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Coverage and Energy Based Clustering Techniques to Increase The Lifetime Of Network

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Abstract:-A varied wireless sensor network consists of many types of nodes in sequence. Some of the nodes have high probability processing and large energy. The high energy nodes are called the manager nodes. Except the high energy nodes the other nodes are used for monitoring the data. These nodes sense the data from the environment and also act as a path to manager node, these are the normal nodes. In this paper, an energy-aware algorithm K- medoid is presented for the optimum selection of cluster heads and sensor groups that are used for monitoring and sending messages from nodes in point coverage, using the energy comparison between the nodes. This algorithm used is useful in reducing the energy consumption of the network and increase its life-time. Also we concentrate on a maximum lifetime coverage scheduling of target nodes and collect data for a WSN, even though if all the sensors have the identical sensing radius and the same transmission data. Finally, the practical efficiency of our algorithms is presented and analysed through simulation. These extensive simulation results show better performances of our algorithms.

Keywords: *Clustering, K- Medoid, idle nodes, lifetime maximization.*

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I. INTRODUCTION

In many wireless sensor network (WSN) applications, sensors are evenly distributed in a fixed area to keep a record of current or natures conditions, such as pressure, humidity, temperature, etc., and to send the recorded data towards a base station. sometimes, a set of these target points are monitored in a specific area. On the another point of view, for a better result guarantees, the each and every point of interest should be observed by at least one sensor at all times. But, the consumption of energy by a sensors should be minimized since, in maximum cases, working of sensors is totally based on battery.So, to preserve energy power supplies of these sensors must turn off when they are not in use .Sensor networks are often wished to be buitt in remote environments, like forest or desert. Since the capacity of the nodes is restricted, it seems to be very difficult to recharge or change the battery of all the sensor nodes. However, in many monitoring devices it is assumed that the system will operate as long as possible. So, some techniques must be applied to save energy. The most efficient method for saving energy is to put as many sensors to an inactive mode. But at this time, the network must maintain the connectivity that the base station must be able to connect to any active sensors. Since every node in a specific area sense a common data, it's not mandatory that all of them must be active, as long as there are sufficient working sensors to give surety of system's function. Therefore, the lifetime of a sensor network can be increased respectively if we schedule work of the sensors. In a continuously operating sensor networks, unused sensors are deployed, but only a few of them are active on that time, though the major part of sensors are kept inactiveand for the purpose of preserving energy. The clustering techniqus that will be applied in this paper will form the clusters of the k size. Depending on this, a cluster head will be assigned, that will be useful to preserve the energy in the clusters while the transmission of data through the sensors. The rest paper consist the related work in section 2, the proposed system in section 3, the results in section 4 and the conclusion in section 5.

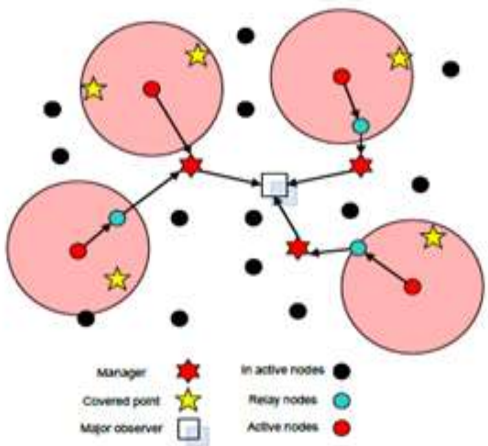

Fig 1: subset of sensors to monitor the target points in each round

II. LITERATURE SURVEY

Zaixin Lu, et. al proposeed that in any sensor scheduling problem, the target monitoring and collection both are considerd for the mazamization of network lifetime. The problem is studied both theoretically and practically. Also, they have stated thatit is NP-hard for efficient network lifetime though all the nodes and target points are in a Euclidean plane. By the other side of the issue, a polynomial-time approximation scheme is developed, assuming that the density of target points is enclosed, and a constant-factor approximation algorithm for the general case. The practical efficiency of algorithms, that is compared with the greedy algorithm is evaluated. The result was that the proposed algorithm was efficient then the previous one [1].

A. B. M. Alim Al Islam et al. proposed a sensor network improve network stability. In LEACH, each sensor node gets equal chance to be a cluster head and thus its lifetime depends only on its own residual energy. Therefore, a sensor node with low energy dies within a short time. So a cluster head must be chosen according to the residual energies to increase the stability of a WSN. Sensor nodes with very low residual energies should be excluded from choices of probable cluster heads to maxi- mize their lifetimes. The four heuristics is presented to achieve goals. The complete clustering algorithm DCRN describes these algorithm [2].
D.Suresh et al. states the centralized clustering architecture, and a clustering algorithm to provide efficient energy consumption and efficient network lifetime in the wireless sensor networks that is CAFEE (Clustering Algorithm for Energy Efficient). If the BS receives the information of any location and remaining energy for each sensor node and the average remaining energy can be calculated. The modify k-means algorithm to make an ideal distribution for sensor node clusters by using the information of location and residual energy for all sensor nodes. The two models are include in this algorithm set up model and Steady sate model [3].

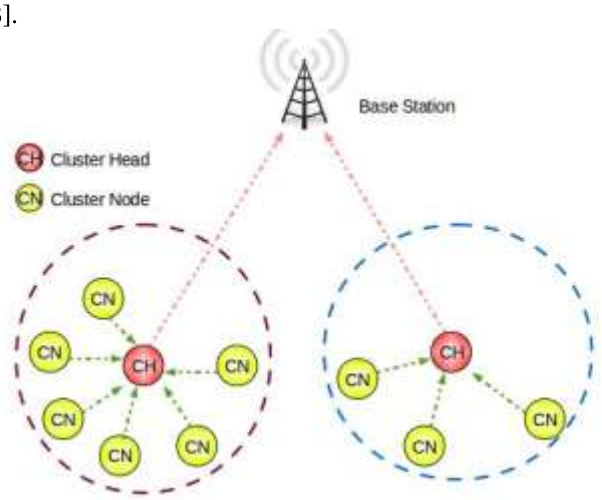

Fig 2 : Cluster based wireless sensor network

J.Surekha et al. states that clustering is a technique to divide sensor nodes in number of groups in the network. Formation of cluster is based on information required in certain region, and cluster head is selected by availability of nodes in the cluster. In , cluster their is one head that act as a leader and is responsible to collect data from all nodes then send it to BS. The main moto is, to reduce the task of cluster head by transaction of data with other cluster head and maximize lifetime of network [4].
Faramarz Ahmadnezhad et al. a routing algorithm Energy Based Clustering Self organizing map (EBC-S) to increase the lifetime of WSN. The topological energy based clustering method is approached to extend life time of the network with sufficient network coverage. The energy based clustering must create clusters with equal energy levels. By this means energy consumption could be better balanced in whole network. The proposed algorithm are LEACH-C and LEA2C protocols.Thus the operation of the algorithm is divided into rounds in a similar way to LEACH-C [5].

Jenifer Angel J proposed a novel method to enhance the lifetime of the nodes by introducing clusters that communicate to the main fusion center of the cognitive sensor network. Each sensor sends its spectrum sensing result to the cluster head the node that is nearer to the fusion center is selected as cluster head. The cluster heads sends its opinion to the main fusion center which makes the final decision. The results simulated using NS-2 shows that there is a reduction in consumed energy in the proposed network model when compared with the Parallel distributed spectrum sensing network model [6].
Mario Cordina et al. had presented a cluster-based routing algorithm that is based on Fuzzy-ART neural networks to increase the life span of the networks. The saving of energy can be analysed by using LEACH, a centralised version of LEACH and a self-organizing map (SOM) neural network-based clustering algorithm. Also the use of a base station centric predictive filtering algorithm used for reduction of transmitted data leading for further increasing the network lifetime [7].
Hai Liu et al. tried to find an optimal solution for the target watching schedule that achieves the maximal lifetime. The three solutions are as under
steps: 1) computing the maximal lifetime of the surveillance system and a workload matrix by using linear programming techniques,
2) decomposing the workload matrix into a sequence of schedule matrices that can achieve the maximal lifetime. 3) determining the sensor surveillance trees based on the above obtained schedule matrices, which specify the active sensors and the routes to pass sensed data to the base station [8].

III. PROPOSED WORK

This paper consists of clustering techniques the n number of clusters are made according to our need. K- medoid algorithm is used for clustering, also the concept of active deactive is used, due to which the maximal lifetime is provided to network and lifetime of network is also inceased. The LEACH protocol is used to calculate the energy of each sensor node.

ALGORITHM

K- Medoid

Step 1 : (Select initial medoids)
1-1. Using Euclidean distance as a dissimilarity measure, compute the distance between every pair of all objects as follows:

$$d_{ij} = \sqrt{\sum_{a=1}^{p} (X_{ia} - X_{ja})^2} \quad i = 1,\dots,n;\ j = 1,\dots,n$$

1-2. Calculate P_{ij} to make an initial guess at the centers of the clusters.

$$p_{ij} = \frac{d_{ij}}{\sum_{l=1}^{n} d_{il}} \quad i = 1,\dots,n;\ j = 1,\dots,n$$

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1-3. Calculate $\sum_{i=1}^{n} Pij\ (j = 1, \dots n)$ at each objects and sort them in ascending order. Select k objects having the minimum value as initial group medoids.

1-4. Assign each object to the nearest medoid.

1-5. Calculate the current optimal value, the sum of distance from all objects to their medoids.

Step 2 : (Find new medoids)
Replace the current medoid in each cluster by the object which minimizes the total distance to other objects in its cluster

Step 3 : (New assignment)

3-1. Assign each object to the nearest new medoid.

3-2. Calculate new optimal value, the sum of distance from all objects to their new medoids. If the optimal value is equal to the previous one, then stop the algorithm. Otherwise, go back to the Step 2.

The above algorithm runs just like K-means clustering and so this will be called as 'K means-like' algorithm. In Step 1, we proposed a method of choosing the initial medoids. The performance of the algorithm may vary according to the method of selecting the initial medoids.

Method 1. Random selection
Select *k* objects randomly from all objects.

Method 2. Systematic selection
Sort all objects in the order of values of the chosen variable (first variable will be used in this study). Divide the range of the above values into *k* equal intervals and select one object randomly from each interval.

Method 3. Sampling
Take 10% random sampling from all objects and perform a preliminary clustering phase on these sampled objects using the proposed algorithm. The clustering result is used as the initial medoids.

Method 4. Outmost objects
Select *k* objects which are furthest from the center.

Method 5. Gaussian mixture
Assuming that the objects are derived from *k* Gaussian components, estimate each mean vector of *k* Gaussian models through Expectation-Maximization (EM) algorithm (Vlassis and Likas, 2002) and find the closest object to the estimated mean vector.

FLOWCHART

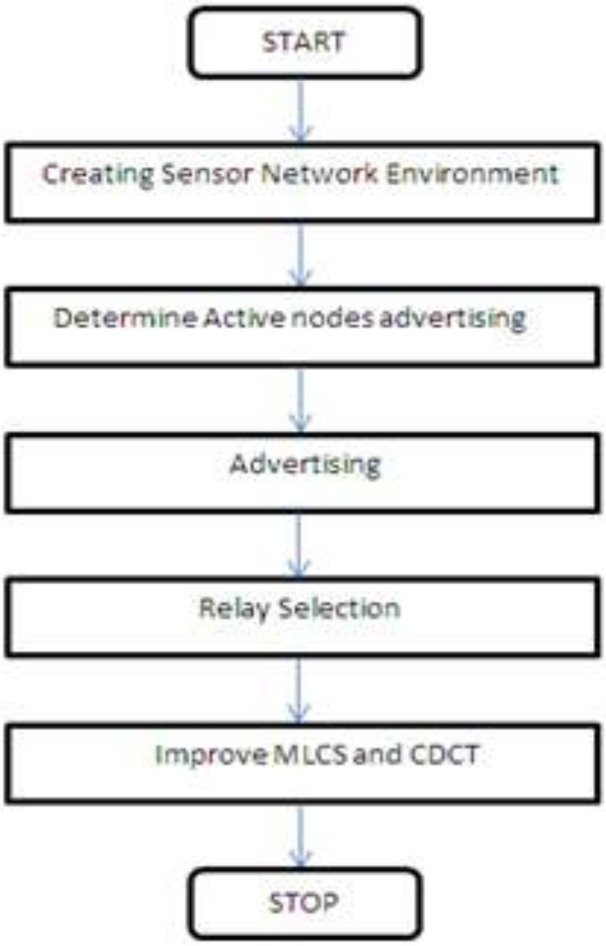

Fig 3: flowchart of proposed system

IV. SIMULATION AND RESULTS

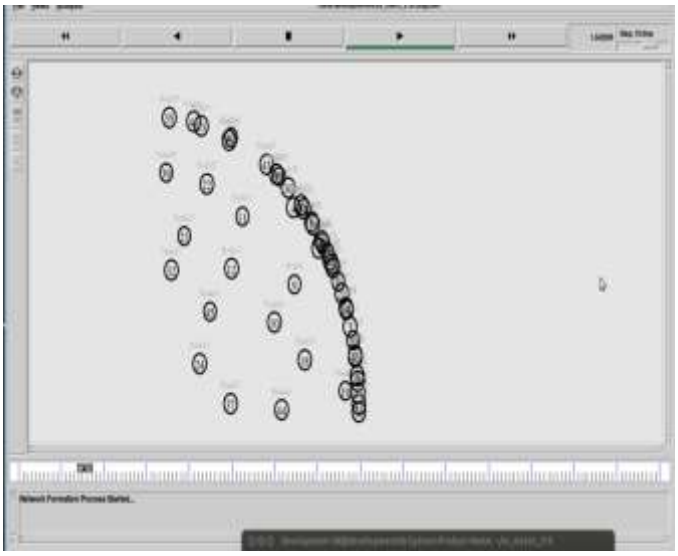

Fig 4: Network formation

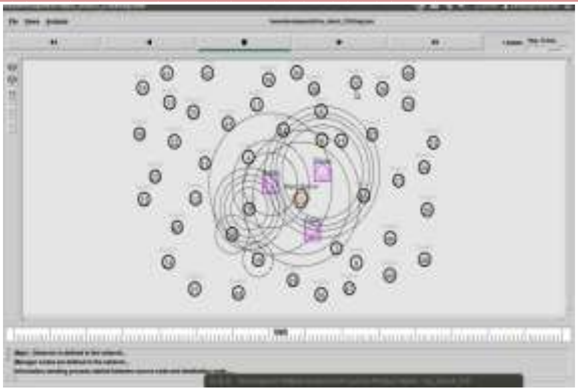

Fig 5: Active node communication

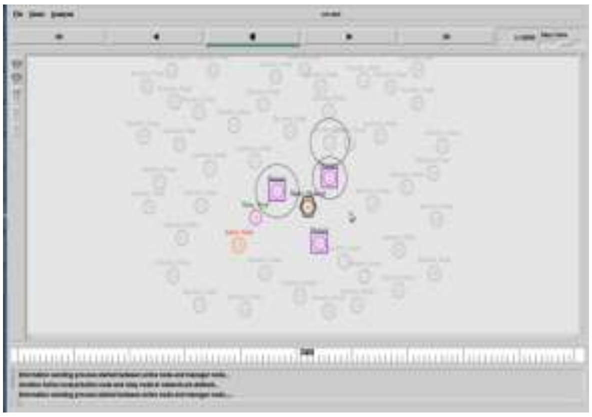

Fig 7: Off node communication

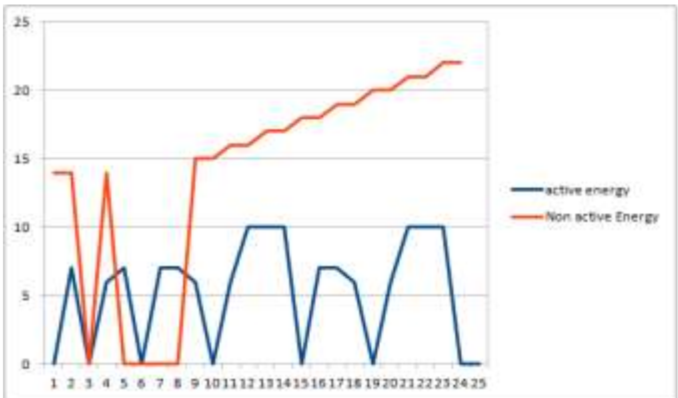

Fig 8: Compare Energy

Fig 9: Compare delay

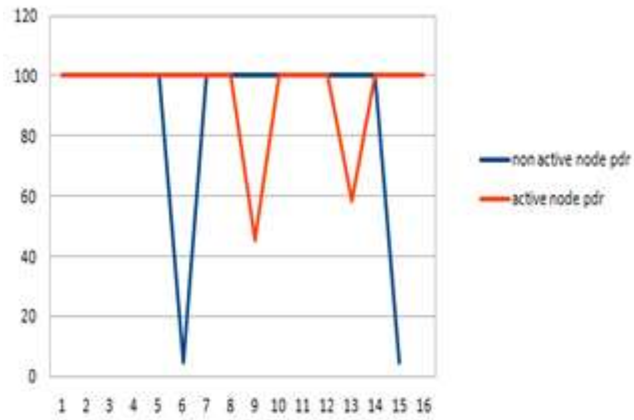

Fig 10 : compare pdr

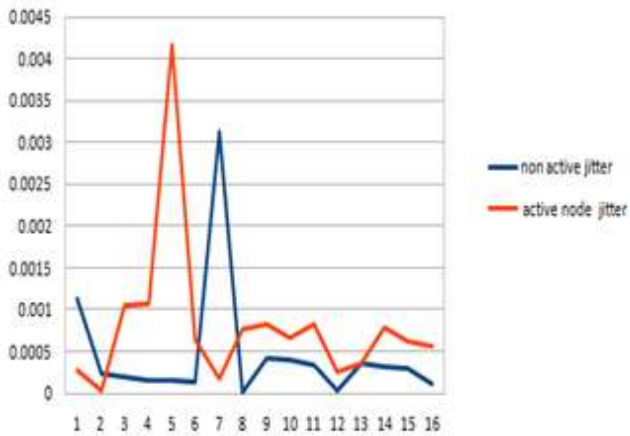

Fig 11: Compare Energy

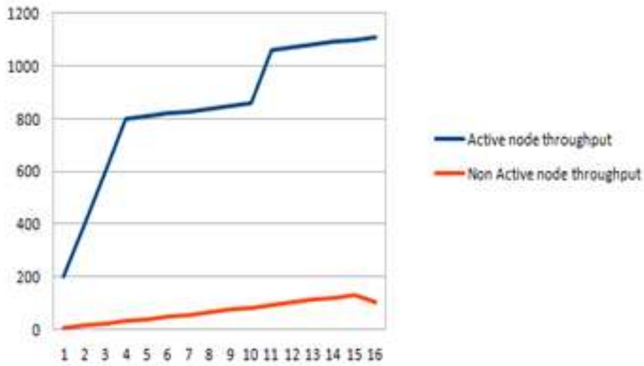

Fig 11: Compare throughput

V. CONCLUSION

In this paper an effort is being made to provide the maximum lifetime energy to a specified Wireless Sensor Network. The K- mediod protocol is used for the better clustering. Also a concept of active deactive is used in this concept. The energy of network is calculated by Leach protocol. The comparision are shown on PDR, energy, throughput, jitter and delay.

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