Review of a Method for Selection of Cluster Head by using K-Means Algorithm for Energy Efficient Wireless Sensor Network

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***Abstract*— Wireless sensor network are the networks which consists of hundreds to thousands of sensor nodes gathering various data including temperature, sound, location,etc. They have been applied to various fields such as healthcare, monitoring system, military, and so forth. Normally its very difficult to recharge or replace the sensor nodes which have limited battery capacity. Energy efficiency is thus a primary issue in maintaining the network. This paper proposes an efficient cluster head selection method using K-means algorithm to maximize the energy efficiency of wireless sensor network. It is based on the concept of finding the cluster head minimizing the sum of Euclidean distances between the head and member nodes. Computer simulation shows that the proposed system used approach allows better performance than the existing hierarchical routing protocols such as LEACH and HEED in terms of network lifetime**.

***Index Terms*— LEACH, HEED, Cluster Head, K-means,WSN.**

I. INTRODUCTION

WSN is a network of tiny battery powered sensor nodes of limited on-board processing, storage and radio capability. Sensor nodes are usually deployed in a random fashion, and collect the context information and perform the given mission in cooperation with other nodes. Each sensor node transmits the sensed data to other sensor nodes or Base Station. There exist various WSNs employing the cluster structure, which efficiently allocate the resource and energy and thereby maximize the network lifetime. Here each cluster of sensor nodes is monitored and controlled by a node called Cluster Head (CH). Each CH aggregates the data sent from the sensor nodes belonging to its cluster, and then transmits them to the BS. Forming the clusters, especially CH selection, is one of the most critical tasks in the management of WSNs since CHs consume much larger energy than other bodes in the network. One of the most recognized protocols in this regard is LEACH protocol, and it uses a probabilistic model for CH selection.

II. LITERATURE REVIEW

[1] Fuzhe Zhao in this paper, an overview of the original LEACH and LEACH-C protocols is presented and a new version of hierarchical protocol is proposed. The proposed protocol obtains energy efficiency by the modification to choosing of cluster heads formula and the steady-state phase. The modification to the choosing of cluster heads formula makes the sensor nodes which have more energy and play less role in making the CH or VCH have more opportunity to act as CHs in the coming round. So the total energy of the whole network has more even distribution among different nodes. The introduction of VCH makes the frequency of reclustering more lowly and prolongs the time of being in steady-state phase; thus the energy used for calculating the formula on every node reduces. Through the modification and simulation, we can conclude that our proposed protocol performs better than LEACH and LEACH-C protocols.

[2] Yali Yuan [2] Energy is a major factor for designing WSNs in the real world. Unfortunately, the battery energy is inherently limited. Therefore, efficient utilization of the energy is most important. To improve the energy efficiency, many algorithms are proposed. One of the main characteristics of these algorithms shows that the network lifetime is highly related to the routing selection. This paper has proposed a cluster algorithm and the A-star with fuzzy method, called CAF, providing an energy-efficient routing in WSNs. The main goal of the CAF algorithm is to prolong the lifetime of the WSN by evenly distributing the workload, retaining the remaining energy, and reducing the number of the hops. To achieve this goal, this paper has mostly focused on selecting proper CHs from existent sensor nodes and the optimum next hop from the CHs. The SEP algorithm has been used to choose the best CHs, while the Astar method and fuzzy approach is used to select the proper next hop of the optimal path.

[3] Amandeep Kaur Mann [3] in this paper of the data mining process is to extract information from a large data set and transform it into an understandable form for further use. Clustering is important in data analysis and data mining applications. It is the task of grouping a set of objects so that objects in the same group are more similar to each other than to those in other groups (clusters). Clustering can be done by the different no. of algorithms such as hierarchical, partitioning, grid and density based algorithms. Hierarchical clustering is the connectivity based clustering. Partitioning is the centroid based clustering; the value of k-mean is set. Density based clusters are defined as area of higher density then the remaining of the data set. Grid based clustering is the fastest processing time that typically depends on the size of the grid instead of the data. The grid based methods use the single uniform grid mesh to partition the entire problem domain into cells.

[4] Tong Zhao in this paper it is investigated about burst optical signal detection and symbol timing recovery in burst-mode optical receivers. We proposed a new detection method based on the -means clustering techniques. The theoretical analysis and the numerical examples show that this method is efficient, can be performed quickly, has very good detection performance, and is

thus suitable for the burst-mode optical receiver. We also analyzed the performance penalty of the proposed burst signal-detection method in the presence of ISI. For the symbol-timing recovery, we presented a DA interpolation-based feed forward timing-recovery scheme. By using a feed forward approach instead of a feedback loop, we achieved a fast synchronizer. We investigated the performance under different oversampling ratios and obtained the conclusion that even using a very low oversampling ratio, the detection performance does not degrade dramatically, compared with high oversampling ratios. These characteristics make the proposed methods suitable for burst-mode optical signal transmission, and can also be used in other high-speed transmission systems..

[5] Meena Malik the main concern of this paper is to examine the energy efficiency and performance of LEACH protocol using own set of parameters. We compare the lifetime and data delivery characteristics with the help of analytical comparison and also from our simulation results. From this work we find that LEACH provides better results for number of cluster heads as 3 and this paper has covered performance of LEACH protocol only, we can also compare this protocol with other routing protocols that may or may not be hierarchical in nature. The process of data aggregation and fusion among clusters is also one of an interesting problem to explore. It is needed to satisfy the constraints introduced by factors such as fault tolerance, topology change, cost, environment, scalability, and power consumption for realization of sensor networks. Since these constraints are highly specific and stringent for sensor networks, new wireless ad-hoc networking techniques will have to be explored further..

[6] Devina Chhabra]This paper proposes a the primary limiting factor for the lifetime of the sensor network is the energy supply. Each sensor node must be designed in such a manner that it utilizes its battery supply in order to maximize total network lifetime. Clustering in the network's topology reduces number of transmissions in the network. It also provides energy efficiency as cluster heads aggregates the data from its cluster members, thereby reduce duplication of transmission and enhances the network lifetime. In this paper, we have presented selected clustering protocols for WSNs which describes various modifications carried over the primitive LEACH and highlighted their features. Some of the achievements derived by the discussed clusterbased routing protocols are scalability, heterogeneity and prolonging network lifetime.

[7] M. Bani Yassein In this paper we considered a well known protocol for wireless sensor networks called LEAH protocol which is the first and the most important protocol in wireless sensor network which uses cluster based broadcasting technique. Followed by an overview of LEACH protocol implementations, then we proposed a new version of LEACH protocol called V-LEACH protocol. From the simulation results, it can be draw a number of conclusions. The first: number of messages created by the V LEACH is less than the messages created by the original LEACH. The second: if messages created by the new version are less that mean the network energy remaining using V-LEACH is more than the remaining network energy using the original LEACH.

[8] B.Manimekala In this paper the classic k-mean clustering algorithm was used to cluster the mobile nodes. Since the kmeans algorithm has some draw backs and produce wrong clusters if there were lot of outliers in the location data, the future works may address more suitable algorithm for clustering the nodes in the mobile scenario.

[9] Kyung TaeKim In this paper we have proposed a new energy efficient MAC protocol, called dynamic threshold MAC (DT-MAC), which employs a dynamically adjusted threshold for the buffer of sensor node. It was designed to display consistent performance for various network traffic conditions. In addition, DT-MAC reduces the number of control packets by transmitting data up to three hops with only one RTS/CTS packet. As a result, DT-MAC can improve the energy efficiency which is one of critical issues of MAC protocol for sensor networks in addition to the QoS including fairness among the nodes, channel utilization, delay, and so forth.

Conclusion

Thus in this project the main aim is to improve the cluster head selection method based on k-means algorithm for energy efficient wireless sensor network. Also it aims at to reduce distance between nodes and cluster by using wireless sensor network which is used to form cluster. To minimize clustering time and prolong the lifetime of network is the main aim of this proposed system by using NS2 software.

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REFERENCES.

[1] Fuzhe Zhao, You Xu, and Ru Li, "Improved LEACH Routing Communication Protocol for a Wireless Sensor Network," International Journal of Distributed Sensor Networks,Volume 2012, 19 November 2012.

[2] Yali Yuan, Caihong Li, Yi Yang, Xiangliang Zhang, and Lian Li, "CAF: Cluster Algorithm and A-Star with Fuzzy Approach for Lifetime Enhancement in Wireless Sensor Networks", Abstract and Applied Analysis Volume 2014, 28 April 2014.

[3] Amandeep Kaur Mann,Navneet Kaur, "Survey Paper on Clustering Techniques", International Journal of Science, Engineering and Technology Research (IJSETR) Volume 2, Issue 4, April 2013.

[4] Tong Zhao, Arye Nehorai and Boaz Porat , "K-Means Clustering-Based Data Detection and Symbol-Timing Recovery for Burst-Mode Optical Receiver", IEEE TRANSACTIONS ON COMMUNICATIONS, VOL. 54, NO. 8, AUGUST 2006..

[5] Meena Malik1, Dr. Yudhvir Singh, Anshu Arora, "Analysis of LEACH Protocol in Wireless Sensor Networks," International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 2, February2013.

[6] Devina Chhabra, Rajeev Vashisht, "Hierarchical Clustering Algorithm LEACH-A Review,"International Journal of ComputerScienceandInformationTechnologies,Vol.5(3),2014.

[7] M.BaniYassein, A.Al-zou'bi, Y.Khamayseh, W.Mardini, "Improvement on LEACH Protocol of Wireless Sensor Network (VLEACH), " International Journal of Digital Content Technology and its Applications, Volume 3, Number 2, June 2009.

[8] B.Manimekala, M.Kayalvizhi, "A Data Transfer in Wireless Sensor Networks Using ADV Protocol, "International Journal of Computer Science, Vol. 9, Issue 1, No 1, January 2012.

[9] Kyung TaeKim and Hee Yong Youn, "An Energy-Efficient MAC Protocol Employing Dynamic Threshold for Wireless Sensor Networks, "International Journal of Distributed Sensor Networks, Volume 2012, doi:10.1155/2012/304329.