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A Novel Cluster-Based Energy Efficient Routing With Hybrid Protocol in Wireless Sensor Networks

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Abstract
In wireless sensor network, lifetime of sensor nodes is the most essential parameters. sensor node's lifetime may be extended using LEACH and HEED scheme which is allowing to move the cluster head surrounded by the sensor nodes try to allocate the energy consumption over all nodes in the network. Energy efficiency is depends on the selection of cluster head. In this paper, we proposed the clustering algorithm to minimize the overhead of control packets by using LEACH and HEED and Efficient utilization of node near sink and to implements the hybrid protocol which would be better than the existing protocol.
Keywords: Wireless sensor network, clustering, energy efficiency.

I. Introduction

Wireless sensor network consisting of thousands of sensor nodes which is working in an unattended atmosphere with restricted computational and sensing capabilities. Wireless sensor network consist of sense data which is directly communicate with base station. Transmission of data from node to base station are possible using single hop and multi hop communication. when the size of network is increased then single hop communication is not possible .multi hop communication can be used to transmit the sensed data among all the network nodes. wireless sensor network are the mixture of independent devices which is transmitted gathered information to the sink node using multi hop communication. In wireless sensor network ,important challenges is to invent energy efficient routing mechanism to raise network life span due to restricted energy capacity of the network nodes.

sensor network consist of many nodes and each node having its three subsystem: the sensor subsystem , the processing subsystem and the communication subsystem. In the sensor subsystem which senses the environment. The processing subsystem are responsible to perform local calculation on sensed data. The communication subsystem are used to exchange the message between neighbouring sensor nodes .While individual sensors have limited sensing region, processing power and energy ,networking a large number of sensors gives rise to robust, reliable and accurate sensor network covering a wide region.

Wireless sensor network having the following characteristics:
1.It consist of 2 nodes

a)sensor nodes :sensor nodes having the restricted energy and can sense data.
b)one base station: Base station having the more energy and which is faraway from base station.
2.All the sensor nodes are statics. They are directly communicate with the base station.
3. Cluster head carry out data aggregation and Base Station receives compressed data.
4.The duration of Wireless Sensor Network is the total amount of time before the first sensor node runs out of power.

Cluster based routing algorithm are used to increased energy efficiency in wireless sensor network .when data transmitted or received by the nodes in the network ,then data crash and blocking will be occurred.

clustering technique can assist in dropping useful energy consumption . Clustering is useful for many application that involve scalability to hundreds or thousands of nodes. Scalability in this environment must implies for load balancing, efficient resource consumption and data aggregation. Clustering can be very efficient in one-to many, many-to-one, one-to-any, or one-to-all communication. In sensor node clustering, the fundamental process is to select a set of cluster head from the set of nodes in the network. By using cluster head, communication and data aggregation can be done. cluster head collects all the data from nodes and then transmit to the base station. A lot of parameters can be used for electing the node as a cluster head such as locality, mobility, battery, throughput, etc. During the selection process, one cluster head per cluster must be selected because single cluster consist of multiple cluster can give rise to cluster information, quality of service and routing

management issues. In energy efficiency of clustering algorithm, cluster head play an important role.

In Wireless Sensor Network energy is mostly enthusiastic for transmission and reception. Network lifetime may be extended by using cluster head selection. Selection of cluster head depends on different parameters. Depending on the parameters ,cluster head selection is classified into 3 characterized such as deterministic, adaptive and Hybrid metric .

In deterministic metric ,identification of node, degree of nodes, energy degenerate throughout last round , preliminary energy of the nodes are used to decide their role during various data gathering rounds. In deterministic metric, all the sensor nodes in the network send message to their neighbours node and then the node receiving the first message ,that node declare themselves as a cluster head and send a broadcast message to all the nodes in the network that the node is become cluster head.

In adaptive scheme, nodes in the network directly send the data to base station. selection of the cluster head is either depends on the base station or sensors nodes in the network. In Hybrid metric, consisting the combination of deterministic metric and adaptive metric.

II. Related work

Various dissimilar approach have been carried out to design feasible wireless sensor network.

Energy conservation is critical to the extend the network lifetime of Wireless Sensor Networks .There are various approaches for energy efficient routing have been planned to reduce energy consumption. By using Clustering methods, energy to be conserved. In many WSNs applications routing efficiency is essential for energy efficiency, load balancing, and data fusion . In this paper we are anxiety about CH selection schemes . In clustering method, only CHs require to communicate with the sink node via multihop communication. In Low Energy Adaptive Clustering Hierarchy is a well known clustering algorithm in which cluster head is randomly selected .In LEACH, communication distances to the maximum number of one hop neighbours. In addition, LEACH requires all CHs to perform single hop transmissions to the networks sink.

In HEED, the node uses two parameters communication cost between cluster member and residual energy. Depending upon residual energy cluster head is selected. HEED is a multi hop clustering algorithm for WSNs. Remaining energy of each sensor node is used to probabilistically choose the first set of CHs. communication cost between cluster members shows the node level to the neighbor and is main parameter that decides whether to link the cluster. HEED appear in that location that are nearest to the sink, as nodes in such areas require to

transmit incoming traffic from other parts of the network. Furthermore, knowledge of the whole WSNs is necessary to determine communication cost between cluster members. HEED is a distributed clustering method in which CH nodes are selected from the WSNs. HEED CH selection parameter is a hybrid of energy and communication cost.

Hybrid Routing Protocol is a hybrid protocol that divide the network into different zones which make hierarchical protocol which is called as zone-based hierarchical link state(ZHLS).In HRP, physical location of the nodes is identifies by using global positioning system. In ANHR(A New Hybrid Routing Protocol) is a combination of plane routing protocol and hierarchical routing protocol that find the current states of the last node and the current residual energy .
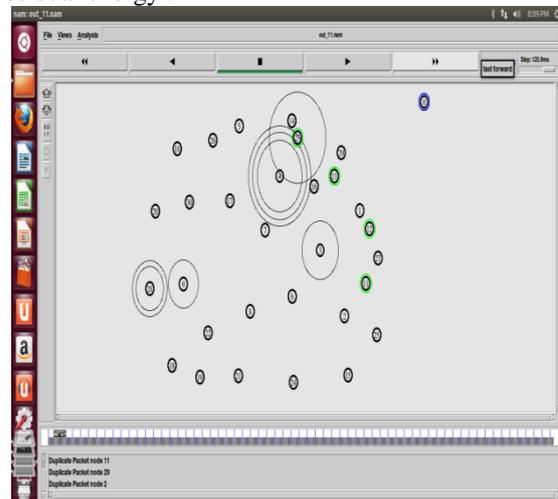

Fig 1: Cluster based end to end multihop transmission

III. Energy Consumption Model:

In this paper we apply a radio model proposed in [3] as radio energy model to measure energy consumption for proposed ANCBER algorithm. A Modular approach would be implemented to measure the energy consumption. The approach would consist of transmitter ,the receiver and the power amplifier module. The proposed hybrid protocol would optimize the energy by using cluster based routing in wireless sensor network. The transmitter and the amplifier module would be responsible for energy consumption of the sender and the receiver module would be responsible for energy consumed at the receiving node .The signal power at the receiver node, the energy absorb by the transmitter and the time for transmitting and receiving the data traffic between the cluster would be measure. Based on the above parameters the proposed techniques would be compared and evaluated with the LEACH and HEED clustering algorithm.

$$dEng = P\_tx * txtime$$

This variable keeps track of total energy consumption in Transmission.

$$et\_ = et\_ + dEng$$

$$dEng = P\_rcv * rcvtime$$

This variable keeps track of total energy consumption in Receiving mode.

$$er\_ = er\_ + dEng$$

Where dEng is the Decrease in energy and et- is the total energy consumption.
P_tx is the Packet Transmission.
P_rcv is the Packet Reception.
txtime is the Transmission Time.
rcvtime is the Reception Time.

ANCBER: New Cluster Based Energy Efficient Routing

A New Cluster Based Energy Efficient Routing algorithm use the self association technique for routing and clustering of Wireless sensor network. In the proposed scheme, each node has to carry out the basic operation of sensing the field parameters, form data packets, and communicate with the cluster head. In WSN ,clustering means dividing nodes in network into different clusters . Sensor nodes are assigned with a unique identifier and have same capability. sensor nodes goes in active as well as in sleeping circumstances.

Many parameters can be used for selecting the node as a CH such as location, mobility, energy and throughput and distance. In this algorithm, selection of CH depends upon residual energy of the node. Residual energy is used to set the initial set of cluster heads

Intra cluster communication cost is used for deciding to join a cluster or not. This cost value is based on node's proximity or node's degree to the neighbor. Each sensor node estimates CHprob value for becoming a CH as follows :

$$CHprob = Cprob * Eresidual/Emax$$

This probability value should not be beyond the threshold value Pmin; Pmin is inversely proportional to Emax. This algorithm consists of constant number of iterations. Every node goes through this iteration until it finds a CH that it will be the node with least communication cost. At the end of iteration every node doubles the CHprob value. Iteration will be terminated if CHprob value reaches 1.

After each round, energy consumption of CH and regular nodes **are** calculated. From this calculated value, those nodes contain higher residual energy will be selected as CH. Cluster formation is similar to LEACH. This algorithm is based on

residual energy, at different rounds nodes have maximum energy will be selected as CH. So the drain rate of the nodes will be linear and packet delivery rate is increased. At the end of each round, utilization of energy is better and hence network lifetime is prolonged in higher level compared to other algorithms

Cluster Head declared its selection by conveying advertisement message to all other nodes in order to form the cluster. each CH creates TDMA schedule for their members to transmit their data and it also tells when it to transmit. Nodes can send data during their allocated period. Radio of regular nodes is turned off until their scheduled time reached. Thus the energy is saved. Finally CH aggregates all data and **sends** to Base Station.

In ANCBER, each and every node share data regarding present energy state with its one hop neighbour.

In this algorithm , node can be used in four different way.

1) cluster head: After the selection of cluster head, CH communicate with cluster member and adjacent CH node .CH is responsible for transmitting the information to cluster member and adjacent CH node.CH uses two types of communication ,Intra cluster communication and inter cluster communication . intra cluster communication can be done between CH and its cluster member. inter cluster communication can be done between CH and its adjacent CH.

2)Cluster member :Cluster member are the member which are present in the cluster and collect all the data and send back to CH.

3)Dead node: In this ,sensor nodes can not transmit and receive the data. sensor nodes can not work because its energy has been low.

4)Isolate node: In this node is disjointed from the network .so that nodes can't transmit and receive the data.

In this paper, we compare the ANCBER algorithm with the LEACH [(Low-Energy Adaptive Clustering Hierarchy) and HEED algorithm in terms of the network lifetime and through put and delay.

Advanced Hybrid Routing Protocol (AHRP):

Advanced Hybrid Routing Protocol is a hybrid protocol which makes a hierarchical protocol .AHRP based on the GAP protocol ,which allows each node to identify its physical position. This protocol judge the suitability of the node and route selecting through the value of remaining energy of node. Every node in the network communicates with other by best effort to transmit data as well as forced to establish adaptive dynamic cluster hea

IV. Simulation Evaluation

In this section, we evaluate the performance of our proposed algorithm (ANCBER) using Network simulator 2. In simulations, we assumes an error free physical layer links and ideal MAC layer. In this paper, we consider the each node's energy consumption as the summation of energy consumed in the transmission and reception of data packets per section. We compare CBER with LEACH and HEED. The results obtained from simulations are average of several tests. The simulation parameters are given in Table, in which the parameters of radio model are the same as those in [3]
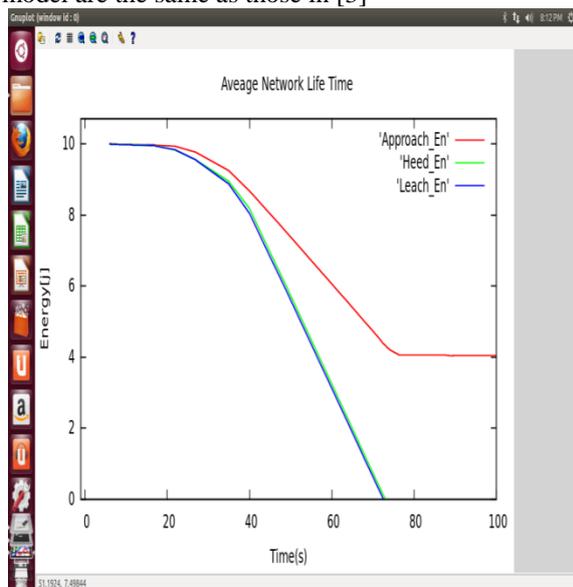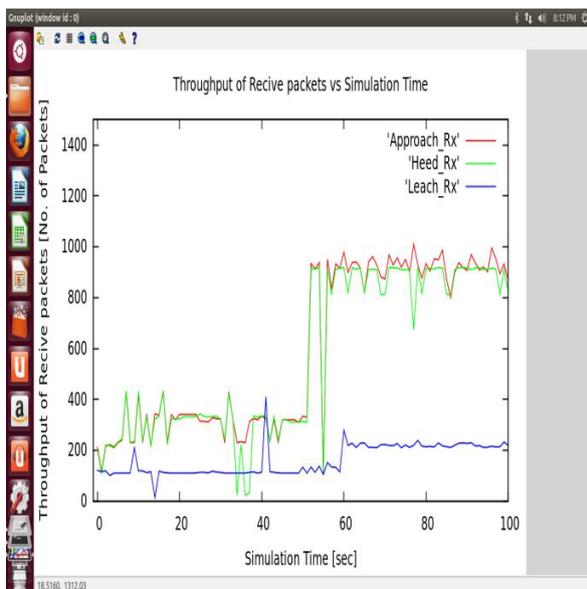
Fig 2 : Comparisons of network lifetime

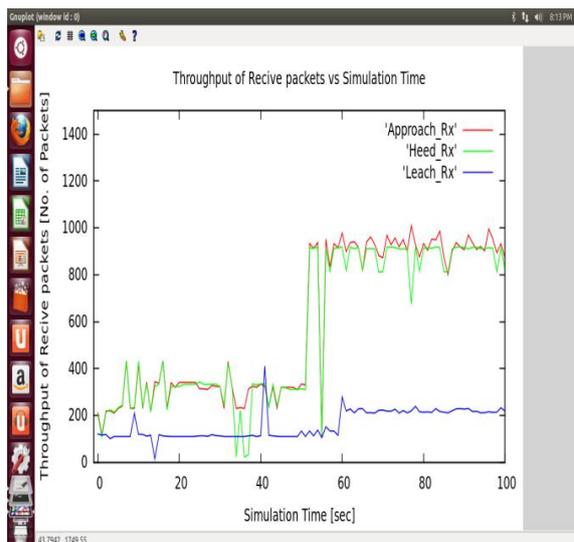Fig 3: Comparisons of Packets Transmission

Fig 4: Comparisons of Packet Reception

Table for Parameter for Simulation:

Parameters	Value
Propagation Factor(β)	2
Network Length	2000m
Simulation Time(t)	150
Energy capacity of nodes(Ecap)	10j
Optimal cluster size(r)	4
Min threshold power(mthr)	0.30j
Network Area	1800/900
Carrier frequency(f)	2.4GHZ
Data Rate	256KBPS
Number of nodes	31

V. Conclusion

In this paper, we proposed the A new cluster based energy efficient routing algorithm (ANCBER) to extend the network lifetime, and simulation results are compared with the previous cluster based routing algorithms LEACH and HEED. The proposed ANCBER algorithm selects the CH node depending on the residual energy and nodes neigh bore information. Furthermore, this CH node is the node that has the best remaining energy and requires the minimum energy to be reached by the cluster members. The results from simulations show that the ANCBER algorithm has best efficiency in terms of both data packets received by sink node and the network lifetime. ANCBER is a clustering algorithm to minimize the overhead of control packets and efficient utilization of nodes near sink. and implements a Advanced Hybrid Routing protocol as compared to Hybrid Routing Protocol and A New Hybrid Routing Protocol.

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