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Survey of Energy Efficient Algorithm using WSN

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Abstract—In wireless sensor networks, sensor nodes always have a limited power resource. The energy consumed by transferring data from the sensor node to its destination raises as a critical issue in designing reasonable wireless sensor network routing protocols. LEACH was the first protocol for balancing the energy consumption among nodes, although with some shortcomings such as residual energy of nodes has not considered during cluster head selection, probability function for becoming a cluster head is based on the assumption that all nodes have same initial energy, not true in case of heterogeneous network, number of cluster head nodes are not fixed in LEACH due to random selection, the different cluster numbers in each round will make the node numbers in every cluster different and uneven cluster numbers dissipate uneven energy in each round

Keywords— WSN,Leach,Gateway,Sensor Node

I. INTRODUCTION

Wireless Sensor Networks (WSNs) consist of many battery-powered sensor nodes that detect their physical surroundings and send them to a sink node. Since the battery resource directly affects the operation time of sensors, it is very important in prolonging the lifetime of a WSN to design energy-efficient protocols. Thus, many studies in WSNs have been focused on delivering the sensed data to the destination energy-efficiently. Routing in WSNs means that the information from sensor nodes (SNs) is forwarded to the base station (BS) regularly or on demand.

It is classified as flat and hierarchical routing. Clustering approach can be regarded as one of hierarchical routing techniques. As reported in many research works, clustering schemes have great advantage for energy saving in WSNs . The clustering associated with data aggregation improve the network performance by decreasing the amount of data to be delivered and the number of hops from sensors to the BS. In such a networks, however, more energy is consumed in the cluster head nodes because more computing and communication load is assigned to the cluster heads. This results in the non-uniformity of energy consumption among nodes, making some nodes die earlier than others.

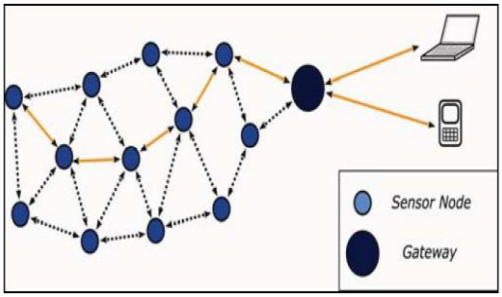

Figure 1.1 - Architecture of wireless sensor network

The WSN work in three phases that are given below:

In 1st phase (Registration phase): The sink node send a control packet to it neighbor node and when the neighbor get that control packet it send acknowledge back to sink node and registration with the sink is done.

In 2nd phase (data transmission): In this phase sink communicate with registered sensor node .The sink gets the data from the registered sensor node. All the routing algorithm are design for the second phase of data transmission.

In 3rd phases (Check connectivity): In this phase the sink sends control packets to register neighbor node to check it connectivity and it send it again and again to maintain and check the connectivity.

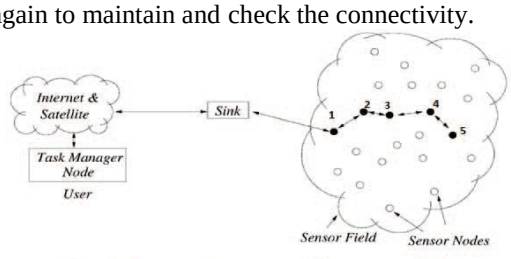

Fig 1.1(b) - Sensor nodes in sensor field

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II. COMPONENTS OF WSN NODE

A sensor node is made up of four basic components as shown in figure: a sensing unit, a processing unit, a transceiver unit and a power unit. They may also have application dependent additional components such as a location finding system, a power generator and a mobilizer. One of the most important components of a sensor node is the power unit and may be supported in some cases even by a power scavenging unit such as solar cells. These nodes must
(i) consume extremely low power
(ii) operate in high volumetric densities
(iii) have low production cost and be dispensable and
(iv) be adaptive to the environment.

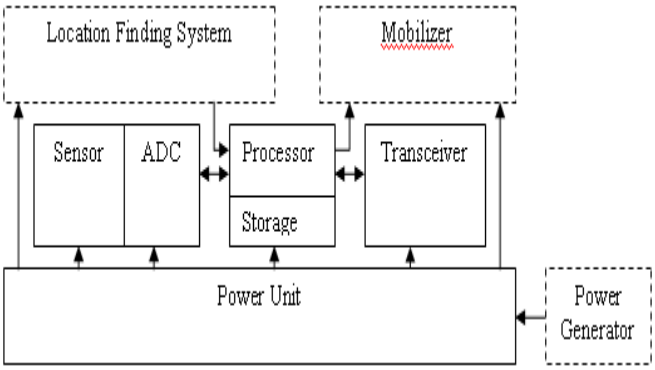

Figure 1.2 - Components of a sensor node

III. Related Work

1. Anindita Roy and Debashis De et al[1] proposes a new protocol which is the improvement of LEACH protocol. This paper presents a clustering hierarchy protocol based on Energy Efficient Cluster Head Selection (EECHS), which aims to reduce energy consumption within the wireless sensor network and prolong the lifetime of the network. Simulation result shows that the proposed protocol (EECHS) has better performance than Based Energy Clustering (BEC) protocol in reducing energy consumption and prolonging lifetime of the wireless sensor network. EECHS gives better performance than BEC in respect of number of alive nodes, residual energy and energy consumption based on number of rounds. Based Energy Clustering (BEC) protocol is an improved version of Low Energy Adaptive Clustering Hierarchy (LEACH) . In BEC the election strategy of cluster-heads takes the energy factor into account. Although the election strategy of cluster-head nodes in BEC considers the residual energy information about the nodes. BEC does not consider the distance between the nodes from the Base Station (BS) and the number of consecutive rounds in which a node has not been a cluster head. Moreover it assumes that every time a node becomes a cluster-head, it can communicate with Base station directly. Which is incorrect, as cluster-heads located far from the base station spend more energy in transmitting data those located near to the base station. To ensure the even energy load distribution over the whole network, additional parameters should be considered to optimize the process of cluster-head selection. So in this paper cluster head selection algorithm is improved by adjusting the threshold T(n) , relative to the nodes remaining energy, distance of the nodes from the base station and the number of consecutive rounds in which a node has not been a cluster head.

2.Li ,Ding and Liu et al[2] proposes a new improved protocol of LEACH protocol named as Leach-N. This paper proposes a new improve method which is called LEACH-N base on LEACH. According to this new protocol, the problem that how to select nodes as the cluster head node depend on the residual energy of nodes in the cluster. This strategy can guarantee the rationality during selecting head nodes. Moreover, the network robustness can be enhanced and the life cycle for the network can be prolonged. The simulation results show that the algorithm proposed by this paper behaviors better performance than LEACH in the following three aspects, the numbers of life nodes, energy consumption and data transmission.

3.Farooq Dogar and shah et al[3] , in this paper, we have found a Multi-hop Routing with Low Energy Adaptive Clustering Hierarchy (MR-LEACH) protocol. In order to prolong the lifetime of Wireless Sensor Network (WSN), MR-LEACH partitions the network into different layers of clusters. Cluster heads in each layer collaborates with the adjacent layers to transmit sensor's data to the base station. Ordinary sensor nodes join cluster heads based on the Received Signal Strength Indicator (RSSI). The transmission of nodes is controlled by a Base Station (BS) that defines the Time Division Multiple Access (TDMA) schedule for each cluster-head. BS selects the upper layers cluster heads to act as super cluster heads for lower layer cluster heads. Thus, MR-LEACH follows multi-hop routing from cluster-heads to a base station to conserve energy, unlike the LEACH protocol. Performance evaluation has shown that MR-LEACH achieves significant improvement in the LEACH protocol and provide energy efficient routing for WSN. MR-LEACH protocol introduces the concept of equal clustering i.e., any node in the given layer will reach the BS in equal number of hops. Simple sensing nodes will join the cluster head afterwards, the BS will choose the cluster heads for lower layer cluster heads from its immediate upper layer cluster heads. In this way clustering hierarchy will be formed till we reach the base station. Clustering-based routing protocols for Wireless Sensor Networks have gained wide acceptance due to their

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characteristics of less energy consumption. Many state of the art routing protocols for wireless sensor networks use clustering at multiple levels to further reduce energy consumption. Some protocols introduce couple of clustering levels while others try to use resources efficiently by providing multi-hop routing with unequal clustering.

4. Rajiv Kr Tripathi,Grad, Yatindra Nath Singh and Nishchal K. Vermah et al[4], LEACH was the first protocol for balancing the energy consumption among nodes, although with some shortcomings such as residual energy of nodes has not considered during cluster head selection, probability function for becoming a cluster head is based on the assumption that all nodes have same initial energy, not true in case of heterogeneous network, number of cluster head nodes are not fixed in LEACH due to random selection, the different cluster numbers in each round will make the node numbers in every cluster different and uneven cluster numbers dissipate uneven energy in each round . After LEACH, several algorithm were derived for energy efficient WSN routing and balancing energy among the nodes in a WSN. As we have used number of supported nodes for clustering rule so we called it NLEACH. In real situations, sensor nodes drain out non-uniform energy due to different distances between sensor nodes and base station. In heterogeneous network, there may be two or more groups of nodes which have different initial energy.

IV. LEACH PROTOCOL

Routing in WSNs means that the information from sensor nodes (SNs) is forwarded to the base station (BS) regularly or on demand. It is classified as flat and hierarchical routing.

Clustering approach can be regarded as one of hierarchical routing techniques. As reported in many research works, clustering schemes have great advantage for energy saving in WSNs. The clustering associated with data aggregation improve the network performance by decreasing the amount of data to be delivered and the number of hops from sensors to the BS. In such a networks, however, more energy is consumed in the cluster head nodes because more.

V. LEACH CLUSTRING ALGORTHIM

TABLE 1 - DIFFERENT CLUSTERING ALGORITHM

Algorithms	Clustering Rule
LEACH	Random probabilistic clustering.
LEACH-C	Centralized clustering algorithm to produce better cluster.
LEACH-F	Clustering with fixed number of cluster.
PEGASIS	Each node communicate only with a close neighbour and takes transmitting to the base station , thus reducing the amount of energy spend per second.
HEED	Cluster heads are selected periodically according to a hybrid of the node residual energy and node proximity to its neighbour or node degree. Availability of multiple power levels in sensor nodes is assumed.
TEEN	Total number of transmissions are reduced by allowing the nodes to transmit only when they sensed value less than a threshold value.
EECS	Clustering based on residual energy through local radio communication while achieving better cluster head distribution.
EECED	Nodes with more residual energy have more chances to become as cluster head.
EEHC	Cluster head selection based on weighted election probabilities according to the residual energy in each node. Heterogeneous topology assumed.
Hansen et al	Clustering for large sensor networks using a minimum separation distance.
Zytoune et al	When transmission energy is much higher than the data aggregation and reception energy then probability of selection of cluster head should be function of distance of the node from the base station.
TB-LEACH	Nodes which have the shortest time interval will win the competition and become cluster heads ensuring that the partition of cluster is balance and uniform.

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Chen at el	Impact of topology on the performance and energy efficiency in wireless sensor network for source extraction by illustrating the performance, energy efficiency and lifetime of various sensor networks.
Huang et al	Clustering by selecting only potential nodes as cluster head nodes.
Handy at el	Every node becomes a cluster head node exactly once within one epoch.
Tao et al	Cluster head selection by combining the optimal number of cluster head with residual energy of nodes.
Kaur et al	Strategic deployment for heterogeneous sensor nodes is proposed for the lifetime maximization.
Crosby et al	Clustering by reducing the likelihooddddd of malicious nodes from being selected as cluster heads.
N-LEACH	Cluster head selection depending on how many nodes were supported in previous round.

VI. CONCUSION

Many applications including environment monitoring use a clustering approach for efficient energy consumption. LEACH (Low Energy Adaptive Clustering Hierarchy) is the most famous one of clustering protocols, which enables the balanced consumption of energy to prolong network lifetime. In LEACH, however, additional energy and time are consumed to reform clusters at the setup phase of every round

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