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Clustering of Wireless Sensor Networks Using PAM Algorithm

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ABSTRACT: In the growing world of wireless sensor networks ever growing research area is energy efficiency. The survival of Wireless sensor Network depends on efficient usage of energy. Energy is used for two main purpose, one is routing and other for sensing, which is the primary purpose of WSN. This paper gives an insight of clustering which is the primary level of establishing the network to share data. Basic clustering algorithm applied is K-Means and K-Mediods. Comparison of K-Means and K-Mediod algorithms is carried out using NS2.

Keywords: WSN, Clustering, K-means K-medoids.

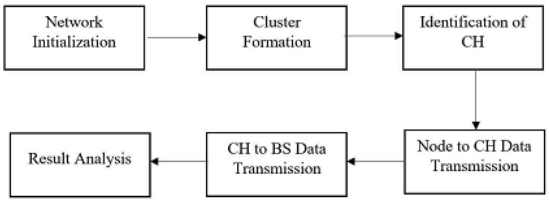
I. INTRODUCTION

The Wireless Sensor Networks (WSNs) are comprised of colossal number of close to nothing and low-estimated sensor nodes. Transmitting Multimedia information like video or picture is that the property of sight and sound WSNs, and much visual data can be gathered in modern and agrarian observing, military observation, savvy home and social insurance and so forth. As it's known, the size of this information is regularly huge and these nodes may devour a lot of energy. Few scholars attempt to study and find a solution for this problem. The WSNs consists enormous small nodes with computing, sensing, and transmission abilities in fields like healthcare, military, and hence forth. More recent advancements in these sensor networks have resulted to several newly made protocols, in specific that are designed for networks where energy awareness is a necessary factor. Energy efficiency is hence one of a primary issue in maintenance of the network.

Power is one among principal factor to improve their life in WSNs. A significant part of the energy was devoured during transmission and reception. In light of an outsized number of such nodes, battery can't be effectively revived, and furthermore the capacity turns into the principal asset for each node. Thus, energy sparing has gotten an outstanding incentive in WSNs. So as to maximize energy efficiency and improve the life of network, a new considerable algorithm must be developed. Techniques that are innovative often improve energy efficiency to increase the network lifetime are needed.

In our project, together we've put forth a K-medoid based clustering algorithm to deliver effective energy in WSNs. To instigate the after effects of clusters, we've used the algorithm for calculation for pulling back the negative affecting of the outliers with the goal that we can ascertain the ideal medoids among the nodes. Our algorithm extends network lifetime and also improve energy efficiency effectively.

II. PROPOSED SYSTEM ARCHITECTURE



The proposed system consisting of the stages such as following:

1. Network initialization
2. Cluster formation by using PAM algorithm
3. Identification of CH and BS
4. Data transmission from node to cluster heads
5. Then data transmission from CH to BS.

In this way we will get the results as improvement of network lifetime, reduction in consumption of energy and reduction in average delay.

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III. FLOW OF THE ALGORITHM

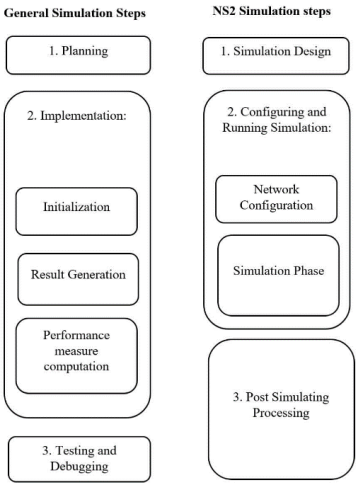
Step1: Initialization randomly selecting 'K' medoid from 'n' data points (nodes).
Step2: Assign each data to the closest medoid.
Step3: Improvement of Network are often done using the subsequent steps for each medoid "m" and for every non medoid "o".
1) Swapping "m" & "o" & then re-computing the cost. Cost is nothing but the sum of the distances & energy of knowledge points
below.
2) If node is out of range, then we've to communicate edge node & then add the respected cluster supported Euclidean distance.

3) If total cost of the above process is larger than original value, then we can undo the swap process.

Step4: The steps are repeated until cost diminishes, in each group make point that limits the whole of separation inside the bunch and ultimately reassigning each point to regarded cluster.
Step5: Selecting appropriate cluster head with respect to these medoids.

IV. NS2 SIMULATION STEPS

To check our K-Mediods algorithm we preferred using NS2 , a event driven simulator. Thanks to its flexibility and modular nature, NS2 has gained constant popularity within the networking research. The general simulation steps involved is shown in the below figure



1: Design for Simulation
This step in simulation of a network given in designing the simulation. During this step configuration of network, assumptions, the measure of performance, simulation purposes and also style of results should be determined by the users.
2: Configuring and Simulation Running
Here we implement the design with in the above said step. It contains of 2 phases:
• Phase of network configuration: During this phase, components of network are configured and created in step with the design for simulation. Henceforth, these occurances like transfer of data are start scheduled to a particular time.
• Phase of Simulation: Here it begins the simulation which was included within the previously discussed phase thus maintaining clock of simulation and also events chronological execution. Thus generally runs until clock of simulation reaches a set value.
3: Post-simulation process
The most important work here involves checking tatality of program and evaluation of the network performance which is simulated. Having the primary task i.e. debugging, remaining is achieved by proper compiling the conducted results of simulation.

V. SIMULATION RESULTS

As explained above we created the network which is the first step of simulation. 16 nodes are created in a area of 500*500.

Parameters	Values
Number of initialized nodes	15
Area (sq. m)	500*500
Initial Energy of any node (Joules)	50
Initial Energy of the entire network (Joules)	750

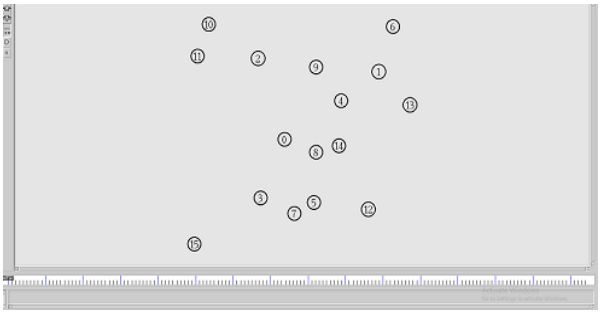


Figure 1: Initial node position

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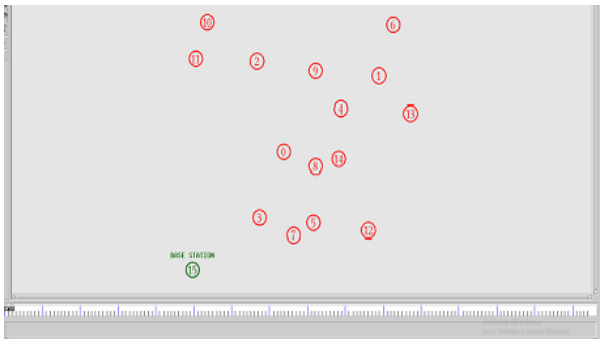


Figure 2: Base station and Algorithm Calculation

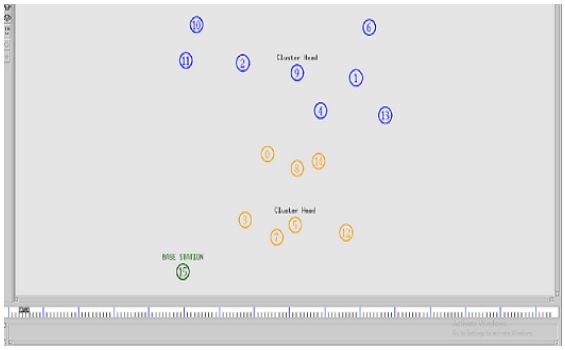


Figure 3: Cluster and Cluster Head Formation

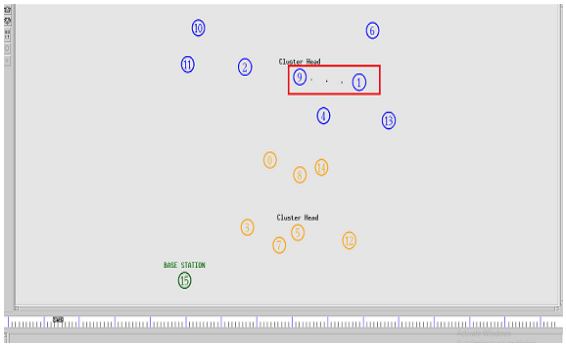


Figure 4: Data transmission from Node to Cluster Head of Cluster1

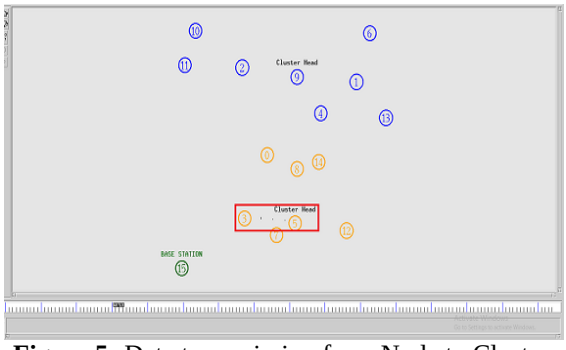


Figure 5: Data transmission from Node to Cluster Head of Cluster2

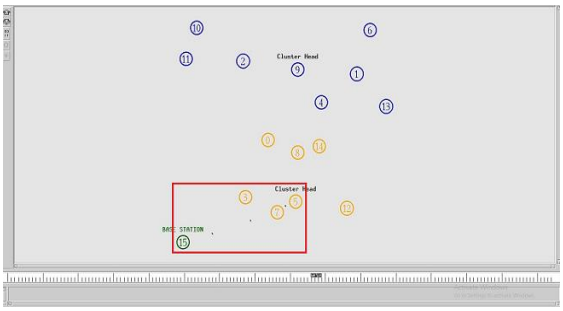
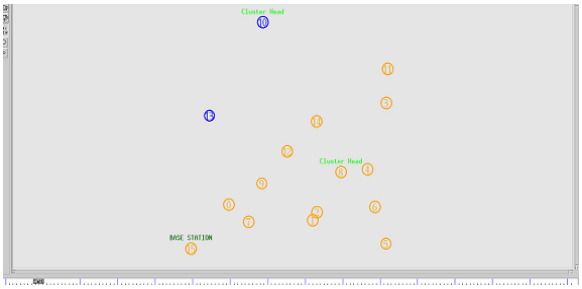


Figure 6: Data transmission from Cluster Head to Base Station

VI. COMPARISON WITH K-MEAN CLUSTERING



This is the simulation result of the K-mean clustering. As we know that K-means forms clusters with nodes that are almost as same as each other, with the above picture it is clear, an uneven clustering can happen. Also if this is the case, the cluster head with the cluster having less number of nodes will be pressurized more.

6.1 Residual Energy Comparison

6.1.1 With constant number of nodes

Area (sq. m)	Residual energy using K-mean (Joules)	Residual energy using K-medoid (Joules)
500	729	730
600	729	729
700	731	730
800	729	729
900	730	731
1000	730	729

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6.1.2 With constant area

Number of Nodes	Residual energy using K-mean (Joules)	Residual energy using K-medoid (Joules)
8	388.9176	389.1885
10	485.9787	485.9887
15	729.6522	729.7284
20	974.1169	974.214
25	1215.3631	1216.1008

For the table-1 readings, the number of nodes used for simulation is kept constant i.e., 15 nodes. For the table-2 readings, the area used for simulation is kept constant i.e., 500*500 sq. m. From both, the residual energy using K-medoid is comparatively more than that in K-mean.

VII. CONCLUSION

This paper thus gives a detailed description of what is K-mediod algorithm. We have proved that K-mediod performs better and is more consistent when compared to K-means. When K-mediod is used along with LEACH protocols we obtain the network to be more energy efficient. The implementation of the algorithm using NS2 will ease the learning process of young researchers. The proposed solution is predicated on the cluster algorithm K-medoids, during which centroid is chosen based on medoids technique of statistics. K-medoids is an algorithm uses partitioning around medoids which in real select centroids round the actual center of the clusters which is given by X-center (Xc) and Y-center (Yc) respectively. The proposed algorithm for the WSN clustering has performed well with the WSN simulations in NS2. Euclidean distance is employed to compute the gap between the 2 nodes under this simulation. The cluster on which the results were tested contained 15 no. of nodes and this number can vary accordingly.

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