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A Review on Energy Efficient Routing in Wireless Sensor Networks

Navjot Kaur[1], Jatinder Kumar[2]

Department of Computer Science & Engg, SSCET, Manawala, Amritsar[1]

Asst Professor Department of Computer Science & Engg, SSCET, Manawala, Amritsar[2]

Abstract: There has been plenty of interest in building and deploying sensor networks. These networks are composed of a high number of very easy nodes wherever the majority of them ought to perform the function of a router also. Energy consumption of these nodes is important issue because the power provide of the node is provided by restricted batteries methodology, which limit the lifetime of the links additionally to whole networks. The energy treatment of network sensor node is serious issue for long lifespan of the network. Because the sensor nodes are being acting like routers as well, the choice of routing algorithm would be a key role within the energy consumption control. in this review paper we have done study and also the analysis of varied research work associated with Energy efficient Routing in Wireless sensor Networks in order to design an energy proficient path routing protocol for WSNs that's efficient in terms of the energy usage of the whole network such network wouldn't get disconnected because of the energy depletion of its nodes.

Keyword: clustering, Energy, Efficient, hole, Routing, static, Wireless Sensor Network.

1. INTRODUCTION

WSNs consist of little and less complicated devices known as sensor node. The characteristics of sensor node are:
• Sensing the environment or surrounding and collect the data from the surrounding and communicate through wireless links.
• Collected information is forwarded using multiple hopes relaying on controller that's used to connect with the alternative networks [1]
Elements of sensor node are shown is shown below.

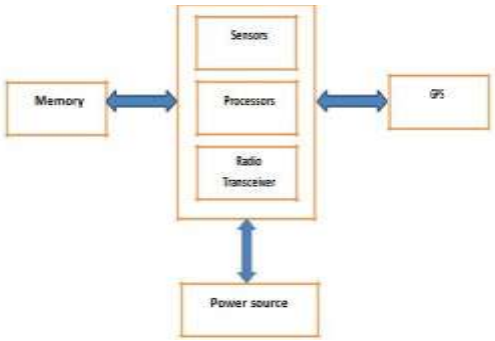

Figure1: Elements of Sensor Node

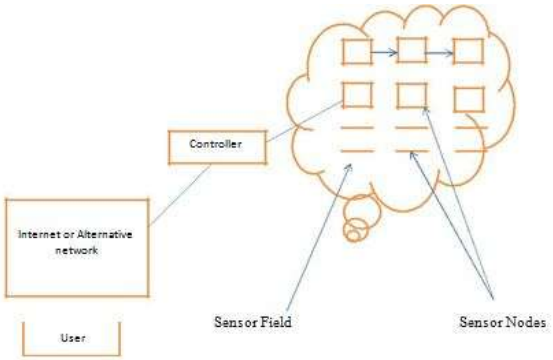

Figure2: Sensor Nodes spreaded in a sensor field

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A wireless network is created from several entities that are: Scattered sensor nodes, Controller, Network (internet or alternative) and User. The sensor nodes are scattered within the sensor fields as shown in above figure

Replacement of sensor nodes carrying very less power sources is tough and life time of sensor depends upon power supply. To reduce energy consumption, energy efficient routing protocol is needed. So, designing energy efficient routing protocol may be a necessity. Several routing protocol are designed for WSNs. Routing in WSNs may be a very tedious task because of the inherent property of the WSNs [2].

2. ROUTING IN WSN

WSNs are intended for monitoring an environment. The main goal of a WSN is to gather information from a particular domain, forward it to the sink, wherever the application lies. Guaranteeing the direct communication between a sensor and the sink could drain the nodes' power very quickly, as of higher energy demand in transferring messages. So, it's generally needed that the nodes are collaborated to confirm communication of distant nodes with the sink. in this method, messages are propagated through intermediate nodes by establishing a route to the sink. Routing protocols for WSN are responsible of discovering and maintaining the routes within the network [3].

According to the participation style of sensor nodes, routing protocol in WSN might be classified into three categories. Direct Communication: within the case of direct communication, any node may be sent data directly to the bottom Station (BS). Applying this routing technique {in a| during a| in an exceedingly |in a very} very large network could drain the energy of sensor nodes quickly. It's very tiny. Example: SPIN. Flat: in this kind of protocols, if any node requests to transmit the info, firstly searches for a route to BS and after that transmits the data. This way, nodes around the BS could drain their energy quickly. Its scalability is average. Example: Rumor routing. Clustering: according to the clustering routing protocols, the whole area is split into numbers of clusters. Every cluster has the cluster head (CH) and this cluster head will directly communicates with BS. Nodes are during a cluster send their data to their corresponding CHs. Example: teen.

3. ROUTING PROTOCOL

Routing algorithm is used by the routing protocol to determine optimum network information transfer and communication paths between network nodes. There are variety of parameters to classify and compare completely different routing protocol.

Classification of Routing Protocols
A WSNs could be have classified in four ways, routing path establishment, network structure, protocol operation primarily based, initiator of communication and application design of network as shown in below figure

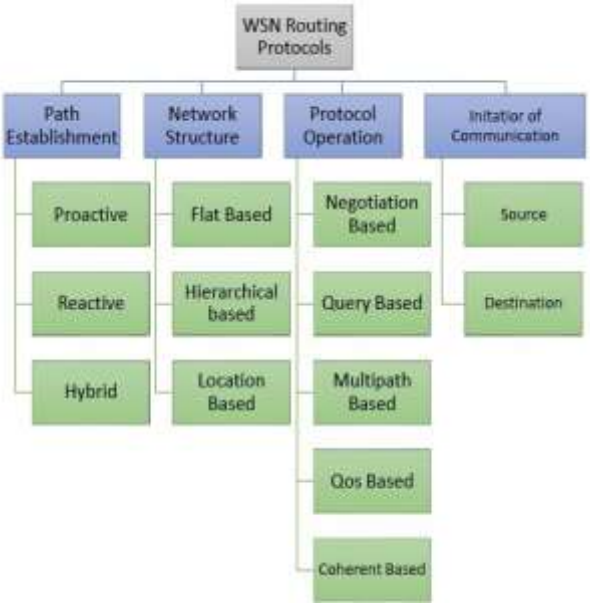

Figure: 3 Classification of Routing Protocol

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I. LEACH

(Low Energy adaptive clustering Hierarchy): in the network, for distributing energy loads among the sensor nodes this adaptive clustering protocol is used. It uses single hop routing mechanism wherever information is transmitted on to the cluster head or the sink [4]. It works in two parts:

1) The setup phase: Organization of clusters, choice of cluster head is completed and to determine whether a node will become a cluster head or not, a formula is used in every spherical.

2) The steady state phase: so as to reduce overhead the information is sent to the bottom station, the period of the steady state phase is longer than the period of the setup phase in order to reduce overhead. Cluster head creates a TDMA (Time Division Multiple Access) schedule based on the number of nodes within the group. CDMA (Code Division Multiple Access) code is used for random communication within the cluster. LEACH isn't appropriate for big network areas.

Advantages of LEACH protocol

1. It mostly uses hierarchical routing algorithms in sensor networks.
2. The entire wireless sensor network is split into several clusters in leach protocol. The Node that's served as a CH in present round can't be selected because the CH again; so each node will share the load equally that is imposed on Cluster heads.
3. Choice of CH node is random so there are equal probabilities of every node to that energy consumption of whole network is averaged. So LEACH can prolong the network life cycle [5].

Disadvantages of LEACH protocol

Due to the dependence on cluster heads instead of the cluster members for communicating with the sink, it is because of modification of CH in every iteration of the communication of knowledge. There's no inter-cluster communication within the networks as a result of the CHs will directly communicate with the sink. This method needs high range of the transmission power within the network. In LEACH CHs are not at all uniformly distributed inside the cluster that means the CHs may be placed at the edges of the clusters. In LEACH, CH selection may be a random method, that doesn't take into considerations the energy consumption of the various nodes within the cluster along with the CH into account and this results in the reselection of CH because the same node in several simultaneous iteration of knowledge processing within the network. It doesn't work well with the application that needs giant space of coverage along with the multi-hop inter-cluster communication [6] [4].

II. IB LEACH Protocol:

This protocol is the improved version of LEACH protocol. The benefits and disadvantages of IB LEACH protocol are:

Advantages of IB LEACH protocol:

1. High cluster stability.
2. Scalability of the network is simple.
3. Most efficient protocol to balance the load in wireless network.
4. Energy efficiency is incredibly high as compared to other routing protocol.

Disadvantages of LEACH protocol

1. High delivery delay
2. Complexity of the algorithm of this protocol is little bit high.

III. HEED

Hybrid Energy efficient Distributed clustering Protocol: HEED extended the fundamental scheme of LEACH by using residual energy and node degree as a main parameter for cluster election to attain power balancing. By using an adaptive transmission power within the inter-clustering communication, it works in multi-hop networks. In HEED, the proposed algorithm periodically chooses CHs depending upon the combination of two clustering parameters. Residual energy of every sensor node is the initial parameter and the second parameter is the intra-cluster communication cost act because the node degree (i.e. number of neighbors). The primary parameter is used to pick an initial set of CHs and the second parameter is used for breaking ties [7].

Advantages of HEED Protocol are:

1. Networks lifetime improvement as compared to the LEACH clustering as a result of LEACH randomly selects CHs, which can lead to faster death of some nodes.
2. The nodes only need local (neighborhood) information to create the clusters.
3. In HEED due to distribution of energy, the lifetime of the nodes is enhanced inside the network which results in stabilizing the neighboring node.

Disadvantage of HEED protocol

1. Due to very large workload some Cluster heads that are near to the sink might die.
2. Likely LEACH protocol, the clustering in every round appoints important burden within the network. This burden causes remarkable energy dissipation which results in decline of the networks lifetime.
3. HEED suffers from a consecutive burden because it wants much iteration to create the clusters. Thus because of many iterations several packets are broadcasted.

IV. TEEN (Threshold sensitive energy efficient sensor network protocol)

For reactive network the primary developed protocol was teen. The reduction of range of transmission is that the purpose of hard threshold that is finished by allowing the nodes to transmit only if the sensed attribute is within the range of interest. The soft threshold additional reduces the number of transmissions by eliminating all the transmissions which could have otherwise occurred once there's very little or no modification within the sensed attributes once the hard threshold. Teen is well matched for time essential applications and is also quite efficient in terms of energy consumption and response time. It also allows the user to manage the energy consumption and accuracy to suit the application. the most disadvantage of this scheme is that if the thresholds are not achieved, the nodes can never communicate, the user won't get any information packet from the network and cannot come back to grasp about the nodes if they die. Thus, this scheme isn't well appropriate for applications wherever the user needs to induce data regularly. Another drawback is that a practical implementation would have to make sure there collision-free cluster [5].

V. ZECR (Zone-Divided and Energy -Balanced clustering Routing)

ZECR protocol may be a one of the efficient protocol for WSN and adapts to the energy heterogeneous network. the most advantage of ZECR is that it will balance the energy consumption of the network and prolong the network life time obviously. During this section the details of ZECR protocol will be illustrated by the five components in sequence: Zone division, Size of cluster radius, Cluster set-up phase, Inter-cluster multi-hop routing phase and information transmission phase [8].

4. IFREQUENT PROBLEMS OCCUR IN WSNS SOME FREQUENT OCCURRED PROBLEMS [8] ARE

1. Coverage problem: It shows however well a sensor monitored or tracked during a wireless network.
2. Position estimation drawback: determining the actual position of nodes within the wireless network is that the real problem.
3. Energy Consumption: In WSNs most of the energy is consumed in transferring and receiving of data as compared to sensing and processing of data.

5. CONCLUSION

In this review work we analyzed the sensors nodes in WSNs have got only limited sources of energy and computing. The main limitation of these networks is that the quantity of energy consumption. The lifetime of a Wireless sensor Network depends on its node's energy level. In most of sensor networks there's no way to recharge node's battery because of its unattended nature; thus efficient use of the available energy sources of the node is important. The routing protocol should consider the link quality and the possible interference and the noise level of the link before choosing a next hop node for communication. Wireless sensor Networks, which can be spread over a vast geographical area, have their applications in several fields. There's need of approaches which may manage these WSNs in higher way possible.

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