

SURVEY OF IMPROVING CONGESTION CONTROL IN WSN USING GRID BASED ALGORITHM

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Abstract - The evaluation and up gradation of wireless sensor Network (WSN) requires transfer of data from source to destination. Nodes within wireless network are sensors having limited energy associated with them. Nodes collaborating together form clusters. Data transmission takes place from distinct clusters towards base station. Energy of sensors needs to be preserved in order to enhance lifetime of network. This paper presents the overview of various existing techniques used to enhance lifetime of network and handling problem of congestion. Lifetime of network ensures degradation in terms of packet drop ratio. The extensive parametric analysis of some popular protocols has been done in this paper which can be used for future enhancements.

Key Words: WSN, Clustering, Grid Formation, Lifetime, Packet drop ratio

1. INTRODUCTION

Wireless sensor network [1] consists of spatially distributed devices used to maintain physical or environmental conditions. Nodes used within WSN could be of distinct configuration. These nodes form heterogeneous environment. Heterogeneous [2][3] environment requires protocols in order to establish communication among distinctly configured nodes. IEEE 802.11 standards established for Wi-Fi connectivity is commonly used protocol for transmission within WSN. Nodes following common protocols form clusters. The Present time is such where people don't have much time. The people wish to carry out their occupations in a hurry. Physically nearness at the specific area may not be plausible. For this reason client depends vigorously on innovation. Cell innovation is one of the instrument by which client will move the data without truly to the inaccessible place. The cell system is accomplished with the assistance of confinement. The restriction thusly is finished by the utilization of obscure hubs and stay hubs. The grapple hubs are those through which data about the obscure hubs can be gotten. The obscure hub position at the end of the day will rely on the stay hub positions. It has much real application in agribusiness explore. Other than this there is considerably more immaterialness of WSN in University and schools however working with restricted computational power and constrained memory. It gives full administration of remote sensor items, programming advancement and arranged counselling administrations to business. WSN are utilized as a part of numerous territories to screen a physical condition, for instance: Source of Light, Pressure taking care of component, Sound creating frameworks, Humidity checking framework, Checking Soil ripeness recognition , Determining Air Quality checking, Quality of water checking, Measurement of Object Attribute, for example, Mass, Velocity, Motion, Scale and Position, Mixture of Soil with fertilizer.

Remote correspondence comprises of hubs which are in charge of transmission of data from source to the goal without utilizing wired component. The Sensor hubs are utilized for this reason. The sensor hubs will transmit the data to the following hub in arrangement whose span crosses with the other sensor hub range. The provisions for hubs are broad. Point must be minimized, vitality powerful, multifunctional, and remote. At the point when all these point associated their shape arrange and by this the principle thought process can be gotten. For instance, if there is a data accessible for need of water among all segments of the field, put the focuses are in the dirt to frame a system. After it system can accumulate information and transmit information to primary PC.

Sensor is utilized as a part of the home likewise, for example, cooler and microwave. These are brilliant machines we can set its planning when nourishment is get ready then it consequently give caution. Remote Sensor Network is more advantageous and more noteworthy focal points over regular wired Sensor. They are utilized as a part of any condition particularly when regular wired sensors are unrealistic. They additionally diminished the cost and postponement. In WSN there is no need that system site get close to it we can impart the system site get a long way from this. Remote sensor organizes gather information which is in vogue, and we get data about the information. Sensor unit comprise of Analog to advanced converter. The ADC will get the simple flag and changes over it into the computerized shape. The advanced information has greater lucidity related with it. The discrete signs will be its case. The sensor hubs will be influenced by number of parameters. The parameters will choose the

lucidity by which transmission happens. The parameters are separated into following classes: Temperature, dampness and vibration

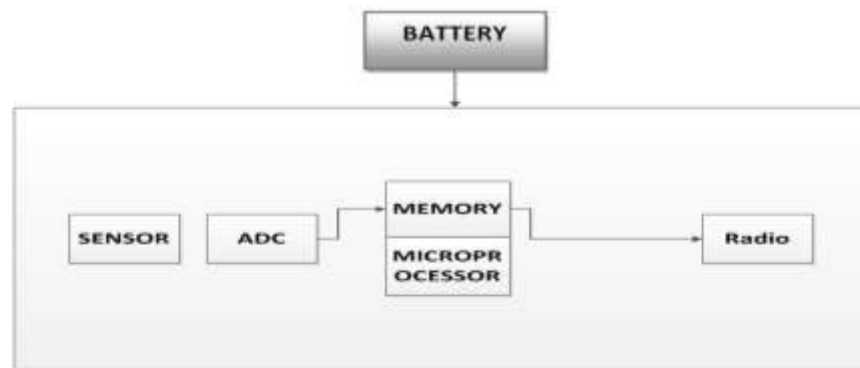


Figure 1: Wireless Sensor Network Operation (Chaouchi & Marie n.d.)

There are such a significant number of capacities, for example, environment, sense movement, and measure light quality.

- Power Source: The power source is the basic segment related with the WSN. It is utilized to give the ability to the sensor hubs inside the WSN. Without battery no sensor can work. The upside of sensors is they are little vitality devouring gadgets which don't require a great part of the power source.
- Radio: This is a little gadget which is utilized to transmit the data from source hub to the goal hub. The source is known as Radio source and goal is known as Radio Destination.
- The Electronic Brain: The sensor hub will comprise of remote system which is utilized to transmit the data to goal. The microchip chip is utilized to coordinate the information toward the goal. The microchip will have number of pins related with it. Each stick will have certain capacity related with it. The power source is a basic piece of the electronic mind. It is utilized to give the ability to the sensor hubs inside the WSN. Without battery no sensor can work. The upside of sensors is they are little vitality devouring gadgets which don't require a great part of the power source. The Radio is likewise utilized as a part of request to guarantee remote correspondence. This is a little gadget which is utilized I request to transmit the data from source hub to the goal hub. The source is known as Radio source and goal is known as Radio Destination.

Presently in nowadays there is fundamentally centre in nurseries, with the goal that misuses of various harvests can be precluded. So a superior sensor n/w required which give all these data precisely. Basically for this a numerous scattered sensor control this conditions. Additionally this system accommodating in open surface close to this it is useful in soil likewise i.e. again an open surface.

2. CLUSTERING

[4] In WSN is formed so that minimum energy is consumed during transmission of data. Formed clusters consist of large number of nodes which may have same or distinct configuration. The nodes within the clusters if belongs to same configuration then homogeneous clusters are formed. In case nodes are of distinct configuration then heterogeneous clusters are formed. Nodes [5] selection from clusters is critical that leads to selection of cluster head.

Cluster head from particular cluster is node having maximum energy. All the nodes [6] from a distinct clusters transfer the data towards selected cluster head from their cluster. Data then is transmitted from one cluster head to another cluster head until destination node that is base station is reached. Packet drop ratio is considerably reduced as maximum energy node is selected for transmission of information. As energy decays [7], sensors unable to hold the packet and hence packet is dropped. As more and more packets arrive at the sensor having minimum energy, packets are dropped. This enhances packet drop ratio considerably. Within clustered environment techniques were researched over to enhance performance in terms of packet drop ratio during degradation of sensor energy.

3. GRID FORMATION

The sensor nodes are deployed either uniformly or randomly. The area where the nodes are deployed is divided into logical squared-shaped grids of a predefined size. Global Positioning System (GPS) is used to determine to which grid every node belongs. For each non-empty grid, a node is selected to act as the grid master node. This node is responsible for routing the data generated in the grid or received from the neighbor grids. If the grid contains a single Node, that node becomes the master node

otherwise the node with the highest ID is selected as the master node. Then, every master node broadcasts its status to the other nodes in the grid. They reply by sending their IDs back to the master node. In order to ensure the connectivity, the maximum grid size must satisfy the relation R where R is the sensor radio range. This ensures that each node is capable of communicating with any node in the same grid or any node in any one of the neighbor grids. An example of a grid sensor network is the sensor field is divided into 16 grids. This paper presents comprehensive analysis of techniques used to enhance lifetime and decrease packet drop ratio. Highlights of this paper is listed as under

- Energy efficient protocols in WSN for enhancing lifetime of networks are discussed.
- Techniques used to minimize packet drop ratio are identified.
- Cluster head formation techniques are discussed in detail.
- Comparative analysis of various protocols is presented for determining best possible protocols out of available protocols.

4. ENERGY EFFICIENT CLUSTERING TECHNIQUES IN WSN

Large number of protocols researched over a decade to enhance lifetime associated with the network. This section discusses various protocols falls under energy efficient category.

4.1 Low Energy Adaptive Clustering Protocol(LEACH)

Low Energy Adaptive Clustering hierarchical protocol [4][8] is used to enhance energy efficiency associated with transfer process. Time division multiple access protocol is integrated within LEACH. Cluster head selection is a problem within LEACH. In fact cluster head selection does not take place and data is transmitted from transmitter towards random selection of node selected as head. Aggregation is performed at cluster head and when threshold value is reached, packets are transmitted forward. In case cluster head energy dissipated completed, all the packets aggregated at node will be lost. Properties associated with LEACH are listed as under

- Hierarchical in nature
- Random Cluster Head Selection is involved
- Adaptive membership of cluster
- Aggregation of data at cluster head
- Communication involves nodes and cluster head
- Threshold values involve during transmission

LEACH protocol is represented as under

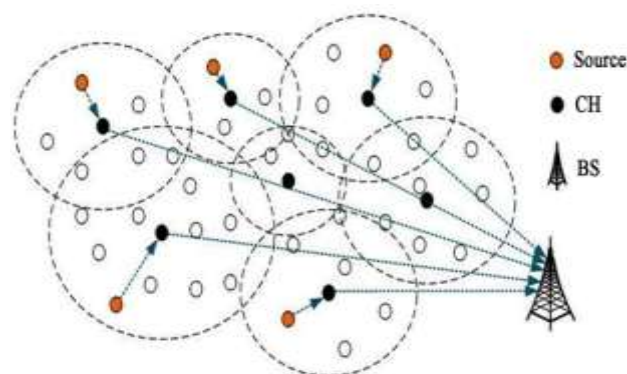


Figure 1: Leach Protocol(Cheikh et al. 2014)

4.2 Distributed Energy Efficient Clustering Protocol(DEEC)

This protocol [9][10] is advancement associated with LEACH. Cluster head selection is complex in case of DEEC. Maximum energy nodes are elected among available nodes. The node with the highest probability of conserving energy is selected as cluster head. A distributed multilevel clustering algorithm for heterogeneous wireless sensor networks is considered with following characteristics

- The cluster head is elected by a probability based on the ratio between the amount residual energy present at each node and the average energy of the network.
- The lifetime of a cluster head is decided according to its initial energy and residual energy. So always the nodes with high initial and residual energy have a better chance to become a CH.
- DEEC is implemented based on the concepts of LEACH algorithm. The role of cluster head is rotated among all nodes of the network to make energy dissipation uniform.
- Two levels of heterogeneous nodes are considered in this algorithm to achieve longer network lifetime and more effective messages than other classical clustering algorithms.
- It also works better for multilevel heterogeneous networks.
- In DEEC, all the nodes must have the idea about total energy and lifetime of the network. Average energy of the network is used as the reference energy.

DEEC protocol is represented through the following figure

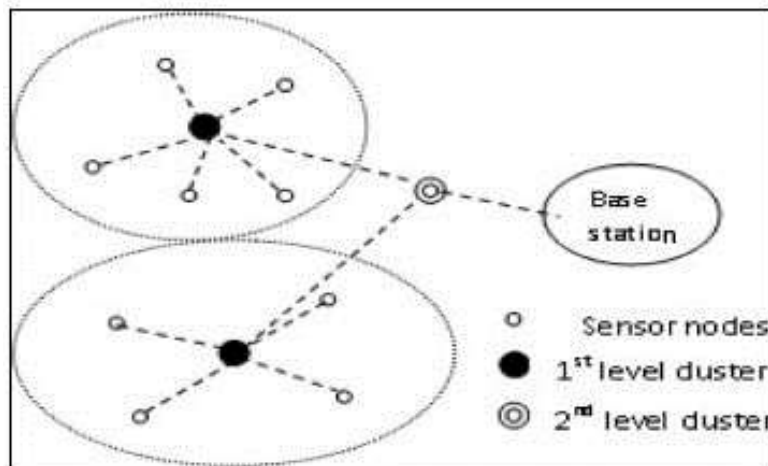


Figure 2: DEEC protocol(Cheikh et al. 2014)

4.3 STABILITY ELECTION PROTOCOL(SEP)

SEP [10] concentrate the effect of heterogeneity of Clusters, as far as their vitality, in remote sensor arranges that are progressively bunched. Following properties are considered

- In these systems a portion of the nodes progressed toward becoming bunch heads, total the information of their group individuals what's more, transmit it to the sink.
- It accept that a rate of the populace of sensor hubs is outfitted with extra vitality assets which is a wellspring of heterogeneity which may come about from the underlying setting or as the operation of the system advances.
- It additionally consider the sensors are arbitrarily (consistently) appropriated and are not versatile, the directions of the sink and the measurements of the sensor field are known.
- It is assumed in SEP that nodes cannot take full favorable position of the nearness of hub heterogeneity.
- SEP, a heterogeneous-mindful convention to draw out the time interim before the passing of the principal hub (we allude to as strength period), which is pivotal for some applications where the criticism from the sensor organize must be solid.
- SEP depends on weighted race probabilities of every hub to end up bunch go to the rest of the vitality in every hub.
- SEP[11], [12] is advancement associate with DEEC. Energy is conserved and lifetime of network is improved considerably by the use of this protocol.

Representation of SEP is as under

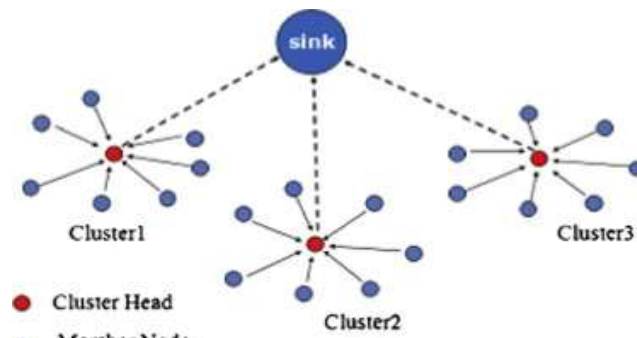


Figure 3: Representation of SEP(Cheikh et al. 2014)

4.4 ENHANCED DISTRIBUTED ENERGY EFFICIENT CLUSTERING PROTOCOL (EDEEC)

Remote Sensor Networks (WSNs)[13]–[15] comprises of across the board arbitrary sending of vitality obliged sensor hubs. Following properties exists of EDEEC.

- Sensor hubs have distinctive capacity to detect and send detected information to Base Station (BS) or Sink.
- Detecting and in addition transmitting information towards sink requires substantial measure of vitality.
- In WSNs, save vitality and delaying the lifetime of system are incredible difficulties. Many directing conventions have been proposed with a specific end goal to accomplish vitality productivity in heterogeneous condition.
- EDEEC for the most part comprises of three sorts of hubs in amplifying the lifetime and solidness of system.

Enhanced distributed energy efficient clustering protocol is advancement of DEEC that conserve energy and reduce packet drop ratio considerably. Further enhancement in DEEC can be made to enhance performance DEEC by reducing distance between nodes in which data is being transmitted.

Today's world needs some technologies to fulfill their routine work. WSN[16] is that technology which fulfills the routine work of the society. Wireless sensor network senses the physical world whether it is temperature, pressure, humidity and some other environment activities. WSN is used in an environment where the wires or cable are not possible to reach. It is easy to install compared with the other cables network. Now, these day's WSN are using mainly for the data transfer purpose. Sensor nodes[17] in the wireless network transfer the data packets from source to destination. Wireless sensor network includes sensors nodes and a base station (sink) and there are so many sensors which create a network. All the sensor nodes in a network communicate with each other and transfer the data packet from source node to the sink. Sensor nodes can communicate directly with the base station. Sensor nodes consume a lot of energy while data transfer. On the other hand, sensor nodes also consume energy after transferring the data packets. Due to this consumption, the lifetime of the network also gets reduced. This is the major issue of the sensor network. There[18] are more issues of the network but energy consumption and improve the lifetime of the network. Taking these issues in concern, there is one method which is very much useful to resolve these problems called clustering. Clustering, the technique in which large network region is divided into smaller one. With this technique, sensor nodes do not require direct communication with the base station.

Representation of EDDEC is as under

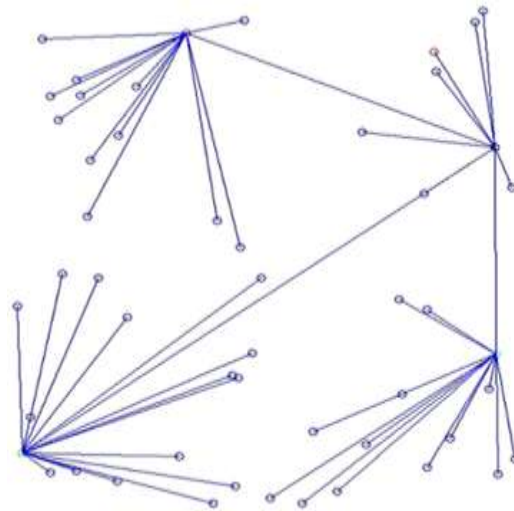


Figure 4: Representation of EDEEC(Preethi et al. 2016)

In every cluster, there is a cluster head which collects the data from all the network nodes and then transmits that data to the base station. The cluster head is elected on the basis of maximum energy of the node. The node which has highest energy is selected for cluster head. Basically only cluster head is responsible for the communication in the network. Cluster head needs more energy for the data aggregation and transmitting the data. So after transmission of the data, its energy reduces and the node which has second highest energy is selected for cluster head. There is so many clustering protocols which not only reduces the energy consumption but also enhance the network lifetime. These protocols are LEACH, HEED, DEEC, EDEEC, SEP etc. These protocols are cluster-based protocol and a lot of work has been done with these protocols. LEACH is the first protocol which came into the existence in the clustering protocol. DEEC is also a cluster-based protocol in which cluster head is selected based on the residual energy of the sensor nodes and the average energy of the network. EDEEC is the enhanced version of the DEEC protocol and requires a heterogeneous network. LEACH is the homogeneous network.

5. RESEARCH GAPS

Energy conservation is one of the prime issues associated with existing clustering protocols. Cluster head selection causes huge amount of energy to be consumed. In case cluster head selected is not optimal, it may cause large amount of packets to be lost. The packet drop ratio is another parameter which is critical in analysis of performance of clustering algorithm. Distance consideration is missing or shortest path algorithm is not considered causing degradation of performance in existing system. To overcome the problems of existing system distance based approach in DEEC can be proposed. Problems in existing literature are listed as follows

- Energy conservation is high
- Packet drop ratio is high
- Residual energy is low
- Distance based mechanism is not considered

6. CONCLUSION AND FUTURE SCOPE

This paper presents comprehensive survey of techniques used within WSN to achieve increase in lifetime of sensor within WSN. Critical analysis of various efficient protocols used in WSN has been reviewed Enhancement in lifetime involves mechanism such as sleep and wake up protocol but has demerits associated with it. The idle nodes are considered to be sleep and in results there is breakage in functioning of topology. In order to restore the nodes to their initial state sufficient energy is required leading to loss of packets. Secondly the distance conservation mechanism is not considered in DEEC protocol which results in high packet drop ratio. In case of leach aggregation the cluster head causes problem because if cluster head is dead then all packets collected at cluster head are lost automatically. From analysis of existing techniques it is identified that there exist a tradeoff between energy and packet drop ratio. In future this tradeoff between energy and packet drop ratio is to be

eliminated by considering distance between nodes before selection of cluster head or by making more than one cluster head. Use of priority queue can also be merged within existing approach for enhancing performance of WSN.

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