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CONVENTIONAL ENERGY EFFICIENT ROUTING PROTOCOLS IN WIRELESS SENSOR NETWORKS

Abstract

Wireless sensor network is a significant piece of wireless communication. It is a gathering of an enormous number of sensor nodes that are set in remote spots. The sensors have ability to do a typical undertaking. So energy exhaustion plays a significant job in keeping up a stable network. To build the system lifetime, a different energy effective algorithm is required which expands the network lifetime and makes the network more energy productive. For the augmenting, the lifetime of the network diverse routing technique has been utilized which help in expanding the lifetime of the network. This article portrays the diverse routing protocol which helps in energy efficient routing in a wireless sensor network.

1. INTRODUCTION

Wireless sensor network (WSN) comprises of a few sensors that are scattered spatially and are utilized to monitor the sensation in environment, for the computation of the conditions occurring in the environment identified with temperature, pollution levels, and humidity. The sink or base station gets data when these sensors collaborate and interface with one another and pass their data in the network. In the course of the most recent decade, there is quick advancement in WSN on account of its properties of having low power battery, wireless communication, and little size. They are generally utilized in numerous applications that are executed in a real environment. The network is basely made out of a few of sensors and gathering of sensor which are conveyed near ready to play out the quantity of

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exercises which imply sensing, monitoring, processing and communication abilities implying the chronicle of data about the occasions which are occurring in the environment. The essential components which are attached in the sensors are micro-processors, transceivers, external memory, and processing unit. Some additional components, for example, mobilizer, and power generator are also attached to it. Processing unit which is comprises of analog-digital converter and deals with the methodology through which coordinated effort of one sensor node to another sensor node. Transceiver unit keeps up the foundation of the node to the network. The microprocessor plays out the capacity which incorporates the administration and assortment of data from sensors node, interfacing of physical radio layer to data which is sent by the user (Shuang, 2015). Figure 1 shows the component of wireless sensor networks (WSN).

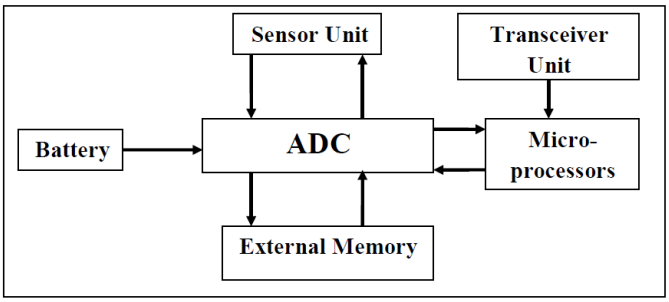

Fig. 1. Wireless sensor component (Shuang, 2015)

2. DIFFICULTIES IN WIRELESS SENSORS

Wireless sensors are sent at remote spots, to get the full limit of sensors networks, some constraint of these networks which causes technical issues in the network must be expelled. A few difficulties which hinder the performance of the network are identified with adaptation to fault tolerance, communication, low latency, scalability, transmission media, and coverage issue. To take care of the above issues diverse routing protocol is utilized. Diverse routing strategies are utilized for transmitting the data from the sensor node to the base station. Routing procedure is very not quite the same as should be expected IP network routing which comprises of various unique characteristics in a manner to unreasonable for a global addressing procedure for different quantities of sensor nodes, requirement for a method that can be applied to a system for appropriate linkage of a sensor node to a base station. For working the system to accomplish the ideal, it must require routing protocol (Swetha, Santhosh Amarnath & Anitha Sofia, 2019). These protocols are characterized into the accompanying ways and to make the system (Wireless Sensor Network) more energy efficient some energy efficient protocols are explained in the following section.

3. ENERGY EFFICIENT PROTOCOLS

Energy efficiency performs a significant job in WSN. These days the size, shape of the network is increasing. Because of it, the huge most measure of energy of a node is utilized which expands the early death of a node. Thus unique effective routing protocol is created to increment the lifetime of the network. Following are known and most common energy-efficient routing protocol.

3.1. Track Sector Clustering (TSC)

Track sector clustering dependent on the clustering algorithm in which each cluster one cluster head is chosen. The entire network is partitioned into triangular sectors and concentric circular tracks. The partition of network right now in energy saving. The procedure of TSC for its execution is partitioned into phases. Track setup, Sector setup, Cluster heads selection, chain construction, and data transmission. Sensor nodes energy is not squandered by the calculation of tracks by the base station. Energy dissipation is additionally decreased by redundancy distance between a head node to the base station. The focal point of these concentric circles is a base station. Random choice of the head node is done at the primary level. At the point when the base station decides the area of the head node it computes the transmission slope. In a specific cluster, the arrangement of the head node happens when nodes that are at a higher level have a similar transmission slope. The methodology utilized assists with decreasing the redundancy level in the data which is transmitted by breaking the long chain of nodes into a littler one. In a specific cluster, the formation of the head node happens when nodes that are at a greater level have a same transmission slope. The benefit of utilizing TSC is to diminish in data for transmission in the network (Gautam, Lee & Pyun, 2009). Figure 2 shows data gathering at head nodes in TSC protocol.

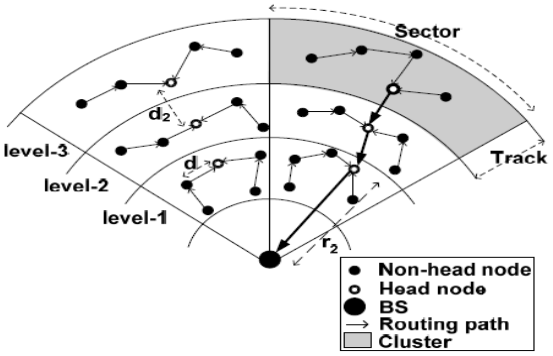

Fig. 2. Data gathering at head nodes in TSC protocol (Gautam, Lee & Pyun, 2009)

3.2. Low Energy Adaptive Clustering Hierarchy (LEACH)

The working of LEACH is partitioned into two phases

1. Set up phase which partitions the network into clusters, CH makes notice for a timetable of transmission.
2. The steady phase involves data aggregation, compression, and transmission to the sink.

The benefit of employments of LEACH is its direct communication by each cluster head for sending the information to sink. The utilization of the cluster is increment the lifetime of the network. It aggregates the original information which is sent by the detected sensor into a littler size for simple transmission of information. In LEACH protocol each node is allowed to turn into a cluster head which assists with diminishing the likelihood of passing on the sensor nodes (Xiangning & Yulin, 2007). Figure 3 shows data gathering at head nodes in LEACH protocol.

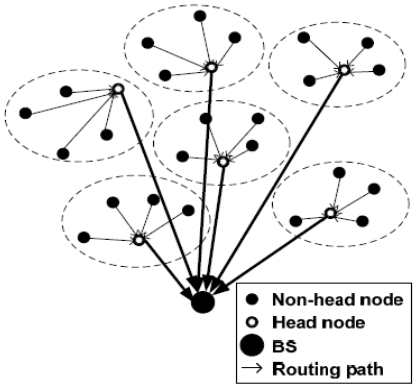

Fig. 3. Data gathering at head nodes in LEACH protocol (Xiangning & Yulin, 2007)

3.3. Power-Efficient Gathering in Sensor Information Systems (PEGASIS)

This PEGASIS protocol was acquired after modification in LEACH was finished. A chain-like structure of nodes is done and every node sets up communication just with its neighbor which is close in distance. The transmission of data happens through one node to another node just with the assistance through one node which is assigned can send data to the base station. The leader node is altered turn by turn during transmission of information. The base station decides if it is chain formation or the chain structure by the nodes themselves utilizing a algorithm (greedy). It needed a global knowledge (network knowledge). At the point when information is move every node assembles its information from its neighboring node. At random areas, to make system powerful sensor nodes die. This entire

procedure is accomplished by changing the transmission leader in each communication round. To take care of above issue, nodes that are permitted, so they can form leaders, by making a limit to a distance for neighbors (Jung, Han & Chung, 2007). The benefit of the PEGASIS is the transmission number is less which helps in less loss of energy by the sensor nodes. Figure 4 shows data gathering at head nodes in PEGASIS protocol.

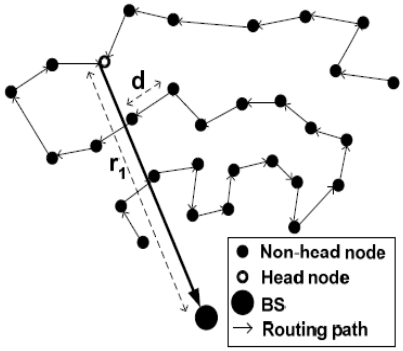

Fig. 4. Data gathering at head nodes in PEGASIS protocol (Jung, Han & Chung, 2007)

3.4. Threshold Sensitive Energy-Efficient Sensor Network Protocol (TEEN)

It is particularly made for reactive networks. The reactive network is the network that comprises of those sensor nodes which embrace the adjustments in themselves as indicated by the progressions which happen in environment. To expand energy efficiency, the transmission number is decreased in the network. There is a particular range of utility when information value falls, at exactly that point information transmission happens. Each cluster in the network has a cluster head that sets properties.

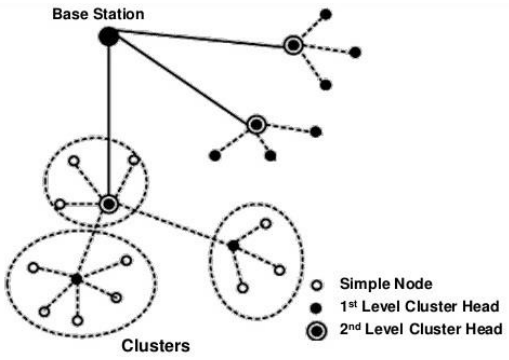

Fig. 5. TEEN protocol (Bria, Wahb & Alaydrus, 2019)

In the (hard and soft) threshold, these thresholds are of its part nodes. The transmission of information occurred when its value is larger than soft threshold value along the estimation of the contrast between the older and new one, on account of the above methodology, certain transmission (TEEN) are wiped out and that conserves the energy of those sensors which are available in the network (Bria, Wahb & Alaydrus, 2019). Figure 5 describes TEEN protocol.

3.5. Hybrid Energy-Efficient Distributed Clustering (HEED)

The reason for this strategy was the formation of a cluster that is distributed and energy efficient. In notice for the choice of cluster head, two parameters must take into account:

1. The residual energy of every node.
2. Node degree.

For the chosen of CH, the residual energy of the node along with some likelihood is taken thought. The procedure of formation of cluster head happens for the situation when the various nodes which are available in the network discovered their CH to keep up less expense of communication benefit. The benefit of utilizing HEED is help in keeping up long network lifetime, shore scalable information aggregation (Younis & Fahmy, 2004). Figure 6 describes HEED protocol.

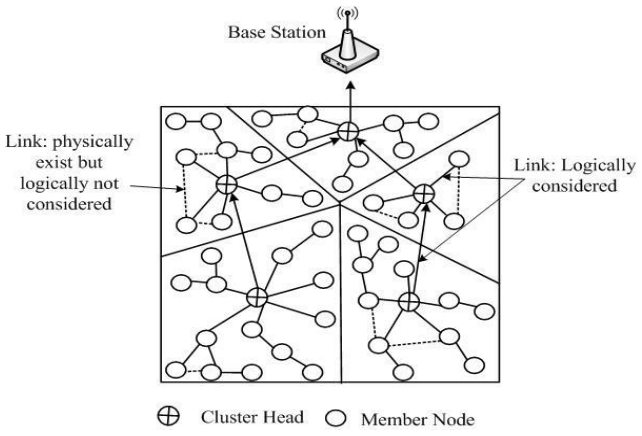

Fig. 6. HEED protocol (Younis & Fahmy, 2004)

3.6. Stable Electron Protocol (SEP)

In the clustered heterogeneous WSN, which has a few benefits over LEACH? The two-level of heterogeneity of sensor node is deemed. They are characterized into two sorts:

1. Normal node.
2. Advanced node.

Advanced node when contrasted with normal node they have greater likelihood of turning into a cluster head when contrasted with other sensor nodes. In the sensor field, this protocol is more scalable, in light of the fact that it needn't the position of nodes (Ayoob, Zhen, Adnan & Gull, 2016). Figure 7 describes SEP protocol.

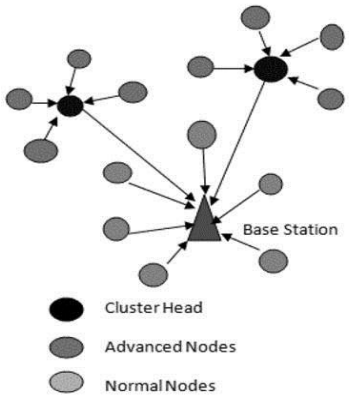

Fig. 7. SEP protocol (Ayoob, Zhen, Adnan & Gull, 2016).

3.7. WSN Routing Protocols Comparison

Right now routing protocols comparison is finished. Table 1 reveals the comparison of various routing protocols in WSN those were studied in this article with the parameters, power efficiency, network stability, cluster head formation, and network scalability.

Tab. 1. Comparison of WSN routing protocols

Energy-efficient routing protocol	Power efficiency	Network stability	Cluster head formation	Network scalability
TSC	moderate	moderate	yes	moderate
LEACH	low	moderate	yes	low
PEGASIS	low	low	no	very low
TEEN	very high	high	yes	low
HEED	moderate	high	yes	moderate
SEP	high	high	yes	high

4. CONCLUSION

In this article short survey on energy efficient routing protocols in WSN and their comparison is introduced. From above comparison a perception is done that cluster based protocols are more energy efficient. WSN which have gain consideration in the course of the most recent couple of years are broadly utilized in both civil and military. There is different difficulties task for viable structure of these WSN. Routing protocols are extraordinary answer for handle the difficulties which happens in WSN. Future work can be reached out on growing new routing protocol which manages issue of node mobility applications.

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