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ENERGY EFFICIENT CLUSTERING THROUGH NODE OVERHAUL IN WIRELESS SENSOR NETWORKS

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Abstract-The primary purpose of node clustering in wireless sensor networks is load balancing and increased network longevity. The de facto standard, the low-energy adaptive clustering hierarchy protocol, manages to get there. Clusters of the same size may be created using an enhanced procedure called balance cluster creation, although this comes at the expense of some clusters being overlapped. In this letter, we discuss a node refresh technique that not only keeps clusters of similar size apart but also improves their energy efficiency. When possible, the suggested approach constructs initial clusters and then updates them with a second-best cluster head. When compared to previous simulated methodologies, the findings produced demonstrate a significant increase in network longevity and reduction in the mortality rate of individual nodes.

Keywords: WSN, efficiency, load balancing, network life time, USCs

1. INTRODUCTION

In the post-PC era, computing technologies like laptops, mobile phones, PDAs, GPS devices, RFID, and intelligent electronics have become more accessible to the general public, portable, widely dispersed, and pervasive. Nowadays, you can put together a portable embedded system with the computing capability of a PC from the 1990s using commercial off-the-shelf (COTS) components. Miniaturized OSes like Windows and Linux might be used to handle such embedded devices. From this vantage point, wireless sensor networks (WSNs) may be considered as the most recent example of the trend towards ubiquitously smaller computing power that Moore's Law has been pushing towards. A typical wireless sensor node consists of a number of different parts, including a sensor, processor, communicator, actuator, and power supply (or simply sensor node). The majority of these components may be placed on a single board due to their small size. Using state-of-the-art low-power circuit and networking technologies, a sensor node powered by two AA batteries may last up to three years in a low duty cycle operating mode of 1%.

Wireless sensor networks (WSNs) often consist of hundreds to thousands of such nodes exchanging information through wireless channels in order to gather, distribute, and analyse sensor data. Uses for wireless sensor networks range from global environmental monitoring and habitat study to battlefield surveillance and reconnaissance to search and rescue in emergency situations to condition-based maintenance in factories to infrastructure health monitoring in homes to smart home realisation and patient monitoring in the body (WSNs). Sensor nodes must self-organize appropriate network architecture, often including multi-hop connections between nodes, after the initial (often ad hoc) deployment.

After that, sensors will continuously or in response to events collect data about the surrounding environment using auditory, seismic, infrared, or magnetic techniques. GPS and other local positioning algorithms can locate almost any target. Through appropriate analysis, data from several network nodes may be combined to provide a more complete picture of the event under investigation. Despite the constraints of individual sensor nodes, WSNs are nevertheless capable of completing tasks. Data requests from end users are gathered and organised by WSN base stations (sink nodes). WSNs are very much like decentralised databases. Connected sensor networks will allow for information sharing on a worldwide scale.

The introduction of WSNs is anticipated with excitement by many. In the "most vital and influential technology" category, WSNs were ranked in Business Week's September 1999 edition. Furthermore, in January 2003, Wireless Sensor Networks were ranked among the top ten emerging technologies by MIT's Technology Review. WSNs are expected to generate over $7 billion in revenue by 2010, up from less than $150 million in 2004. ExScal deployed over a thousand nodes in December 2004 to create the largest WSN to date.

Wire-free electrical processes are often referred to as "wireless" in everyday language. The phrase "wireless communication" is used to describe the process of sending information over great distances using energy sources other than electrical conductors or "wires," such as radio frequency (RF), infrared light (IR), laser light (Visible), or acoustic energy. Sensors like thermocouples and strain gauges may measure physical quantities and send the data they collect as signals that can be analysed by a human or machine. It's common practise to use the term "network" to refer to any system or organisation that functions via the dissemination of data. As used in the field of computer science, the term "network" refers to any system that allows information to be sent between many computers.

2. PROPOSED SYSTEM

LEACH-USC approach

1. In order to construct groups of equivalent size
2. In order to form clusters with clean edges
3. The network's expected lifespan

Similar to the LEACH protocol, the proposed method assigns a cluster head to each node, but it also leaves certain nodes unclustered based on a threshold value, Thcluster. The suggested method's cluster refurbishing stage is based on the concept of allowing the second-best cluster leaders to redistribute surplus nodes from big clusters (MNs— Thcluster) to other clusters. The proposed method is called LEACH-USC since it requires less intracluster communication and employs uniform cluster sizes (USCs). Implementation of the suggested approach is shown in a flowchart (Fig. 1). Cluster head selection in LEACH is an example of a method that uses probability. The first thing to do when forming a cluster is for each node to make a connection with the node that is physically closest to the cluster leader. Like the LEACH method, the BCF method results in clusters of varying sizes, but with no nodes being without a leader. Nodes from the a big clusters will be reallocated to the other clusters based on the second best cluster head as part of the cluster refurbish operation to acquire USCs. We can now calculate the MN distances between the greatest cluster and the others. The purpose of this exercise is to discover possible successors for current cluster leaders. Once the leaders of each cluster with the shortest communication distance to one another have been identified, the remaining k-nodes ([MN— Thcluster]) will be given to the next-best leaders in each cluster. As a result, nodes close to the cluster's edges will be split among many separate cluster leaders. The primary algorithm outlines the steps necessary to upgrade a cluster. Inputs to the clustering method are the threshold value, the total number of cluster heads (X), and the total number of nodes in each cluster (CLUSTER[]) (Thcluster). The first step is to find the biggest group. The ideal distance to put between the MNs in the biggest cluster and the second-best leader in that cluster is then determined. It's important to do this so that nodes closer to other clusters than their own will be invited to join them. By transmitting the first k nodes (k = CLUSTER[biggest] Thcluster) from SecondBestCH[] to the second-largest cluster, the largest cluster may tell the second-largest cluster to reorganise its nodes into clusters using the second-best distance. When we're done, every cluster will be the same size. One may argue that Scenario 2 is possible. To guarantee that each cluster has the same number of MNs, the proposed LEACH-USC protocol divides the total number of nodes by the total number of cluster heads until the residual is zero. If the total number of nodes is not divisible by the total number of cluster leaders, then only one cluster will have a unique MN count (i.e., the residual is not zero). This is why we refer to the protocol as "USCs" (unique identifiers for messages). The TDMA schedule for the whole network is determined when cluster maintenance is **Fig 2 : (a) LEACH. (b) BCF. (c) LEACH-USC**

finished by dividing the total number of nodes by the number of cluster heads. Each node transmits data to the leader of its cluster, who then relays it to the main station. In subsequent cycles, reclustering is performed such that leadership of the clusters is rotated between them.

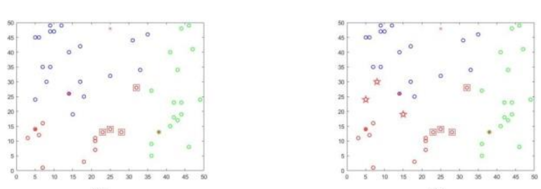
Fig1: Sequence of operations in the proposed LEACH-USC

Algorithm 1: Cluster Refurbish Phase.

Input: Number of cluster heads (X), Number of nodes in each cluster (CLUSTER[ ]), $\text{Th}_{cluster}$
Important Variables: $largest$, MN, SecondBestCH[ ], k
Result: Uniform Size Clusters

```
Sort CLUSTER[ ] in Descending order
for i=1; i ≤ X; i++ do
    largest = i
    MN = CLUSTER[largest]
    for j:=1; j ≤ MN; j++ do
        SecondBestCH[i]=Distance to Second Best Cluster Head
    end
    Sort SecondBestCH[ ] in Aceneding Order
    k = MN - Th_cluster
    if k > 0 then
        Allocate second best cluster head to first k nodes from sorted SecondBestCH[ ]
        Update CLUSTER[ ]
    end
    Remove the CH from the list from further processing
    Sort CLUSTER[ ] in Descending order
end
```

Fig 3: (a) Iteration1. (b) Iteration2



3. ALGORITHM

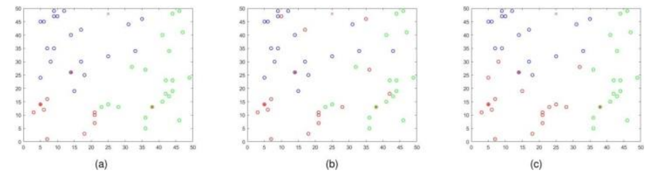


Fig 2 : (a) LEACH. (b) BCF. (c) LEACH-USC

4. RESULTS

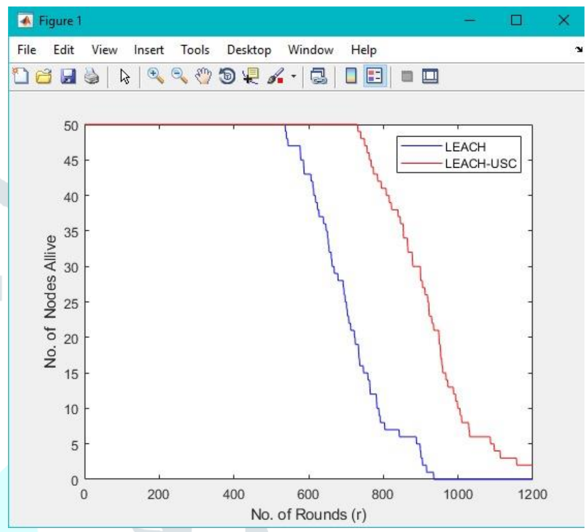
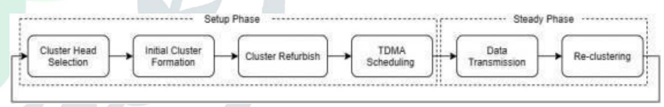


Fig4: Final Result



5. CONCLUSION AND FUTURE SCOPE

There is a wide range of potential uses for wireless sensor networks. The LEACHprotocol is quite popular among WSN techniques. We introduce LEACH-USC, a novel clustering algorithm that forms clusters of uniform size to reduce network congestion. The clusters produced by Regarding both cluster size and overall intracluster communication distance, the suggested LEACH-USC perform well. It seems from the simulation results that using leachables is not as effective as using LEACH.

REFERENCES

[1] F. Karray, M. W. Jmal, A. Garcia-Ortiz, M. Abid, and A. M. Obeid, "A comprehensive survey on wireless sensor node hardware platforms," Comput. Netw., vol. 144, pp. 89–110, 2018.

[2] A. Shahraki, A. Taherkordi, Ø. Haugen, and F. Eliassen, "Clustering objectives in wireless sensor networks: A survey and research direction analysis," Comput. Netw., vol. 180, 2020, Art. no. 107376.

[3] W. B. Heinzelman, A. P. Chandrakasan, and H. Balakrishnan, "An application-specific protocol architecture for wireless microsensor networks," IEEE Trans. Wireless Commun., vol. 1, no. 4, pp. 660–670, Oct. 2002.

[4] I. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "Wireless sensor networks: A survey," Comput. Netw., vol. 38, no. 4, pp. 393–422, 2002.

[5] H. Shin, S. Moh, I. Chung, and M. Kang, "Equal-size clustering for irregularly deployed wireless sensor networks," Wireless Pers. Commun., vol. 82, no. 2, pp. 995–1012, May 2014.

[6] C. Bejaoui, A. Guitton, and A. Kachouri, "Equal size clusters to reduce congestion in wireless multimedia sensor networks," Wireless Pers. Commun., vol. 97, pp. 3465–3482, 2015.

[7] V. Pal, G. Singh, and R. P. Yadav, "Balanced cluster size solution to extend lifetime of wireless sensor networks," IEEE Internet Things J., vol. 2, no. 5, pp. 399–401, Oct. 2015.