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A Review on Energy Efficient Algorithm For Reliable Routing of Wsn

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Abstract- **Wireless sensor networks (WSN) are key components of systems of systems (SoS) since they can be integrated in complex assemblies in order to respond to current societal issues such as the aging of the population, the optimization of natural resources and the reduction of carbon footprint. Typically, kinematic sensors can be used to remotely supervise elderly patient, humidity sensors can be deployed to control field irrigation for a more sustainable agriculture, and connected vehicles will help to optimize the management of urban traffic while limiting pollution.**

Keywords- **Wsn, Leach, Deec, D-Leach**

I. INTRODUCTION

Wireless sensors are equipped with different parts including sensing part, memory, processor, and communication system. Figure 1 illustrates the structure of wireless sensors [2]. Wireless sensors not only gain information from the environment, they can also do some analysis, data fusion and deliver in-network data communication of its own and other node's data.

The wireless sensor networks (WSNs) consist of a great number of wireless sensors working and communicating with each other. Sensor nodes can communicate with their neighbor nodes or the base station while the signal strength is sufficient for sending and receiving. Wireless sensor networks can cover a large geographic area by spreading a great number of sensors and using the appropriate routing technique. However, due to resource limitations, it is important to manage energy consumption in an efficient manner.

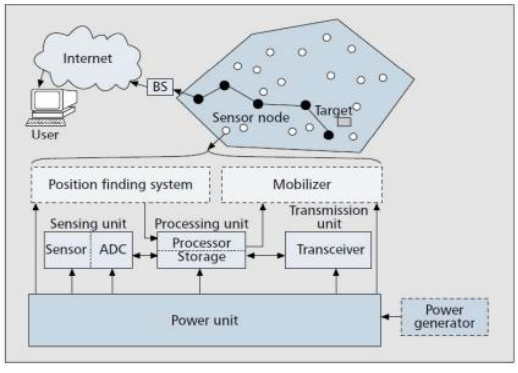

Figure 1 The Components of Sensor Nodes.

In a wireless sensor network, nodes can communicate with the base station by single hop or multi-hop techniques. If nodes are close enough to the base station they can communicate directly with the base station which is called single-hop mode (Figure 2). In multi-hop communication (Figure 2) the base station is not directly reachable by nodes therefore, sensors not only capture and spread their own data but also they should work as relay node for delivering data toward the base station [2].

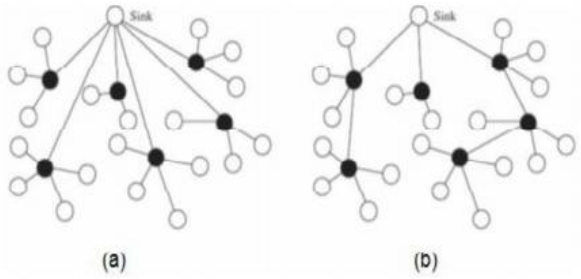

Figure 2 Clustering with Single Hop Connections to the Sink (a) and Clustering with Multi Hop Connections to the Sink (b)

II.LITERATURE REVIEW

1. Energy-LEACH

As discussed in the previous section, one of the disadvantages of LEACH is that cluster heads are selected randomly but in Energy-LEACH routing protocol cluster heads are selected based on their residual energy to improve load balancing between nodes [9]. This routing protocol uses a threshold parameter named as scheduled energy for selecting cluster heads. So, a node can be a cluster head when its residual energy is more than the scheduled energy. In this protocol it is assumed that all nodes can directly communicate with the base station, and there is no condition for the position of cluster heads.

2. Achth-Leach

ACHTH-LEACH improves LEACH by using an adaptive algorithm of cluster head election and allowing multi-hop

transmission among cluster heads and the base station [11]. In Adaptive Cluster Head Election and Two-Hop LEACH routing protocol sensor nodes are divided in two groups:

- The nodes which are close to the base station
- The nodes which are far from the base station

After this classification, the nodes which are closer to the base station are tagged as near nodes and they have been classified in one cluster. On the other hand, the remaining nodes are tagged as far nodes. Then these nodes have been classified in different clusters by a combination of k-means and greedy algorithms. This phase is named by clustering in ACHTH-LEACH. This routing algorithm also has two more phases named by selecting the cluster head and data transmission.

In selection cluster head phase, cluster heads are selected based on calculation of residual energy of each node and the node with maximum residual energy has been selected for this role on the network. With this technique which is used in the second phase, the load is equally balanced among all nodes. In addition, network lifetime would be increased too. The main advantage of ACHTH-LEACH in comparison with LEACH is, when a sensor node becomes cluster head it just needs to send information to nodes which are in the same cluster not the whole network like LEACH, therefore the amount of data which needs to communicate between nodes have decreased significantly as a result of energy consumption and network lifetime would be decreased and increased, respectively.

3.ICCA

ICCA presents one cluster head choosing algorithm based on the Low-Energy Adaptive Clustering Hierarchy (LEACH) protocol to save the network energy and extend its survival life [13]. This routing algorithm has tried to improve shortages of LEACH in selecting cluster heads. As discussed before although LEACH can distribute the cluster head role among all nodes in an appropriate manner, it didn't select cluster head based on remaining energy. In this routing algorithm (ICCA) cluster heads are selected based on residual energy.

In ICCA each node sends its remaining energy to the cluster head in addition of data which has been gained from the environment. Cluster heads gather information from sensor nodes and organize data based on sensors ID and the residual energy of each node. At the end of each round the new cluster is selected based on its remaining energy by current cluster 20 head. Although this algorithm can improve LEACH, but consuming higher memory and processing resources are its shortages.

3.DEEC

DEEC is a distributed energy efficient clustering protocol for heterogeneous wireless sensor networks. In this routing protocol cluster-heads are selected with a probability based on the ratio between the residual energy of each node and the average energy of the whole network. Therefore, each node needs to obtain residual energy of all nodes at each round. Nodes are selected as cluster heads with respect to their residual energy and initial energy. The sensor nodes with high energy level have more chance to be selected as cluster heads.

4. LEACH

Low Energy Adaptive Clustering Hierarchical (LEACH) is a hierarchical routing protocol which is introduced by Heinzehmen [6]. LEACH tries to share the energy dissipation fairly among all nodes by selecting cluster heads randomly to prolong the network lifetime. In the LEACH, cluster heads compress and aggregate data after receiving it from sensor nodes, and then they send it to a base station for decreasing energy consumption in comparison with direct communication between each node and the base station. LEACH uses TDMA/CDMA for avoiding a collision in intra and inters clusters. Due to the centralized data collection, it is more appropriate to use LEACH in a non-dynamic environment without any mobility. Figure 3 shows a flowchart of LEACH protocol.

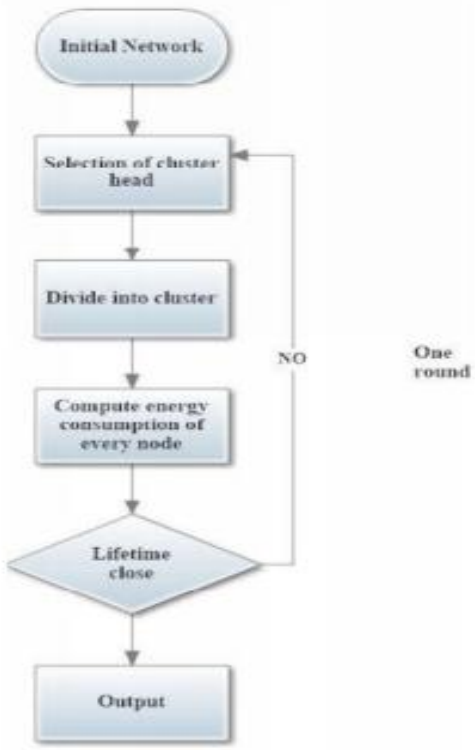

Figure 3 Flowchart of LEACH Protocol.

LEACH routing protocol is made with two phases as it is expressed below:

1. Setup phase- In this phase cluster heads are selected after nodes join each cluster head to create clusters.

2. Steady phase- In this phase gathering data and communicating among nodes, cluster heads and a base station occurred.

IV.CONCLUSION

In recent years, many researchers have been carried out concerning wireless sensor network issues, and especially in communication and control protocols. Those researches include energy management and power consumption, optimal clustering, communications structure and topology. One of the main reasons is that in the proposed algorithm cluster heads are selected based on their closeness to the center of each cluster, therefore they can cover more nodes using the minimum distance between the cluster head and the nodes, which decreases the energy consumption and increases the network lifetime.

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