Survey of Low Energy Low Cost Base Route Selection using LEACH in MANET

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Abstract— Wireless Mobile Ad-hoc Network (MANET) is a collection of wireless mobile sensor nodes for cost less communication with limited power sources. Therefore, efficiently utilizing mobile sensor node energy can maintain a prolonged network lifetime. Low energy adaptive hierarchical cluster (LEACH) in one of the better energy based routing while node moves in environment. Clustering is a key technique used to extend the lifetime of a mobile sensor network by reducing energy consumption. Compressive sensing (CS) can reduce the number of data transmissions and balance the traffic load throughout networks. This paper surveys different energy efficient clustering techniques for wireless mobile sensor network and proposed a new cluster head selection and energy based routing for network lifetime of the network.

Key words: Wireless Sensor Networks, Clustering, LEACH, Cluster Head

I. INTRODUCTION

Wireless Sensor Networks (WSN) is group of heterogeneous sensor nodes which are small, low cost, placed randomly and connected by wireless media to form a sensor field. The sensors are spatially distributed to monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants and to cooperatively pass their data through the network to the Base Station (BS). WSN has the ability to dynamically adapt to changing environments.

Each sensor node in the network is capable in sensing, processing and transmitting the data to the sink via wireless channel. Sensor nodes are equipped with small powered battery, transceiver, and processing and communication unit. Node has limited energy and it cannot be recharged easily so special attention has to be made to low power consumption.

Many researches show that clustering hierarchal network increase network performance than a flat network. In hierarchal network, sensor nodes are group together to form clusters and a node from each clusters which satisfying evaluation criteria such as high received signal strength and high energy level is selected as a cluster head(CH).[1] CH not only aggregate the data send by the nodes in the cluster but also act as a controller to make various routing and scheduling criteria.

There are many advantages of clustering are [2]:

- It saves a lot of energy of the node that send the data by reducing the distances travelled by the data. In clustering cluster head perform data aggregation process and reduce the amount of redundant data.
- It reduces channel contention. It reduces packet collision.
- Clustering result in better throughput of the network under high load. The main advantage of a clustered solution is automatic recovery from failure.

II. CLUSTERING IN WIRELESS SENSOR NETWORKS

Traditional routing protocols for WSN are not enough optimal in terms of energy efficiency and load balancing.

Clustering is introduced to balance the load and increase the lifetime of the network. Clustering is sample of layered protocols where the network is composed of several clusters of sensor nodes. As shown in fig.1.1, each cluster has a leader node which is also called as cluster head. CH takes data from all the nodes in its cluster. Cluster head aggregate all the data received from cluster members and then send that data to the base station. The transmission between cluster members and cluster head is said to be intra cluster communication, whereas the transmission between cluster head and sink is known as inter cluster communication. The local collaboration in clusters, reduce the bandwidth demands. Clustering reduce the routing overhead and make the network more stable [3].
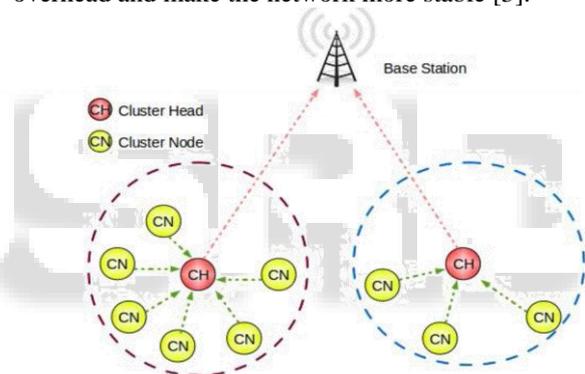

Fig. 1: Clustering in WSNs

The set of aspects that are used to differentiate all clustering based protocols are discussed below [3].

A. Clustering Method

The three approaches are used for clustering process are centralized, distributed and hybrid. In centralized clustering, the clusters and cluster heads are made by an authority (centralized authority). In distributed clustering, all the nodes in the clusters can took the decision of becoming cluster head for the current round. Hybrid clustering is the mixture of both of above.

B. Cluster Properties

In clustering process, following properties are used in the structure of the cluster.

1) Cluster Count

Cluster heads can be pre assigned for fixed clusters or cluster heads can be elected by its cluster members for variable number of clusters. Cluster count can be defined as no. of clusters formed in a round. Small size cluster distribution can be better to conserve energy in wireless sensor network.

479

2) Cluster Size

Cluster size is the maximum distance between the sensor (member) nodes and cluster head. Cluster size can be fixed for fixed clusters or it can be variable for each cluster. Large sized clusters are not good in term of energy consumption because it maximizes transmission distance.

3) Cluster Density

Cluster density is proportion of number of cluster member in cluster and cluster area. In fixed clustering approach, there is sparse density of cluster where as in dynamic clustering the cluster density is variable. So it is a big challenge to conserve energy of cluster heads in dense clusters.

4) Message Count

The number of message transmissions is required for a cluster head selection is called as message count. The cluster heads are chosen using message transmission in many non-probabilistic algorithms. If message transmission number is more for a cluster head than the energy consumption also increases.

5) Stability

During the clustering process if cluster counts are not varied than it is called fixed. But if the cluster counts varied during clustering process than that is called as adaptive. Fixed cluster count gives more stability to the WSN's.

6) Intra-cluster Topology

The communication between the cluster head and the sensor (member) nodes can be direct or multi-hop. This depends upon the sensor node's range of transmission. If the communication range of sensor node is very high than the node can direct communicate with cluster head (CH). But if the transmissions range of the node is low than the node can communicate with CH using multi-hop.

7) Inter-cluster head connectivity

The procedure indicates the communication between the CH and the base station (BS). CH has some range or capability to connect to the BS. But if Ch have not that capability than clustering scheme has to ensure some intermediate provision of routing to base station.

C. Cluster-Head Capabilities

The capabilities of cluster heads during clustering process play very important role. The capabilities of CH's can influence the clustering process in terms of stability and life time of sensor network. Following are some aspects for differentiating the clustering process.

1) Node Type

Some nodes are pre chosen as cluster heads at the time of sensor nodes deployment for that round only depends upon their energy and computation resources.

2) Mobility

Mobile CH can be used for balancing the cluster which gives the better network performance. Mobility of CH's in the network cane assigned on the basis of objectives defined in clustering scheme. If there is any need in the network than mobile cluster heads can be re-locatable easily.

3) Role

The role of CH's in the network is to collect the information from sensor nodes, aggregate that information and send to the base station.

D. Cluster-Head Selection

Cluster heads can be pre assigned or chosen randomly from deployed sensor network. Following are the two ways to select the cluster head.

a)   Probability Based CH Selection

In probability based clustering algorithm, each sensor node in the network uses pre assigned probability to determine the initial cluster heads. Probability can be the maximum energy of the sensor nodes.

b)   Non Probability Based CH Selection

In non-probability based clustering algorithm, the cluster heads selection is based on sensor nodes proximity, connectivity and degree.

E. Cluster Formation

In this phase the cluster heads will send the request to all the nodes in its range to form the cluster. After getting request from cluster head, the nodes will send join message to cluster heads. Following is the categorization of different aspects of clustering in sensor network.

F. Characteristics desired in Clusters

1)   Every node should be in one cluster.
2)   Guarantee the total coverage of network.
3)   Number of cluster head should be less so that there will be less overlapping of clusters and which will improve energy efficiency.
4)   Clustering should be uniform and balanced.

III.   LITERATURE SURVEY

Abedelhalim Hnini et. al. [4] in his title "Effect of a Node's Death on Behavior of the LEACH Protocol and its Descendants" analyze the various LEACH variation protocol and identifies the professionals and cons of all existing LEACH protocol, author additionally planned a approach to enhances the performance supported dead node and end-to-end delay diminution of all existing LEACH protocol.

Ashlyn Antoo et. al. [5] planned "EEM-LEACH: Energy economical Multi-hop LEACH Routing Protocol for Clustered WSNs"in this work they bestowed that chooses a multi-hop path with minimum communication price from every node to the bottom station. This minimizes price per information packet. If the value for direct information transfer is a smaller amount than the value for communication via cluster head, nodes send information on to the bottom station preventing the nodes close to the bottom station from dying quickly.

Sheetal Sisodia et. al.[6] "Performance analysis of a Table Driven and On-Demand Routing Protocol in Energy Constraint MANETs" This paper addresses energy conservation that may be a important think about Energy Constraint Mobile ad-hoc Networks (MANETs) and additionally attempt to scale back routing overhead for economical functioning of the network. Each protocol provides completely different results relying upon the appliance.

Nicola Costagliola, Pedro Garçia López[7] "Energy- and Delay-Efficient Routing in Mobile impromptu Networks" during this paper they discuss however we tend to improved the MChannel cluster communication middleware for Mobile Ad-hoc Networks (MANETs) so as

to let it become each delay- and energy-aware. MChannel makes use of the Optimized Link State Routing (OLSR) protocol, that is OLSR exploits Dijkstra's algorithmic rule to seek out optimum ways across the network. we tend to accessorial a replacement module to MChannel, facultative unicast routing supported 2 various metrics, specifically end-to-end delay and overall network life. We tend to prove that network life and average end-to-end delay improves, compared to the initial OLSR protocol implementation enclosed within the mentioned middleware.

Peyman Arebi Technical and job University Bushehr, Islamic Republic of Iran [8] "A New technique for Restoration Broken Links in Wireless Ad-hoc Networks by Estimation Energy Consumption". Ad-hoc networks enable a collection of wireless hosts to exchange data with none special infrastructure. one amongst the foremost vital problems in wireless ad-hoc Network improves routing protocol method. Among the assorted factors that cause disorder in such a network and routing protocol method, broken links thanks to the shortage of energy is that the most significant ones. This paper proposes technique supported energy estimation to revive broken links and reconstruct the ways of them.

V.Ramesh, Dr.P.Subbaiah analysis Scholar, Sathyabama University, Chennai, [9] "energy economical pre-emptive dynamic supply routing protocol for MANETs" Tennessee, India. AN Ad-hoc network, a self-organizing wireless network is formed of mobile nodes, every node act as relay for providing digital communication that operates on batteries. Existing routing protocols area unit proactive and reactive protocols. DSR may be a easy and economical reactive routing protocol. We 'have got planned Pre-emptive DSR (PDSR) within the earlier work with some modifications to the present DSR algorithmic rule. PDSR algorithmic rule performs routing between supply and destination.

Nini Wei, Lolo Song [10] "A Energy-Aware Routing Strategy supported Dynamic Priority think about consider ad-hoc Networks" a way to style a special and Energy economical multi-hop routing protocol is one amongst the key technologies about impromptu networks analysis. The normal routing protocols like DBF, AODV, DSDV and DSR area unit the shortest path protocols in impromptu network. During this paper, a replacement energy-aware routing policy supported dynamic priority issue named EDSR for impromptu is planned, that relies on the classic DSR (the routing protocol on demand). Simulation with the NS2then compared with the on-demand routing DSR from the energy-consuming and therefore the range of remaining nodes.

Martin M. Mhlanga, Thomas O. Olwal, Martin M. Mhlanga, Thomas O. Olwal [11] "Energy improvement based mostly Path choice algorithmic rule for IEEE 802.11s Wireless Mesh Networks" Wireless Mesh Networks (WMNs) configures itself and since of its price effectiveness. However, this field still incorporates a ton of limitations and therefore the main constrain is that the energy of the nodes is incredibly restricted, particularly once the network is deployed in rural areas wherever electricity may be a scares resource. This analysis so presents AN energy improvement based mostly path choice algorithmic rule for IEEE 802.11s WMNs that is aimed toward

addressing the higher than mentioned constrains. As a new planned normal specifically designed for WMN, the IEEE 802.11s doesn't think about energy conservation as a priority in its protocol. As a result, the most goal for this analysis is that ways with enough energy for transmission within the network should be designated once transmittal packets.

Vinay Rishiwal, S. Verma and S. K. Bajpai [12] "QoS based mostly Power Aware Routing in MANETs" during this paper, QoS based mostly power aware routing protocol (Q-PAR) is planned and evaluated that selects an energy stable QoS unnatural finish to finish path. the chosen route is energy stable and satisfies the information measure constraint of the appliance. The protocol Q-PAR is split in to two phases. Within the initial route discovery section, the information measure and energy constraints area unit inbuilt into the DSR route discovery mechanism. Within the event of AN imminent link failure, the second section, a repair mechanism is invoked to go looking for AN energy stable alternate path regionally

Imane M. A. Fahrnv, Hesham A. Hefny, Laila Nassef [13] "PEEBR: prognostic Energy economical Bee Routing algorithmic rule for Ad-hoc Wireless Mobile Networks" during this analysis paper, a replacement swarm intelligent routing algorithmic rule galvanized from Bees; the Bees Colony improvement (BCO) model is introduced. The planned prognostic Energy economical Bee Routing PEEBR algorithmic rule aims to predict the number of energy which will be consumed by all the nodes on every of the potential routing ways between an explicit supply node and a destination node victimization two sorts of bee agent. PEEBR may be a bio-inspired routing algorithmic rule that considers energy conservation throughout route discovery, analysis and choice.

Hee Yong, Youn Chansu, Yu mount Lee [14] "Routing Algorithms for Balanced Energy Consumption in impromptu Networks" the first goal of such an advert hoc Network routing protocol is correct and economical route institution between a combine of nodes so messages is also delivered in an exceedingly timely manner. Though establishing economical routes is a very important goal, a more difficult goal is to supply energy economical routing protocols, since a crucial limiting issue for a mobile node is its operation time, restricted by battery capability.

Liu Huiyun [15] in his work titled "An Optimized LEACH algorithmic rule in Wireless detector Network" in his planned CDE-LEACH protocol will effective maximize coverage of network, and scale back the network energy consumption effectively. The improved LEACH algorithmic rule will effectively scale back energy consumption of detector nodes within the network and prolong the life cycle of the network. In future that employment increased whereas inbuilt CDE-LEACH with call tree based mostly cluster approach and reliable cluster head node decides for central coordination between members and base station.

IV. OBJECTIVE

Energy based routing strategies is a challenging issue because energy aware and node mobility predication is crucial while the nodes work in mobile ad-hoc nature. In this paper we study number of papers and found that LEACH provide the energy aware routing in TDMA approach that is better utilize the mobile sensor node communication with

reliable manner. Our objective is to provide reliable communication with low energy and low cost based routing in MANET and fulfill the following important goal.

1) Low energy adaptive hierarchical clustering provides better energy utilization in MANET.
2) Its periodical switch the cluster head, so maximum node cover in radio range.
3) It node mobility based route selection strategies so that reliable path are discover from source to destination.
4) It increases the network lifetime, throughput, number of live nodes and packet delivery ratio of the network.

V. PROPOSED WORK

In this section describe about the proposal of low energy, low mobility based routing in mobile ad-hoc network, that is divided into sub modules i.e. LEACH based head selection, routing module and data sending module.

A. LEACH based Head Selection:

In this module elect the cluster head whose responsibility for node join and leave information and its energy and position in real time. LEACH module execute by random manner, one of the node as a initiator to initiate election message for head selection and broadcast the election message within the radio range and elect the cluster head whose energy is higher and mobility is lower. After the selection of cluster head node, it take the responsibility of better routing decision and provide inter cluster communication in every given time. The cluster head are change as a timely manner for providing better service to all member nodes.

B. Routing Module:

During that stage while any member node want to communicate to another member, than sender node initiate the route requesting module and broadcast the routing packet with the help of mobile nodes. While the route packet receives by the cluster head, than its take the route decision, based on energy and mobility of node and reply back to the sender node. So the sender established the path from given route by cluster head. The given routes are more reliable as compare to other ones. But receiver node belongs in other cluster zone than cluster head responsible to provide inter cluster communication by the cluster head to cluster head communication.

C. Data Sending Module:

In this module sender member node sends the data by efficient energy based route to the receiver node and provide reliable data communication with feasible route in every time manner.

VI. PERFORMANCE METRICS

– Packet Delivery Ratio: The quantitative relation between the variety the amount the quantity of packets originated by the appliance layer cosmic microwave background sources and also the number of packets received by the cosmic microwave background sink at the ultimate destination.
– Average End-to-end Delay: This includes all the doable delays caused by buffering throughout route discovery latency, queuing at the interface queue,

retransmission delays at the MAC, and propagation and transfer times.
– Packet Dropped: The routers may fail to deliver or drop some packets or information if they arrive once their buffer is already full. Some, none, or all the packets or information could be born, reckoning on the state of the network, and it's not possible to see what is going to happen earlier.
– Routing Load: the whole variety of routing packets transmitted throughout the simulation. For packets sent over multiple hops, every transmission of the packet or every hop counts.
– Member in Cluster Head: throughout the simulation pause time, variety of member node ménage per cluster head is calculated by dead nodes which depends of TDMA based mostly makes time for each pause time.

VII. CONCLUSION

Mobile ad-hoc network creation is one of the crucial challenge, because energy issue and topology constraint. In this paper we study about the various energy related issue in the field of MANET and sensor communication and its resolution. Most of the researches are focus to minimize the energy conservation with the help of LEACH routing. After that studies we identifies the idea to focus the new step towards the enhancement of network performance based on proposed approach low energy low cost methodology and provide reliable communication in future implementation of LEACH based routing strategy in mobile ad-hoc network.

REFERENCES

[1] Ruitao Xie and Xiaohua Jia, Fellow, IEEE, Computer Society "Transmission-Efficient Clustering Method for Wireless Sensor Networks Using Compressive Sensing" IEEE Transactions On Parallel And Distributed Systems, Vol. 25,No. 3, March 2014.
[2] Amandeep Kaur, Rupinder Kaur Gill,"Event Driven Clustering Scheme and Energy Efficient Routing for Wireless Sensor Network - A Review", Amandeep Kaur et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (4) , 2014, 4949-4951.
[3] S.K Singh, M.P Singh and D.K Singh, "A Survey of Energy-Efficient Hierarchical Cluster-Based Routing in Wireless Sensor Networks," In International Journal of Advanced Networking and Applications, vol.02, pp.570- 580, 2010.
[4] Abedelhalim Hnini, Abdellah Ezzati, Abdelmajid Hajami "Effect of a Node's Death on Behavior of the LEACH Protocol and its Descendants" 2014 Fifth International Conference on Next Generation Networks and Services (NGNS) May 28-30, 2014, Casablanca, Morocco 978-1-4799-6937-1/14/$31.00 ©2014 IEEE.
[5] Ashlyn Antoo et. al."EEM-LEACH: Energy Efficient Multi-hop LEACH Routing Protocol for Clustered WSNs" 2014 International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT), 978-1-4799-4190-2/14 ©2014 IEEE
[6] Sheetal Sisodia, Sandeep Raghwanshi "Performance Evaluation of a Table Driven and On-Demand Routing

Protocol in Energy Constraint MANETs" 2013 International Conference on Computer Communication and Informatics (ICCCI -2013), Jan. 04 – 06, 2013, Coimbatore, INDIA, 978-1-4673-2907-1/13/2013 IEEE

[7] Nicola Costagliola, Pedro Garçia López "Energy- and Delay-Efficient Routing in Mobile Ad Hoc Networks" Mobile Netw Appl (2012) 17:281–297 .

[8] Peyman Arebi Technical and Vocational University Bushehr, Iran "A New Method for Restoration Broken Links in Wireless Ad-hoc Networks by Estimation Energy Consumption" 2012 Fourth International Conference on Computational Intelligence, Communication Systems and Networks.

[9] Ramesh, Dr.P.Subbaiah Research Scholar, Sathyabama University, Chennai,"energy efficient pre-emptive dynamic source routing protocol for manet" IJCET ISSN 0976 – 6367(Print) ISSN 0976 – 6375(Online) Volume 3, Issue 1, January- June (2012), pp. 213-222

[10] Nini Wei, Yi Song [5]"A Energy-Aware Routing Strategy Based on Dynamic Priority Factor in Ad Hoc Networks"2011 International Conference of Information Technology, Computer Engineering and Management Sciences

[11] Martin M. Mhlanga, Thomas O. Olwal, Martin M. Mhlanga, Thomas O. Olwal "Energy Optimization based Path Selection Algorithm for IEEE 802.11s Wireless Mesh Networks" IEEE Africon 2011 - The Falls Resort and Conference Centre, Livingstone, Zambia, 13 - 15 September 2011

[12] Vinay Rishiwal, S. Verma and S. K. Bajpai "QoS Based Power Aware Routing in MANETs" International Journal of Computer Theory and Engineering, Vol. 1, No. 1, April 2009 1793-8201

[13] Imane M. A. Fahrnv, Hesham A. Hefny, Laila Nassef "PEEBR: Predictive Energy Efficient Bee Routing Algorithm for Ad-hoc Wireless Mobile Networks" The 8th International Conference on INFOrmatics and Systems (INFOS2012) - 14-16 May Computer Networks Track.

[14] Hee Yong, Youn Chansu, Yu Ben Lee "Routing Algorithms for Balanced Energy Consumption in Ad Hoc Networks" Hand book. Mobile ad-hoc networks.

[15] Liu Huiyun "An Optimized LEACH algorithm in Wireless Sensor Network
http://doi.ieeecomputersociety.org/10.1109/ISDEA.201