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COMPARISON OF ENERGY CONSUMPTION IN WIRELESS SENSOR NETWORKS WITH DIFFERENT CLUSTERING TECHNIQUE

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ABSTRACT

Wireless Sensor Networks are used for monitoring and collecting information from an unattended environment and for reporting events to the user. The duster heads "arise and process sensor data from the dusters and maintain the link with the station. The clustering is driven by the minimization of energy for all the Resent development in deserting are used to support the work, and a duster visualization interface is used to observe the simulation results. In this paper, an energy efficient inter cluster coordination protocol developed for the wireless sensor networks has been proposed. It is Comparison of Energy Consumption for 50 nodes and 100 nodes of different clustering technique K-Means, SOM and Fuzzy clustering and result analysis in between percentage decay rate of energy for WSN versus velocity in m/s. Simulation was carried out in Matlab R2012b.

Keyword: - Energy Consumption, Energy Optimization, WSN, clustering and Fuzzy clustering, SOM, K-mean

I. INTRODUCTION

A wireless sensor network (WSN) (sometimes called a wireless sensor and actor network (WSAN)) are spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location Wireless Sensor Networks (WSN) now-a-days is very popular for its specialty. WSN applications are having wide variety of domain. It include right from military application to farming application. The surveillance system for enemy or threat, the precision agriculture where farmer can control the temperature, humidity, etc. are the few examples of WSN applications. In figure 1 shows WSN.

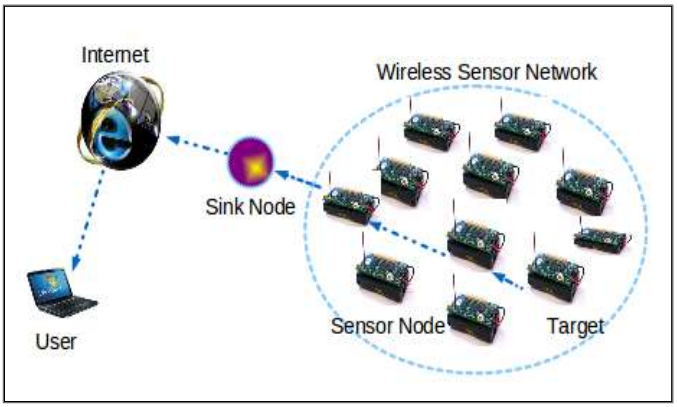

Fig. 1 Wireless Sensor Network

Wireless sensor networks (WSNs) are developed with the purpose of estimating physical parameters or detecting emergency events in a variety of military and civil applications like battle field surveillance, target tracking, environmental monitoring for detection of fire hazards, gas leakages or landslides, home automation and health care applications.

Wireless sensor networks are quite challenging networks as resources are limited and different network topologies is possible. The typical application for WSNs is the sensor nodes gathering data and reporting to sink. All data traffics are from sources to a sink or multiple sink nodes. Mostly sink nodes are assumed to be stationary and the sink mobility is hardly an issue. However in many real applications, the sinks are expected to be mobile when they are integrated with other mobile devices such as cell phones. In these cases sink mobility overhead Optimization of communication cost and overhead in the handling wireless sensor networks is a critical issue and thus efforts are being made to optimize or minimize the communications overheads.

II. WIRELESS SENSOR NETWORKS

Historically WSNs have been characterized as wireless networks consisting of numerous small, energy constrained, low-cost, autonomous nodes that are distribute dove ran area for the purpose of monitoring or sensing. Communication or relaying of data typically occurs via wireless multi-hop routing. The majority of WSNs exhibit a (source, sink) architecture, which may include any number of:

1. Source nodes: which generate data, usually by using sensors to measure environmental factors such as temperature, humidity or radiation.

2. Sink nodes: which collect all data gathered by source nodes, and

3. Intermediate nodes: (which may include source nodes) that aid the transmission of data from sources to sinks.

The network topology has a tendency to affect the latency and capacity as well as robustness of the network. The complexity of the data routing and processing also varies from one network topology to another. For example a highly dense network of wireless sensor requires to pick the topology carefully considering all the requirements. The Sensor network topology in WSN shows in figure 2.

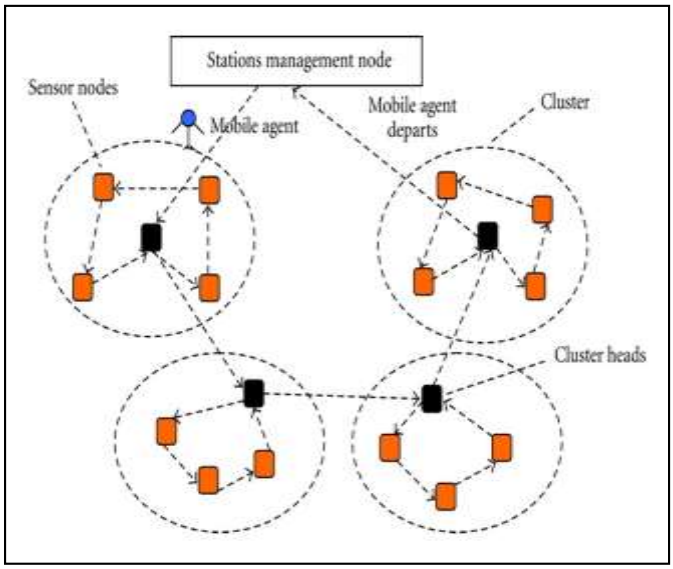

Fig. 2 Sensor Network Topology in Wireless Sensor Network

III. CLUSTERING

In order to reduce the energy consumption a clustering and node redundancy approach has been extensively studied. In Clustering approach, sensor nodes are divided into clusters[7]. Each cluster has a leader which is called cluster head (CH) aggregate all the data received by members of cluster and sends aggregated data to Base Station (BS) [7]. Clustering allows aggregation of data. It helps in removing the redundant data and combining the useful data. It limits the data transmission. The cluster system gives an impression of a small and very stable network. It also improves the network lifetime by reducing the network traffic.

IV. ENERGY CONSUMPTION

Energy is consumed in all the phases of protocol, in the starting for the election of the cluster heads. After election phase, data transmission phase starts in which firstly all the sensor nodes in their clusters send their data to their respective cluster heads so energy is consumed in sending the and receiving the data[1]. Data travels with the help of cluster coordinators which again needs the power to send and receive the data until it reaches the BS. By doing simulation of this process the results show that by increasing the cluster heads, the energy consumed is increased than when the cluster heads are less which is very contrast to the HCR and LEACH [1]. In HCR [1] it is shown that energy consumed is less when there are more cluster heads, same is explained in LEACH [1] but proposed protocol shows different approach than both of these protocols.

V. SIMULATION RESULTS

Simulation results Comparison of Energy Consumption for 50 nodes and 100 nodes of different clustering technique K-Means, SOM and Fuzzy clustering and result analysis in between percentage decay rate of energy for WSN versus velocity in m/s. Simulation was carried out in Matlab toll.

We use the following metrics to evaluate the cluster characteristics: average cluster size, maximum size of clusters, variance of the cluster size, and number of single-node clusters. Its value shown in table 1, The average cluster size depends on the density of the networks and the transmission range of the sensor nodes. The average cluster size should not be too small. In sensor networks, it is not desirable to include too many nodes in a large cluster due to the increasing message collisions and transmission delay in a large cluster. The simulation results are show in figure 3 for 50 nodes and figure 4 for 100 nodes considered.

Table 1: The following parameters has been taken for simulation

S. No.	Parameter	Value
1	Clustering technique	SOM, FUZZY, K-MEANS
2	No. of cluster	5
3.	No. of Nodes	50 and 100
4.	Network length	1000 x 1000 m^2
5.	Update distance	50 m
6.	Sink velocity	50-300 m/s
7.	Update time	5Sec

(A) Comparison of Energy consumption for 50 nodes of three clustering technique

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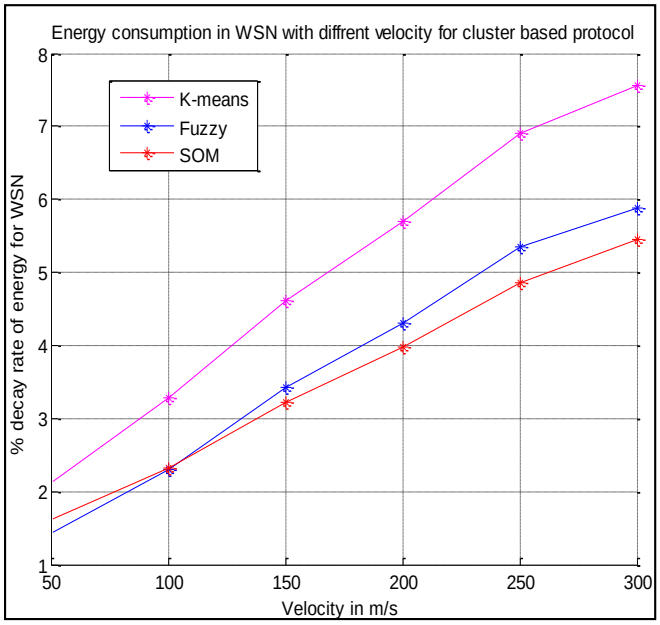

Fig. 3 Energy consumption in WSN with velocity

B. Comparison of Energy consumption for 100 nodes of three clustering technique

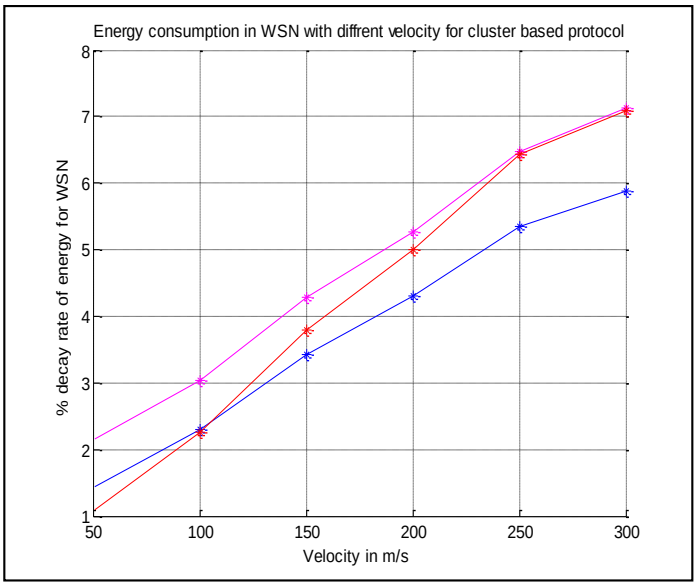

Fig. 4 Energy consumption in WSN with velocity

VI. CONCLUSION

The life of wireless network is strongly depends on the energy consumption of network per unit time. The energy consumption reduction has been taken as a objective in this project. The clustering based network architecture has been proposed in this project to reduce the communication overhead which in turn reduces the energy consumption. The various clustering techniques are available for locating the access point for WSN. The K-means, Fuzzy C-mean and self organizing map (SOM) based techniques are used in this project. The optimum location of AP is important due to communication overhead depends on the moving distance between sink location and AP.

The sink velocity from 50 m/s to 300 m/s has been taken into the account for finding the energy consumption and a comparative analysis is presented in the result section of the thesis. The performance of wireless sensor networks system for Self organizing map has performed better than other two methods. It is also observed that overhead pattern in cluster based protocol is not much dependent upon update time.

In future, this work may be continuing with large scale of network and higher no. of AP. The optimization of no. of cluster, hop distance and update time may be done with various optimization techniques. The researcher may also account the time dependent parameter like delay, switching time etc.

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