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Study and Analysis of Stability in Energy Efficient Network in WSN

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***Abstract*:- An energy efficient hierarchical cluster-based routing protocol for continuous stream queries in WSN we introduce a set of cluster heads, head-set, for cluster-based routing. The head-set members are responsible for control and management of the network. On rotation basis, a head-set member receives data from the neighbouring nodes and transmits the aggregated results to the distant base station. For a given number of data collecting sensor nodes, the number of control and management nodes can be systematically adjusted to reduce the energy consumption, which increases the network life. Nodes in a sensor network are severely constrained by energy, storage capacity and computing power. To prolong the lifetime of the sensor nodes, designing efficient routing protocols is critical**

***Keywords*: - BFOA, LEACH, LEAD.**

I. INTRODUCTION

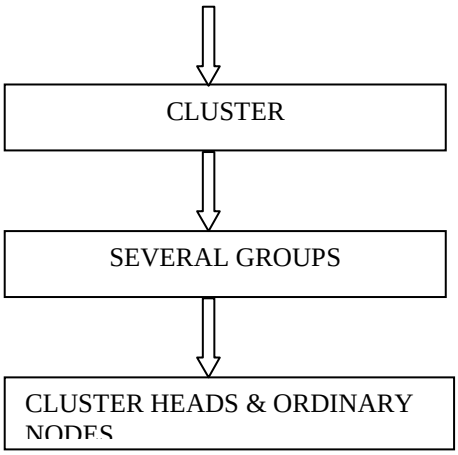
A Wireless Sensor Network (WSN) is a collection of small, lightweight sensor nodes deployed in large numbers to monitor the ambient conditions. WSN have a numerous applications, but the available energy at each sensor nodes are treated as a constraint. Hence energy consumption is a major criterion. Major advantages of WSNs over the conventional

Networks deployed for the same purpose are greater coverage, accuracy, reliability and all of the above at a possibly lower cost. Some of the early works on WSNs have discussed these benefits in detail. Clustering is the process of dividing a network into groups of sensor nodes called clusters. Each cluster consists of one or more number of cluster heads. The cluster heads gathering all data from their cluster members. The collected information are routed to the Base Station. The Base Station (BS) is a fixed node, which is capable to transmit and receive the data within the entire network. The number of cluster head selection varies depends on the number of sensor nodes. Energy consumption is efficiently controlled by selecting more than one cluster head for cluster containing more number of nodes in the network. Analysis of energy consumption is made depends on number of cluster heads are needed, when the number of nodes increased. Although formation and maintenance of clusters introduces additional cost due to the control messages required for the purpose, still cluster-based WSNs have taken much attention of the researchers due to their better performance. Distributed, dynamic and randomized clustering schemes are interesting due to their simplicity, feasibility, and effectiveness in providing energy-efficient utilization, load balancing and scalability simultaneously. Many research projects in the last few years have explored hierarchical clustering in WSN from different perspectives. A variety of protocols have been proposed for prolonging the life of WSN and for routing the correct data to the base station. Each protocol has advantages and disadvantages.

The greatest challenge manifesting itself in the design of wireless networks is the limited availability of the energy resources. These resources are quite significantly limited in wireless networks than in wired networks.

CLUSTERING, in general is defined as the grouping of similar objects or the process of finding a natural association among some specific objects or data. In sensor networks, clusters are used to transmit processed data to base stations. In cluster-based systems the network nodes are partitioned into several groups. In each group one node becomes the cluster-head and the rest of the nodes act as ordinary nodes. The process of cluster-formation consists of two phases –cluster-head election and assignment of nodes to cluster-heads. The cluster-head needs to coordinate all transmissions within the cluster, so also it handles the inter-cluster traffic, delivers the packets destined for the cluster etc. Hence these cluster-heads experience high-energy consumption and thereby exhaust their energy resources more quickly than the ordinary nodes. It is therefore required that the cluster-heads' energy consumption be minimized (optimal) thus maximizing the network lifetime.

A Basic Cluster Based Algorithm



II. PROBLEM IDENTIFICATION

After the literature survey we found that there is major issue of power consumption in wireless sensor network which has been shorted out by many researchers. Now a day there are number of techniques developed for energy efficient network. To make it more reliable and more suitable to find the properly working model of

energy efficient network there should be a requirement of maintenance of the network.

Many researchers found some issues on wireless sensor network those are as follows:-

***a.* Limited Memory and Storage Space** - A sensor is a tiny device with only a small amount of memory and storage space for the code. In order to build an effective security mechanism, it is necessary to limit the code size of the security algorithm. For example, one common sensor type (TelosB) has a 16-bit, 8 MHz RISC CPU with only 10K RAM, 48K program memory, and 1024K flash storage. With such a limitation, the software built for the sensor must also be quite small. The total code space of TinyOS, the de-facto standard operating system for wireless sensors, is approximately 4K, and the core scheduler occupies only 178 bytes. Therefore, the code size for the all security related code must also be small.

b. Power Limitation - Energy is the biggest constraint to wireless sensor capabilities. We assume that once sensor nodes are deployed in a sensor network, they cannot be easily replaced (high operating cost) or recharged (high cost of sensors). Therefore, the battery charge taken with them to the field must be conserved to extend the life of the individual sensor node and the entire sensor network. When implementing a cryptographic function or protocol within a sensor.

III. RESULT

We simulated LEACH (with 5% of the nodes being cluster-heads) using MATLAB with the random network, how these algorithms compare using Eelec = 50 nJ/bit as the diameter of the network is increased.

With minimum number of sensor nodes having maximum coverage in the network and the nodes are within the communication range. By making optimized wireless clusters using the Euclidean distance from all the location nodes to the Sensor Nodes. By making the Clusters of the sensor nodes with a corresponding central transceiver point which will be further chosen from a group of sensors.

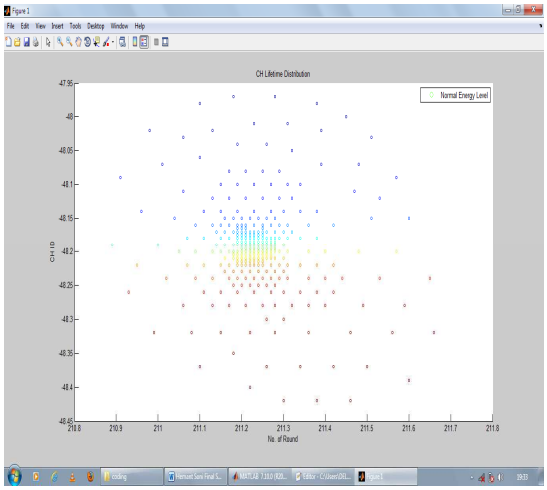


Figure 1. sensor nodes with normal energy level

Many wireless sensor network based monitoring applications are becoming feasible as fundamental data collection and network protocol are becoming efficient in handling simple sense and send functions as computation and storage capacity of sensor nodes are expand. These Sensor nodes are capable of performing more complicated functions, more over the need to realize the complete loop of sense control actuate similar to the wired sensing facility demands for more in network processing to enable any meaningful in network actuator. Nodes have been seen as scattered in WSN shown in fig. Fig shows that nodes which are placed more distance with high energy level as compared to nodes which are placed in less distance or centre with normal energy level.

1. Simulation for cluster and head set

The graph that shows the variation in optimum number of clusters with respect to the head-set size, where the base station is at d=150m and the number of nodes n=1000. The head-set size can be varied between 1 and 6. As the graph shows, the head-set size cannot be greater than 6. Moreover, for a given head-set size, the maximum number of clusters can also be determined from the graph.

In the result figure 5.2 the simulation has been done for how the number of clusters operated in the network. Number of nodes in group can be said to have a cluster. So that a cluster can be design by the study of operation of nodes. Figure shows that clusters can be operate in a limited manner i.e. after reaching the maximum condition named as maximum optimum cluster in the figure there will be a sudden breakdown which breakdowns it to its maximum level of head set. After that no head set will be occurred. So that to operate a cluster in wireless sensor network topology there is need of knowing the maximum level for an efficient manner.

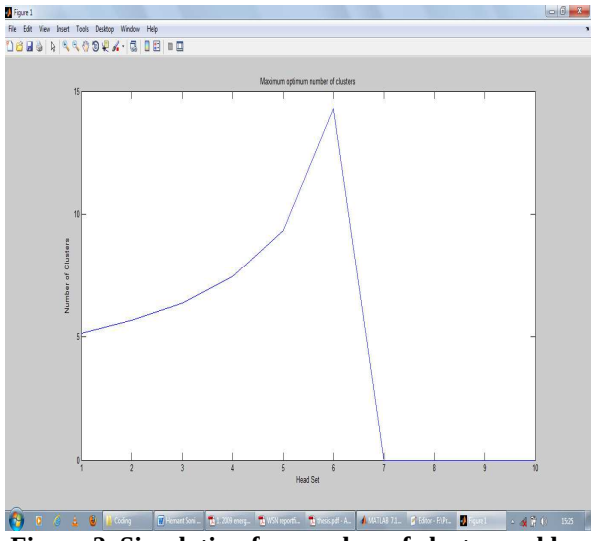


Figure 2. Simulation for number of cluster and head set

2. Simulation and result for LEACH, LEAD and BFO

In the initial condition there is a requirement of large amount of power to start the network. So that in each energy efficient algorithm like LEACH, LEAD and BFO requires more power initially to start the network. After starting the network it will reach at the stable condition after sometime that can be understand as linear or stable mode for energy distribution. Below all graphs shows that the energy consumption with respect to the number of clusters. As expected, the energy consumption is reduced when the number of clusters is increased. However, the rate of reduction in energy consumption is reduced for higher cluster sizes.

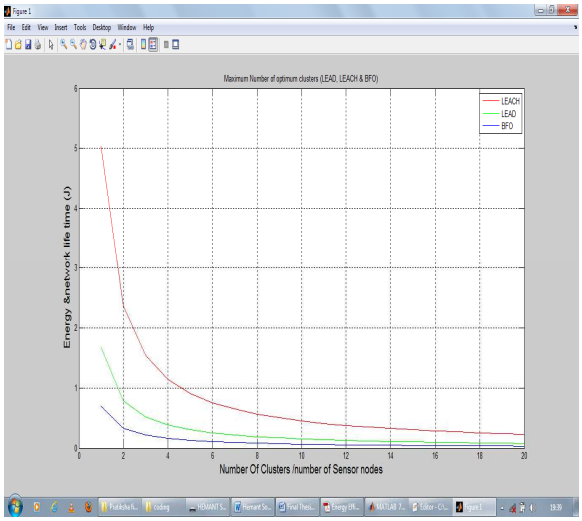


Figure 3. Comparison between LEACH, LEAD and BFO algorithms

Above result shows a comparison result between LEACH, LEAD and BFO algorithms. As the result shows that LEAD provides better stability then LEACH but BFO algorithm provides more stability in terms of power consumption then LEAD. Overall we can say BFO algorithm is the best method to provide energy efficient network and stability.

CONCLUSION

The Research work carried out in this paper presented an analytical view for various algorithms related to power consumption in the network. This thesis investigates energy efficient clustering algorithms related to wireless sensor network. A bio-inspired clustering algorithm based on BFO has been proposed. This decreases power consumption in wireless sensor network and make network energy efficient to increase network lifetime.

In the paper we have discussed about energy efficient clustering algorithms related to wireless sensor network in which we have described about LEACH, LEAD, and proposed algorithm BFO for minimization of total power consumption and increasing network lifetime which compares of others. We have finally shown the simulated results which show the comparative results of various algorithms related to energy efficient network.

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