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Contemporary development in Distance centred Cluster Formation system For Prolonging Lifetime Challenges of WSNs - A Review.

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***Abstract*--Sensor nodes are exceedingly energy compelled gadgets since they are battery worked gadgets and because of brutal environment sending it is difficult to change or revive their battery. Energy protection and dragging out the system life are two noteworthy difficulties in a sensor system. Communication devours the substantial part of WSN energy. This paper researches the related works identified with a few conventions that have been proposed to acknowledge power-productive communication in a wireless sensor system. We likewise talked about the issues in view of directing in a wireless sensor network challenges when contrasted with the conventional systems because of sensors smaller memory, less handling control and obliged energy supply. It has been shown that in the previous couple of years numerous new routing protocols have been contrived for wireless sensor Network.**

Keywords: WSN, LEACH, clustering, network life time.

1. Introduction:

Wireless sensor networks are special category of ad-hoc wireless network that are used to provide wireless communication infrastructure among the sensors deployed in the specific application domain with some extra features and restraint like limited energy capacity, non-rechargeable battery life and low memory capacity. Sensor nodes are tiny devices that have capability of sensing physical parameters, processing gathered data and communicating over the network to monitoring station.

Since WSNs are application specific and nodes are responsible to sense, collect and aggregate data and send it further towards the destination. So in WSN routing protocol should be design in a way to full fill these tasks. The main concentration for designing a good routing protocol is energy efficiency. In addition, a power source supplies the energy needed by the device to perform the programmed task. This power source often consists of a battery with a limited energy budget. In addition, it could be impossible or inconvenient to recharge the battery, because nodes may be deployed in a hostile or unpractical environment. On the other hand, the sensor network should have a lifetime long enough to fulfill the application requirements. Experimental measurements have shown that generally data transmission is very expensive in terms of energy consumption, while data processing consumes significantly less. In general, energy-saving techniques focus on the networking subsystem (i.e., energy management is taken into account in the operations of each single node, as well as in the design of networking protocols. [12]

On the basis of energy distribution among sensor nodes, WSNs are classified into homogenous and heterogeneous networks. Homogeneous network is a network in which initially all sensors have equal energy whereas heterogeneous network is a network in which different nodes have different characteristics. Sensor nodes can be heterogeneous by construction i.e. some nodes have larger batteries, farther reaching communication devices or more processing power. They can also be heterogeneous by evolution i.e. all nodes started from an equal stage but because of some nodes had to perform more tasks during operation of the network; they have depleted their energy resources.

For different type of network, different routing protocols are used. For homogeneous network, LEACH can be used as routing protocol. LEACH (Low Energy Adaptive Clustering Hierarchy) is a clustering-based protocol that utilizes randomized rotation of the cluster-heads to evenly distribute the energy load among the sensor nodes in the network. The protocol is presented by Heinzelman et al. [11] In this protocol a dense network of homogeneous, energy constrained nodes. These nodes are responsible to send their data to a sink node. In LEACH nodes are divided into clusters. Each cluster consists of a cluster-head which is responsible for creating and maintaining a TDMA schedule, and all other nodes are treated as member nodes. TDMA schedules are assigned to all member nodes. This schedule can be used to exchange data between member and the cluster-head. Member nodes within cluster send data to their CH and cluster-head sends this aggregated data to the sink, thus, when a cluster head node dies all the nods that belong to the cluster lose communication. The problem of LEACH protocol is balance the energy consumption, network energy consumption [11].

2. Related Work:

While wireless sensor networks (WSN) is a power constrained system, since nodes run on limited power batteries which shorten its lifespan. Prolonging the network lifetime depends on efficient management of sensing node energy resource. Energy consumption is therefore one of the most crucial design issues in WSN. Hierarchical routing

protocols are best known in regard to energy efficiency. By using a clustering technique hierarchical routing protocols greatly minimize energy consumed in collecting and disseminating data. In this work **BEN ALLA Said et. al. (2010)** [1], proposed Improved and Balanced LEACH (IB-LEACH), a heterogeneous-energy protocol propose a new method to decrease probability of failure nodes and to prolong the time interval before the death of the first node (we refer to as stability period) and increasing the lifetime in heterogeneous WSNs, which is crucial for many applications. We study the impact of heterogeneity of nodes, in terms of their energy, in wireless sensor networks that are hierarchically clustered. In these networks some high-energy nodes called NCG nodes (Normal node/Cluster Head/ Gateway) become "cluster heads" to aggregate the data of their cluster members and transmit it to the chosen "Gateways" that requires the minimum communication energy to reduce the energy consumption of cluster head and decrease probability of failure nodes. The simulation results demonstrated that new protocol is more energy efficient and is more effective in prolonging the network life time and a stability period compared to LEACH and SEP.
IB-LEACH is an extension of the LEACH, which improves the stable region of the clustering hierarchy and decrease probability of failure nodes using the characteristic parameters of heterogeneity in networks. In these networks some high energy nodes called NCG nodes (Normal node or Cluster Head or Gateway) become "cluster heads" to aggregate the data of
their cluster members and transmit it to the chosen "Gateways" that requires the minimum communication energy to reduce the energy consumption of cluster head and decrease probability of failure and this increase the lifetime of the network. Simulation results shows that the IB-LEACH achieves better performance in this respect, compared to SEP and LEACH in both heterogeneous and homogenous environments. In this article it is supposed that nodes called NCG nodes are distributed randomly and fixed. On the other program we will research to predict the choice of becoming cluster head or gateway that will depend on the density of nodes in an area and we will research the mobile gateways.

In this work, **Fengjun Shang, and Yang Lei, (2010) [2],** considerd a network of energy constrained sensors deployed over a region. Each sensor node in such a network is systematically gathering and transmitting sensed data to a base station (via cluster- heads). This work focuses on reducing the power consumption of wireless sensor networks. Firstly, we pro-posed an Energy-balanced Clustering Routing Algorithm called LEACH-L, which is suitable for a large scope wireless sensor network. Secondly, optimum hop-counts are deduced. Lastly, optimum position of transmitting node is estimated. Simulation results show that our modified scheme can extend the network lifetime by up to 80% before first node dies in the network. Through both theoretical analysis and numerical simulations, it is shown that the proposed algorithm achieves higher performance than the existing clustering algorithms such as LEACH, LEACH-M.
They have proposed a routing protocol named LEACH-L. The experiments demonstrate that in the larger scope sensor networks, Comparing with LEACH and LEACH- M which is the multiple-hop protocol only considering the distance, LEACH-L can balance network load, re-duce the network's energy consumption, enhance the net- work's data collecting precision and extend the net-work's life cycle, certainly, LEACH-L demands each sensor node to record its own location information and the information of candidate routing cluster-heads, increas-ing the storage requirements of sensor nodes. But, com-pared with balancing the nodes' surplus energy and pro-longing the life time of network, LEACH-L is valuable.

Wireless Sensor Network is the network of power-limited sensing devices called sensors deployed in a region to sense various types of physical information from the environment when these sensors sense and transmit data to other sensors present in the network; considerable amount of energy is dissipated. In this work, an effort has been done to propose F-MCHEL, a homogeneous energy protocol. In LEACH protocol the clusters are formed randomly on the basis of threshold values; whereas, in the proposed protocol a fuzzy logic approach is used to elect the cluster-head based on two descriptors - energy and proximity distance proposed by **Tripti Sharma and Brijesh Kumar, (2012)** [3].Out of these elected cluster heads one Master cluster head has been elected .The cluster head which has the maximum residual energy is elected as Master cluster head. In conventional Leach approach all the Cluster heads are used to sends the aggregated information to the base station, however in the proposed protocol only Master cluster head sends the aggregated information to the base station. Simulation results on MATLAB shows that the proposed protocol provides higher energy efficiency, better stability period and lower instability period as compared to LEACH protocol in spite of overhead of election of Master cluster head. Results obtained shows that an appropriate Master cluster-head election can drastically reduce the energy consumption and enhance the lifetime of the network.
F-MCHEL is an extension of CHEF which results in better stability of hierarchical network as compared to LEACH and CHEF. In this protocol, the clusters are well separated from each other. Simulation results show that F-MCHEL performs better than the existing protocols in homogeneous environments. In this work, we have also taken only two parameters as input in homogeneous environment. In the future work effort will be done for measure the performance of the protocol in Heterogeneous environment. The proposed protocol can also be compared with other wireless sensor routing protocols.

A wireless sensor network is composed of a large number of sensor nodes that are densely deployed in a phenomenon or very close to it. The lifetime of sensor nodes shows a strong dependence on battery lifetime. Clustering provides an effective way for prolonging the lifetime of a wireless sensor network. Therefore, Clustering techniques are used to distribute the energy consumption among nodes in each cluster and extend the network lifetime. LEACH (Low-Energy Adaptive Clustering Hierarchy), a clustering-based protocol that utilizes randomized rotation of Cluster-Heads (CHs) to evenly distribute the energy among the sensors in the network. But LEACH cannot select CHs uniformly

throughout the network. Therefore there is the possibility that the elected CHs will be concentrated in certain area of the network. Hence, some nodes will not have any CHs in their vicinity. The proposed approach U-LEACH is an approach to address this problem. It describes a uniform distribution technique that is Uniform Distribution Technique (UDT) for selecting CHs and their corresponding clusters proposed by **Nazia Majadi, (2012)** [4]. The goal of this work is to build such a wireless sensor network in which each sensor node remains inside the transmission range of CHs and therefore, the lifetime of the network is prolonged.
It is found that LEACH protocol fails in some conditions where the higher energetic nodes are concentrated, some nodes having highly probable to remain outside of any CH's vicinity will die within short period. Therefore the rotation of cluster heads and the metric of residual energy are not sufficient to balance the energy consumption across the network, CHs are required to be distributed uniformly throughout the network so that a single node should not be deducted by clusters. This work has presented a routing protocol U-LEACH in WSN that can reduce the problems of LEACH. As well as, a uniform distribution technique of U-LEACH for selecting CHs can not only reduce energy consumption but also increase nodes life time. Therefore, the network lifetime is prolonged. As the future work, the proposed U-LEACH protocol will be applied to WSNs where sensor nodes are heterogeneous.

The nodes in a wireless sensor network have limited energy and hence, lifetime maximization is the prime task during protocol design. Low Energy Adaptive Clustering Hierarchy (LEACH) protocol is a benchmark Clustering Protocol which imposes upon cluster heads the complete load of aggregation and relay of messages to base-station. Our protocol Assisted LEACH (A-LEACH) achieves lessened and uniform distribution of dissipated energy by separating the tasks of Routing and Data Aggregation. It introduces the concept of Helper Nodes which assist Cluster Heads for Multi-hop Routing. A new algorithm has been formulated to facilitate energy efficient Multi-hop Route Setup for helper nodes to reach base station. **Sunkara Vinodh Kumar and Ajit Pal, (2013),** [5], proposed protocol extends the lifetime of the network, minimizes overall energy dissipation in the network and distributes dissipation among Cluster Heads, Sensor Nodes and Helper Nodes vis-a-vis LEACH. This is substantiated by simulation results.
Their Theoretical Analysis has shown that network lifetime goes down when both data aggregation and routing are carried out by Cluster Heads alone which can be eradicated by usage of Helper Nodes for Routing and Cluster Heads for Data Aggregation. We have reduced the overhead for route formulation to base station by electing next hop at each Helper Node using the Received Signal Strength values of beckon signal from base station already available at helper nodes during Helper Node Selection phase. Our concept of Helper Nodes in Assisted LEACH (A-LEACH) protocol has improved the lifetime of the network by distributing the minimized energy dissipation throughout the nodes. Theoretical analysis and simulation results substantiate this.

Wireless Sensor Networks (WSNs) with their dynamic applications gained a tremendous attention of researchers. Constant monitoring of critical situations attracted researchers to utilize WSNs at vast platforms. The main focus in WSNs is to enhance network life-time as much as one could, for efficient and optimal utilization of resources. Different approaches based upon clustering are proposed for optimum functionality by **B. Manzoor, N. Javaid, O. Rehman, M. Akbar, Q. Nadeem, A. Iqbal, and M. Ishfaq, (2013)** [6]. Network life-time is always related with energy of sensor nodes deployed at remote areas for constant and fault tolerant monitoring. In this work, we propose Quadrature-LEACH (Q-LEACH) for homogenous networks which enhances stability period, network life-time and throughput quiet significantly.
Many proposed clustering protocols for WSNs aimed at suitable energy utilization. Load balancing among sensor node is of key importance and it strictly depicts network life-time. In both homogenous and heterogenous networks, protocol design should be capable of best distribution. The main aim of this work is to enhance existing protocol such that more robust and optimized results can be achieved. Q-LEACH, significantly improved network parameters and seems to be an attractive choice for WSNs by extending and enhancing overall network quality parameters.

Wireless sensor network consists of large number of tiny sensor nodes which are usually deployed in a harsh environment. Self configuration and infrastructure less are the two fundamental properties of sensor networks. Sensor nodes are highly energy constrained devices because they are battery operated devices and due to harsh environment deployment it is impossible to change or recharge their battery. Energy conservation and prolonging the network life are two major challenges in a sensor network. Communication consumes the large portion of WSN energy. Several protocols have been proposed to realize power-efficient communication in a wireless sensor network. Cluster based routing protocols are best known for increasing energy efficiency, stability and network lifetime of WSNs. Low Energy Adaptive Clustering Hierarchy (LEACH) is an important protocol in this class. One of the disadvantages of LEACH is that it does not consider the nodes energy and distance for the election of cluster head. **Surender Kumar et. al., (2014)** [7] proposed a new energy efficient clustering protocol DE-LEACH for homogeneous wireless sensor network which is an extension of LEACH. DE-LEACH elects cluster head on the basis of distance and residual energy of the nodes. Proposed protocol increases the network life, stability and throughput of sensor network and simulations result shows that DE-LEACH is better than LEACH.
In this work DE-LEACH a single hop communication protocol for homogeneous network is described. It improves the network lifetime, stable region and throughput of sensor network. For increasing the network energy efficiency it uses a residual energy and distance based cluster head election scheme. DE-LEACH ensures that nodes which are far away from base station will become cluster head only when they have sufficient energy for performing this duty and nearby nodes particularly in the mid of the sensing region have the highest probability to become a cluster head in a round. Simulation result shows that the proposed

scheme is better than LEACH in energy efficiency and network life.

Inexpensive wireless communication, computation and sensing is now need of the Wireless Sensor Network (WSN). Wireless sensor networks (WSNs) comprises large number of wireless sensor nodes which can sense and process data in the environment in a periodic manner. In WSN, as the sensor node depends on its internal battery power, energy efficiency and lifetime of sensors have become a key issue on the performance of wireless network. To make effective utilization of energy resources of a sensor node, communication protocols can be designed precisely. Clustering the sensor nodes is one of the effective techniques to achieve this goal. Low- Energy Adaptive Clustering Hierarchy (LEACH) - A cluster based routing algorithm was proposed as a solution for low power consumption. One of problems in the LEACH protocol is "Extra Transmissions". The goal of our research is to optimize the energy consumption of wireless sensor network by introducing a novel and adaptive technique on the traditional clustering protocol of the wireless sensor network. In order to improve network performance, the Distance based LEACH algorithm is proposed by **Snehal Kole, Mr. K. N. Vhatkar, and Mr. V. V. Bag, (2014)** [8], where the improvement is done in cluster formation technique based on distance parameter. In cluster formation phase of modified LEACH distance of sensor node from cluster head plus distance of cluster head to base station is taken into account.
In this work, **Snehal Kole, Mr. K. N. Vhatkar, and Mr. V. V. Bag, (2014)** [8], have studied well known energy efficient LEACH protocol and proposed an improvement over it to enhance network lifetime. The distance of the node from base station is considered as an important factor in cluster formation which will reduce some extra transmissions in existing LEACH protocol. Analysis of simulation result proves the improvement in the performance of original LEACH algorithm.

Wireless sensor network is built of several nodes (from a few to several hundreds or even thousands), where each node is connected to one sensors. The main challenging task in this network is lifetime and energy consumption. The cluster based routing protocols are most accepted to improve the network lifetime and to reduce the energy consumption of wireless sensor network. **Er. Sarbjeet Kaur et. al., (2015),** [9], presented the pollination based optimization algorithm also called OLEACH-C to improve the performance of LEACH-C protocol. The PBO algorithm is used for clustering in WSN. The node that has maximum remaining energy will be selected as a cluster head. If the two nodes having the same energy then cluster head will be selected on the basis of distance. The node that has minimum distance from the base station will be selected as CH. The Simulations results show that the OLEACH-C protocol selects the best CHs that guarantee a routing optimization with the minimum energy consumption and minimum communication links` cost between nodes within each cluster and other energy efficient communication protocols for WSN routing protocol improve the energy consumption and network lifetimes.
Energy efficient cluster based routing protocol is used to enhance the lifetime of the network. In this work, The PBO algorithm is used for clustering in WSN. It is showing for homogenous wireless sensor environment. This protocol enhances the wireless sensor network lifetime by selecting the cluster head based on their remaining energy as well as distance. And it associates the cluster nodes according to the distance to the proper cluster head. Therefore, OLEACH-C protocol selects the best CHs that guarantee a routing optimization with the minimum energy consumption and minimum communication links` cost between nodes within each cluster and other energy efficient communication protocols for WSN. The simulation is done by using MATLAB. The simulation results shows that proposed OLEACH-C protocol has better performance than the existing LEACH, LEACH-C and EELEACH-C protocols, because in optimized LEACH-C protocol, cluster head is selected based on the node's remaining energy and distance.

LEACH protocol is considered the best in the WSN protocols in extending the network lifetime and reduces energy loss, but LEACH suffers from the problem of the correct distribution of the nodes correlation with CHs. In this work, **Mishall H. Awaad et. al., (2015)** [10], proposed an improved protocol called LEACH-Z(LEACH zones), this protocol improved the distribution of clusters by making the clusters near the base station(BS) large(greater number of nodes) and the clusters are far from BS small(lesser number of nodes), where divides the network area to parts(zones), be part of a larger when close to the BS in addition to preventing the election of CHs in the region far from the BS and thus conserve energy this means that the nodes will remain alive as long as possible, this makes nodes gather more information. The results proved that the LEACH-Z is better than the original LEACH and more optimizations to reduce energy consumption.
As the main task of LEACH protocol is to reduce the power loss, so we proposed LEACH-Z protocol, LEACH-Z to enhance LEACH protocol from those problem that this protocol suffering from which cause wasting the power as denoted in a previous section, our proposed protocol has been proved its efficiency in enhancing the original protocol in the aspects of, first dead node, increasing the remaining node after each round, decreasing the acceleration in the death of the nodes, and help in minimizing the wasted power as we saw that in the section (Results analyzing of LEACH-Z), which led at the end to enable the sensors to collect more information than the original LEACH can do, which is the main purpose of using the WSNs.

3. Conclusion:
Planning energy productive and high throughput routing protocol for Wireless Sensor Networks (WSNs) applications, for example, natural life checking, front line observation and wellbeing checking is looked into in this article to locate the noteworthy difficulties because of the incessant changes of the system topology. It is watched that sensor hubs are inclined to disappointment in WSNs because of unforgiving environment. In this way, blame tolerant and energy productive are crucial issues for WSNs. Diverse variations of LEACH convention are considered for steering in WSN which utilizes a TDMA based MAC convention,

and keeping in mind the end goal to keep up adjusted vitality utilization. Existing vitality effective methodologies for WSNs differ in types of models, conventions, recognition calculation or identification choice combination calculation and so on . This paper is has depicted distinctive WSN grouping based model for proficient vitality usage in WSNs. A few works has been done on high throughput and lifetime based problems utilizing numerous grouping calculations. Different quadrant based LEACH proposed approach has been talked about and it is observed to be more suitable for stable WSN frameworks. It will be useful in sensor systems are organization for long haul checking of fields and are coveted to keep working without sudden changes. Besides, it is likewise fancied to acquire worldwide learning constantly i.e., better scope of territory ought to be gotten. Considering aforementioned needs new approach various quadrant LEACH observed to be suitable to enhances system productivity.

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