A SURVEY ON EFFICIENT PATH MANAGEMENT IN WIRELESS SENSOR NETWORKS

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Abstract: The LEACH protocol didn't take the residual energy of nodes into account when choosing the cluster heads, which may result in the node with rather low energy is to be select as a cluster head. Thus, it will cause the cluster created by this low-energy node to be dead at an early stage, which wastes the whole network's resource. In this we introduced an energy factor when choosing a cluster head, which can avoid a node with very low-energy to be a cluster head. Meanwhile, we conducted a simulation specific to LEACH protocol and this improved algorithm in terms of network lifetime, network stability, collecting data packages and energy consumption. Simulation results show that our improved algorithm has better performance compared with LEACH protocol in these aspects.

1. INTRODUCTION

Wireless sensor networks contain the sensor nodes that is used to collect the information from the surroundings and communicate via wireless transceiver. The collected information that can be delivered to the sink node. These data that can be delivered to one of the more destination node by using multi-hop communication. The sensor nodes are generally operated by the batteries and it have the possibilities to drain the battery. In this situation, it is very hard to recharge the battery of the sensor node. The sink node energy is very rich. Therefore, the sensor node energy is more precious in WSN. So the utilization of the energy is very efficient to prolong the lifetime of the network. It focused the research analysis in WSN. The multi-hop communication is generally required the distant sensor nodes from the sink node. To save the energy with relaying the massive amount of data traffic that can be burdened from the other sensor nodes [1]. A Sensor node generally constrained in terms of energy, processor, memory, low range communication and bandwidth. Limited battery power is used to work the sensor node and it is very hard to replace and recharge it. So, the sensor node is automatically die and it will affect the network performance.

The work of the sensor node is to gather the information from the desired node. All the nodes work ceaselessly and transmit the data as long as it has the potential. Sensor node spend the entire energy for transmitting the data, receiving the data and relaying the data into packets. In order to overcome the energy efficiency problem, the routing algorithm that can be used to maximize the life span of the battery of the sensor node.

There are so many applications that can be used in Wireless Sensor Networks. Some of the applications are Patient monitoring system, Forest fire detection, Weather monitoring system and battlefield surveillance, etc. The outline of the WSN research that the sensor nodes are deployed in the research area. The sensor node has the capacity to store and transmit the data in the network. In these the concept of LEACH protocol that can be used to form the clusters. Basically, the formation of the cluster involving the clustering algorithm. In the concept of LEACH protocol, it uses the homogenous clustering scheme containing the same amount of battery power containing and the nodes form the cluster. In the next step choosing the cluster head as random manner in the concept of LEACH. The Cluster head have the responsibility to transmit data to the sink node. The concept of cluster and cluster head are used to start the transmission of the data from the source to the sink node. In the entire network there are so many number of cluster head want to transmit the data to the sink node. At the time, the problem of overlapping will occur. TDMA concept that can be introduce to solve the problem. In this situation if any one of the cluster head not send the data to the destination node means it will consider as the failure of the particular cluster head.

The Main Objective of this paper, a simple modification in clustering algorithm of LEACH protocol is proposed to exploit virtual Multiple Input Multiple Output (MIMO) based user cooperation. By using this concept, we overcome the problem of data loss and the failure of the network.

- To minimize the number of cluster groups.
- To minimize the network failure.
- Handle the non-uniform load distributi

II.   RELEATED WORKS

In this section a detailed explanation of various clustering algorithm is discussed for non-uniform load distribution in the Wireless sensor networks.

Based on the clustering algorithm named as LEACH (Low Energy Adaptive Clustering Hierarchy) protocol is proposed in [2] [3] the method that can be used for adaptive clustering technique in WSN. It can be used to select the cluster head in optimal way and multi-hop transmission can be done. In these technique, it sometime selects the cluster head in low energy. So, it leads to put the overall process in failure and it distribute the energy throughout the sensors. By adding the energy to the sensor node it will double the efficiency of the network lifetime. The static clustering technique that cannot be use for optimal load balancing solution.

A hybrid energy efficient distributed clustering algorithm (HEED) is proposed in [4] that can be used for load balancing the network scalability and lifetime of network. In these they propose the novel distribution clustering approach for long-lived wireless sensor network. In the system they do not make any assumption about the presence of infrastructure and the availability of multiple level of power in sensor nodes. HEED can give the guarantee connectivity of the clustered networks. Simulation result says that the result of the energy efficiency is higher and it prolong the network lifetime. HEED allow a uniform nodes distribution, but its complexity generates a high overhead at each clustering round.

Author in [5] propose a clustering algorithm for heterogeneous clustering called distributed energy efficient clustering scheme (DEEC). In DEEC, the CH are elected based on the difference between the energy of each node. In these result the DEEC that can be develop to achieve the longer lifetime of the network. It requires the assistance of the routing protocol, which can be allowed each node to know the total efficiency of the network. A clustering algorithm that can be used for energy consumption and increase the scalability of the network. A clustering protocol can be used for design the characteristic of the heterogeneous wireless sensor network for energy efficient.

Author in [6] the network that can be use hundreds or thousands of cheap micro sensors and it allow the user to accurately monitor the remote environment data. In the LEACH involve the new formation in the distributed cluster form that self-organize a big volume of nodes, and it easily adapting clusters and rotating the clusters head. In these result, the LEACH increase the lifetime of the magnitude that can be compared with the local purpose of multi-hop approaches. It is reducing the multiple clusters.

An analytical method that evaluate the performance of MAC protocols involving a soft-clustering structure and a TDMA channel access scheme [7], specifically the MH-TRACE protocol was introduced. The method eliminates the length to stimulate the performance of the protocol. The analytical method was too simple enough to be run in seconds for a large number of parameter sets yet powerful enough to be used in optimization studies. It also contains the importance of the parameters according to the network conditions. Using probability distributions, the model accurately determines the loss in the output. Due to the loss in packets and collisions, it can accurately determine the expected output. The time spent by the Cluster Heads, ordinary nodes, and the average energy consumption of each node in the network.

Author in [8] proposed that MH-TRACE, organize the data in to super-frames. Each cluster forms a frame for transferring the packets and for the transmission of the data from nodes in the cluster. Every node in the network can gain all the packets that can be received in the range without any interruption and each node learn about the future transmission has its received range from the data packets sent prior to data transmission by each transmitting node. Therefore, each node generates its own listening cluster and the packet receives it. In this situation the avoiding the energy wastage for the unwanted data packets. By adopting the concept of MH-TRACE guarantees the entire network efficient energy. Sometimes it will be receiving the outrange data.

Author in [9] claims that in DDCA (Distributed Dynamic Channel Allocation) is a basic resource management problem in wireless sensor networks. It has a favour to the distributed mutual exclusion but not exactly a mutual exclusion problem (because a channel may be reused in different cells). They established the exact relationship between the two problems. Specifically, they introduced the problem of relaxed mutual exclusion model from one important aspect of the DDCA problem. Develop a common algorithm that guarantees and provide the control for mutual exclusion's single resource and to provide the important and efficient conditions for the

information parameters. Based on these results, they propose an example for the distributed channel allocation scheme by using one of the information structures that can be proposed. Considering these distributed dynamic channel allocation as a special case of relaxed mutual exclusion and apply the extended the algorithm to address the issues that can be aroused in distributed channel allocation scheme such as deadlock resolution, challenging with multiple channels, design of efficient information structures, and channel selection strategies.

Integrated Cellular and Ad Hoc Relaying Systems (iCAR) [10] is a system architecture and it is based on the integration of cellular and modern ad hoc relaying techniques. This theory that can be introduced to show the congestion problem due to unbalanced traffic in a cellular system and provides control for heterogeneous networks. By comparing the output performance of the iCAR system with conventional cellular systems in terms of the call block/drop probability, output and signalling overhead via analytical performance and stimulation result. The research show that with a small number of ARSs and some rises the signal collision, the call blocking/dropping probable are in the cell and the entire system can be reduced. In these it can suddenly create the problem to the balance less in the traffic. Sometimes cause transaction leads to failure.

A new energy-efficient approach [11] for clustering nodes in ad hoc sensor networks was proposed by the author that was based on HEED clustering that periodically selects cluster heads. The clustering process was terminated in 0(1) iterations and does not depend on the network topology or size. The protocol incurred low overhead in terms of processing cycles and messages exchanged. In this approach applied to the design of several types of sensor network protocols that require energy efficiency, scalability, prolonged network lifetime, and load balancing. It is provided for form single cluster.

Table 1

Protocol	Network Lifetime	Energy Efficiency	Scalability	Complexity	Long Range Communication
LEACH[2]	Increase	High	Increase	Low	Not Possible
LEACH[3]	Increase	High	Increase	Low	Not Possible
HEED[4]	Increase	High	Increase	High	Possible
DEEC[5]	Increase	High	Increase	High	Possible
LEACH[6]	Increase	High	Increase	Low	Not Possible
MH-TRACE[7]	Decrease	High	Decrease	Low	Not Possible
MH-TRACE[8]	Decrease	High	Decrease	Low	Not Possible
DDCA[9]	Decrease	Low	Decrease	High	Not Possible
iCAR[10]	Decrease	Low	Decrease	High	Possible
HEED[11]	Increase	High	Increase	High	Possible

III. CONCLUSION

In this overall observation the proposed system is developed to reach the data in to the sink. Here, they revised many references that have different clustering techniques and algorithm is used to make the network lifetime. Our proposed system increases the network life time and the nodes lifetime in alternate way. By the proposed system, the data can be transfer without any loss and the data can reach the desired destination. The virtual Multiple Input and Multiple Output (MIMO) is applicable for long range communication.

IV. FUTURE ENHANCEMENT

Same as existing some simple modification in clustering algorithm of the LEACH protocol is proposed to exploit virtual multiple-output (MIMO) based user cooperation. In LEACH protocol cluster head can be chosen randomly from the cluster. If cluster head with low energy or low battery level is chosen it spoil the whole network. In proposed system if energy level or battery level is low to the CH. The Base node will automatically have transferred the data to neighbor CH. The neighbor cluster head transfers the data to the desired destination. This cooperation is called as a MIMO. MIMO improve the energy efficiency and concurrent transmissions. MIMO in wireless sensor network helps to solve the long range transmission. By using MIMO we can transfer the multiple data to the cluster head. MIMO for clustered wireless sensor network prolong the network lifetime and network scalability. It is applicable for large region. The Data aggregation at cluster head and cluster head communicate directly.

REFERENCES

[1]   D. Hemanand & N. Sankar Ram, "Mobile Adhoc Networks - An enhanced scope localization based decision making for MANET energy efficient shortest path routing", Asian Journal of Research in Social Sciences and Humanities, vol. 6, no.10, pp 2128-2142, 2016.

[2]   D. Hemanand & N. Sankar Ram, "Performance of security algorithm against malicious nodes based wireless sensor network", Asian Journal of Information Technology, vol. 19, no. 15 pp 3687- 3692, 2016.

[3]   D. S. Jayalakshmi, D. Hemanand, G. Muthu Kumar, M. Madhu Rani, "An efficient route failure detection mechanism with Energy Efficient Routing (EER) protocol in MANET", International Journal of Computer Network and Information Security(IJCNIS), Vol.13, No.2, pp.16-28, 2021. DOI: 10.5815/ijcnis.2021.02.02

[4]   D. Hemanand & N. Sankar Ram, 'QoS routing for Mobile ADHOC Network Environment' Research Journal of Applied Sciences, Engineering and Technology Vol. 11, no. 9, pp 1013-1018, 2015.

[5]   O. Younis and S. Fahmy, "HEED: a hybrid, energy-efficient, distributed clustering approach for ad hoc sensor networks", IEEE Transactions on Mobile Computing, vol. 3, no. 4, pp. 366–379, Oct 2004.

[6]   L. Qing, Q. Zhu, and M. Wang, "Design of a Distributed Energy-Efficient Clustering Algorithm for heterogeneous wireless sensor networks", Computer communications, vol. 29, no. 12, pp. 2230–2237, 2006.

[7]   W. B. Heinzelman, A. P. Chandrakasan, and H. Balakrishnan, "An application-specific protocol architecture for wireless micro sensor networks", IEEE Transactions on Wireless Communications, vol. 1, no. 4, pp. 660–670, Oct 2002.

[8]   Bora Karaoglu, TolgaNumanoglu, Wendi Heinzelman, "Analytical performance of soft clustering protocols, IEEE Transactions on Mobile Computing", vol.14, no.5, pp.635-651.1 September 2010.

[9]   BulentTavli and Wendi B. Heinzelman, "MH-TRACE: Multi-Hop Time Reservation Using Adaptive Control For Energy Efficiency", IEEE J.Sel. Areas of Communication, June 2004.

[10]   Jianping Jiang, Ten-Hwang Lai, NeelamSoundarajan, "On Distributed Dynamic Channel Allocation in Mobile Cellular Networks", IEEE Transactions Parallel and Distributed Systems. vol. 13, no.10, Oct.2002.

[11]   Hongyi Wu, ChunmingQiao, Swades De, and OzanTonguz, "Integrated Cellular and Ad Hoc Relaying Systems: iCAR", IEEE journal on selected areas in communications, vol. 19, no. 10, October 2001.