of nodes to form a cluster that managed by cluster head. The advantage of this strategy is to minimize the number of message transmissions. In this paper, we propose clustering protocol called Centralized Dynamic Clustering CDC. Each cluster selects a node that serves as the cluster head. The cluster head is responsible for collecting the data from all the cluster members, aggregating the data, transmitting fused information to the base station and selecting new cluster head for next round. When node dies in cluster, the cluster head sends message to base station to forms clusters. Our experiment results show that CDC outperforms LEACH-C in term of communication overhead and latency in data delivery. Sensors have limited resources in terms of memory, energy and computational resources. Clustering has been proposed by researches to group a number of nodes to form a cluster that managed by cluster head. The advantage of this strategy is to minimize the number of message transmissions. In this paper, we propose clustering protocol called Centralized Dynamic Clustering CDC. Each cluster selects a node that serves as the cluster head. The cluster head is responsible for collecting the data from all the cluster members, aggregating the data, transmitting fused information to the base station and selecting new cluster head for next round. When node dies in cluster, the cluster head sends message to base station to forms clusters. Our experiment results show that CDC outperforms LEACH-C in term of communication overhead and latency in data delivery. Wireless sensor networks (WSNs) are used in many application fields, such as habitat monitoring, commercial applications, military surveillance, forest fire detection, home applications, hazardous environment sensing and smart spaces, inventory tracking, , general engineering, underwater applications, disaster management, biomedical health monitoring, animal tracking, seismic detection, etc [1]. Indeed, according to [2] WSNs are listed as one of the key technologies of the internet of things. They are listed, also in [3], to be one of the new technologies that will change the world and our life, Nodes (or motes or Sensors) are physical entities characterized by: (i) a processor with a very limited processing capabilities; (ii) a battery with a limited energy, often irreplaceable and not rechargeable; (iii) and a transceiver [4].

II. COMPONENTS OF A CLUSTERING IN WSN

The WSN systems can be evaluated on the basis of different perimeters. These perimeters include:

- Network lifetime
- Cost
- Temporal accuracy

- Ease of deployment
- Response time
- Security

The perimeters of a node can be given as follows:

- Flexibility
- Robustness
- Security
- Communication
- Computation

III. SENSOR NETWORK CLUSTERING

WSN base station always needs to generate an aggregated value to the end users and the aggregation of the data to be forwarded can also help in reducing the transmission overhead and the energy consumption. To support the data aggregation in the network the nodes can be accommodated in the small groups called the Clusters. Clustering can be defined as the division of the nodes in the groups on the basis of some mechanism. Clustering has been shown to improve network lifetime, a primary metric for evaluating the performance of a sensor network [2]. Clustering is done to achieve the energy efficiency and the scalability of the network. Formation of the cluster also involves the assigning the role to the node on the basis of their perimeters. The coordinator of the cluster which is responsible for the processing, aggregation and transmission of the data to the base station is called the Cluster Head (CH) or the leader, whereas the other nodes which are responsible for sensing and forwarding the collected data to the CH are called the Member Nodes.

The CH node loses more energy as compared to the MN because it performs the fusion on the entire collected data and sends that aggregated report to the BS located far from the cluster location. In a cluster organization both the Intra-cluster and the Intercluster communication takes place. Clustering in WSNs involves grouping nodes into clusters and electing a CH such that:

- The members of a cluster can communicate with their CH directly.
- A CH can forward the aggregated data to the central base Station through other CHs [2].

IV. PERIMETERS OF THE CLUSTERING

- Cluster count/Number of clusters [7]
- Cluster size uniformity
- Inter-clustering routing [7]
- Intra-clustering routing

V. CLUSTERING CLASSIFICATION

The clustering algorithms can be divided on various parameters. On the basis of CH rotation for a round it can be synchronous and asynchronous[7]. Distributed clustering algorithms can be divided into grid based schemes, PSO based, hierarchical schemes, heuristic scheme. On the basis of data movements it also can be divided into single and multi hop clustering algorithms. The classification of the clustering is given in the figure.[4]

Table 1: Classification of Clustering Algorithms

<i>Sr.N</i> <i>o</i>	<i>Category</i>	<i>Algorithms</i>
1	<i>Grid Based</i>	<i>PEGASIS, PDCH, GROU P</i>
2	<i>Hierarchical Scheme</i>	<i>LEACH, HEED, EECS, EEUC</i>
3	<i>Heuristic schemes</i>	<i>LCA-1, LCA-2, HIGHEST CONNECTIVITY</i>

VI. ADVANTAGES OF CLUSTERING

- Scalability
- Data aggregation
- Less load

- Reduced energy consumption
- Collision Avoidance
- Load Balancing
- Fault tolerance
- QoS

VII. CONCLUSION

Node clustering is very useful in the communication for reducing the overhead of the transmission. In this paper we have focused on various parameters of WSN and node clustering. WSN base station always needs to generate an aggregated value to the end users and the aggregation of the data to be forwarded can also help in reducing the transmission overhead and the energy consumption. In this paper we are presenting a review of centralized dynamic clustering for wireless sensor network. Sensors have limited resources in terms of memory, energy and computational resources. Clustering has been proposed by researches to group a number of nodes to form a cluster that managed by cluster head.

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