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Energy Efficiency in Wireless Sensor Networks for Combat Monitoring System

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Abstract:- Wireless sensor community (WSN) performs an crucial function withinside the current world. It may be very useful generation for sending and receiving records from the elements of the community device the usage of sensor nodes which might be allotted over an place. These nodes are responsible for appearing many record operations like collecting, processing the records and perform different operations. They have the crucial electricity for appearing those procedures from the batteries hooked up in those nodes. In many places , the sensor nodes are consists small size battery of very few electricity. It is important to lesser electricity consumption and to make the life of the community as long as possible. For this, the Low Energy Adaptive Clustering Hierarchy (LEACH) protocol is used in earlier. In this research, we proposed a method to layout an electricity green routing protocol .This protocol is designed to reduce electricity ate up in every node through lowering the quantity of time wherein a sensor node is in an idle nation and lowering the common distance over the community. The overall performance of the proposed protocol became evaluated withinside the context of community lifetime and electricity intake.

Keywords:- *Wireless Sensor Network (WSN), Sensor Node, LEACH Protocol.*

I. INTRODUCTION

Wireless Sensor Networks (WSN) are decentralized networks that were given sizeable interest for huge scope of applications including of health, clever buildings, security, army applications and agriculture monitoring. WSN constitutes of a massive wide variety of tiny, reasonably-priced and restrained battery-powered nodes that paintings collectively to carry out numerous responsibilities. The sensor nodes speak with every different withinside the community for collecting and sending a whole lot of messages approximately the monitored item to the sink (base station), which in turn, procedures the data and reviews it to the end-user. To accomplish those responsibilities, a massive wide variety of protocols are proposed withinside the literature. However, the principle trouble faces the WSN protocols, is that each node withinside the community has restrained battery electricity. Increasing community lifetime is one of the severe demanding situations that need to be studied at some point of the designing degree of the community. As sensor nodes finished their electricity fast including of sensing, processing, transmitting records, and conversation so it is the most important electricity consumer, there need to be a control plan to enhance the community lifetime. The lifetime of the community is the time of the primary sensor node in which it finished all its strength and turns into useless . Nowadays there are numerous styles of low electricity ingesting protocols that growth the networks' lifetime, they're divided into companies, flat and hierarchical . In this research paper, the hierarchical clustering type could be addressed. The clustering-primarily based totally hierarchy extends the lifetime through growing the hierarchy degree primarily based totally at the reason of the software of WSN . The clustering-primarily based totally routing protocols may be divided into main companies; allotted and centralized. The accountable detail withinside the allotted clustering is the nodes even as the bottom station is the accountable detail withinside the case of centralized clustering to carry out the records transmitting manner . In in advance works, many styles of LEACH had been studied, the Classic Leach became studied and became as in comparison to the non-clustering algorithms wherein the time of the primary useless node is 8 instances large than the non-clustering. Many change is finished to LEACH to growth the community lifetime or lower the electricity intake, for example, a centralized LEACH became evolved through dispensing the Clustering Hierarchy (CH) nodes everywhere in the community. However, its trouble became the want for Global Positioning System (GPS) to speak with the bottom station and that might growth electricity intake. In this paper, a brand new technique of dividing the community place into clusters is provided through the usage of circular paths to grow the lifetime of WSN compared to traditional LEACH.

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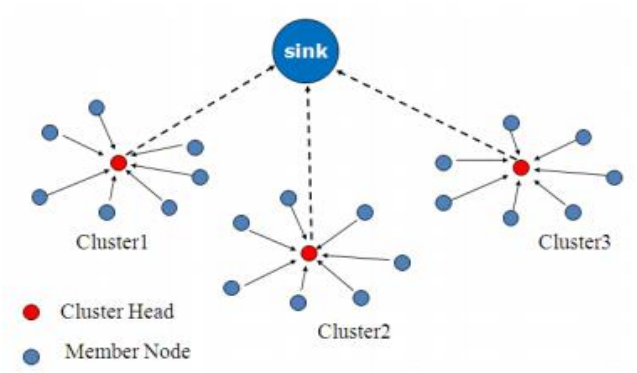

Figure 1. Routing in LEACH

II. LEACH PROTOCOL

LEACH protocol is used as a probabilistic method for the choice of the node in a random manner. The responsibilities of sensing and transmitting the records to the cluster head are finished through a regular node. Whereas, the cluster head plays the responsibilities of processing, aggregation, receiving and transmitting records to the sink or base station. So the cluster head spends greater electricity than non-cluster head one. Every node could be selected as a cluster head to keep the manner of transmitting records. The intake of the node's electricity could be finished systematically till the closing node loses its power and become unusable and so as to the lifetime of the network. LEACH protocol is cut up into numerous rounds, every spherical includes the subsequent phases:

Phase 1: Setup

In this phase, a random wide variety R, from zero to at least one is chosen randomly from every node with a threshold T price of the node. The threshold electricity may be calculated from the subsequent

$$(n) = p\ /1{-}p(r(mod\ 1/p))$$

Here, T(n) is the brink price, P is superior cluster heads choice probability, r is the prevailing spherical. If the price of sensor node's random wide variety (R) > T, then the given node will now no longer be appointed as CH for the present day spherical. If R < T, the node could be appointed because the CH for the present day spherical. After completing the choice of the cluster heads, the message of the equal spherical propagates to different nodes, which then come to be the cluster heads. specific cluster companies withinside the community are shaped in this kind of manner that the cluster head gets the node request message of excessive strength sign because of this that that this CH is in the direction of the node than different ones. And so on, the gap among the node and the cluster head is minimized and draining of electricity withinside the community is likewise reduced.

Phase 2: Steady-nation

This segment makes use of the strategies of CDMA (Code Division Multiple Access) and TDMA (Time Division Multiple Access), therefore, the period of this segment is longest than the preceding one. To keep away from the collision among indicators, every node has confined amout of time for transmitting the facts, that's assigned from the cluster head. When the facts packets arrived on the cluster head, they mixed with none confusion the usage of CDMA and ship to the sink. on this manner, the primary spherical is finished and the system is repeated till the strength of the ultimate nodes is finished . Figure 2 illustrates the waft chart of LEACH protocol, starting from the choice of the cluster heads and finishing with sending facts to the bottom station.

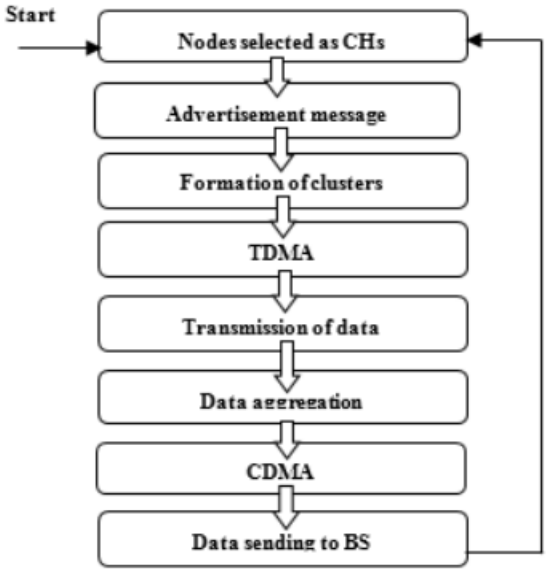

Figure 2. Flowchart of LEACH

III. THE PRRP PROTOCOL (CLUSTERING BASED ON CIRCULAR SHAPE)

In regular LEACH protocol, the cluster heads are dispersed randomly, it may be close to or a long way from the bottom station. The random located CH may also cause greater strength intake primarily based totally on the gap among the CH and base stations. The range of cluster heads in LEACH is numerous in unique rounds. Whereas, the protocol we proposed divides the community into round clusters wherein each cluster has its cluster head. The range of cluster heads is an premier predetermined value. The following assumptions are made in our Proposed Protocol:

- The strength degree of every node withinside the community may be calculated.
- The base station can acquire the messages despatched from unique nodes withinside the community.
- The places of the node may be despatched immediately from the nodes to the bottom station.

Our Protocol is primarily based totally on conventional LEACH wherein the rounds are divided into the set-up and constant nation periods. In the set-up length, the bottom station elects the nodes selected as cluster heads primarily based totally on their strength degree, if the strength exceeds the common strength value. The constant-nation length makes use of the TDMA technique for scheduling the facts indicators despatched to the cluster heads after which transmitted to the bottom station.

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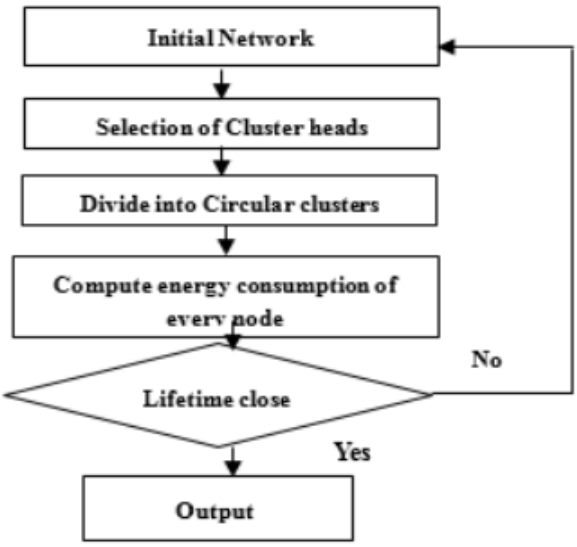

Figure 3. Flowchart of the proposed protocol

The restriction on clusters is based on the width of the network (W) where W equals 1000 and the diameter of each circular cluster equals the width divided by the number of segments on each side. It will be sure that the circular clustering will increase the average lifetime of the network by organizing the task of sending packets to the base station or sink.

Equations (1) and (2) are the script for the part of drawing circular cluster map in MATLAB.

numRe = fix(sqrt(p*N)) (1)

Where numRe, is the number of segments in each side

dr = W/numRe; (2)

where dr, is the diameter of clusters.

IV. SIMULATION AND RESULTS

In this section, the proposed protocol is compared with the classic LEACH. In this we use MATLAB for the simulations. The parameters of the network are given in the following table 1:

Table 1. Simulation Parameters

Parameter	Value
Network size	1000 m^2
Number of nodes	200
Initial Energy (E_0)	2 J
Cluster head percentage	0.1%
Number of rounds	200
Energy for transmitting one bit (E_{trans})	1.0000e-07
Energy for receiving one bit (E_{rec})	1.0000e-07
Data aggregation energy (E_{agg})	1.0000e-08
The energy of free space model amplifier (E_{fs})	0.3400e-9

The parameters of the network are taken from table 1. The conclusion/result for the network configuration before improvement and after the improvement, the total energy depleted and the number of alive sensor nodes are shown in (Figures 1,2 and 3), respectively. Figure 1 shows the configuration of the network for the classic LEACH protocol, the black bold dots indicate the normal nodes and the black empty dots indicate the dead nodes, whereas, the red dots are the cluster heads (CHs). The blue circle in the middle of the network is the sink or base station. In this configuration, the cluster heads are chosen randomly whereas the network configuration for the our proposed protocol, in Fig. 2 separated the network into a number of circle like clusters (green circles) and the cluster head is chosen inside each circle only (the red dot). The total energy dissipated by the classic LEACH is greater than our proposed protocol, as shown in fig. 3. Classic LEACH takes 510 seconds to dissipate the total amount of energy while the circular cluster takes 1310 seconds. Before the time of 100 seconds, the number of dead nodes for the proposed protocol is almost zero, which proves the effectiveness of the proposed improved LEACH protocol as compared to the classic one.

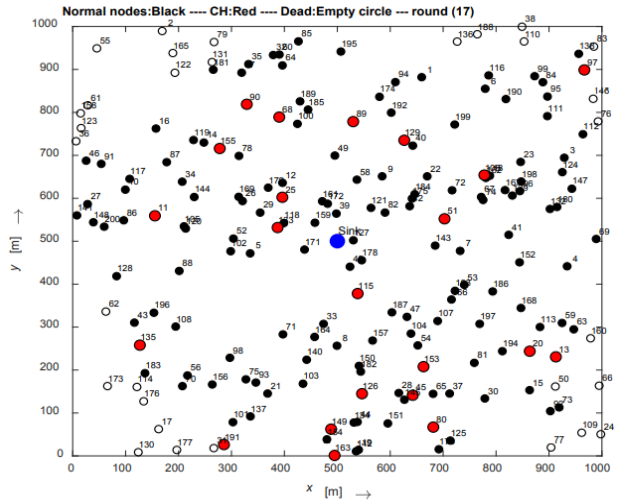

Fig 1. Configuration of network for Classic Leach Protocol

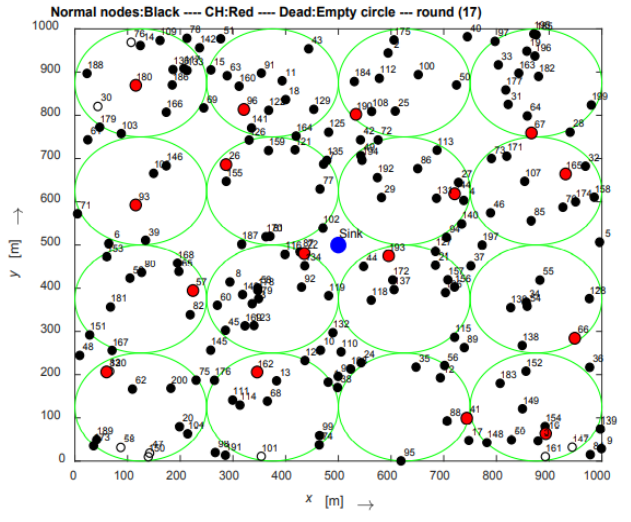

Fig 2. Configuration of network for proposed improved Protocol

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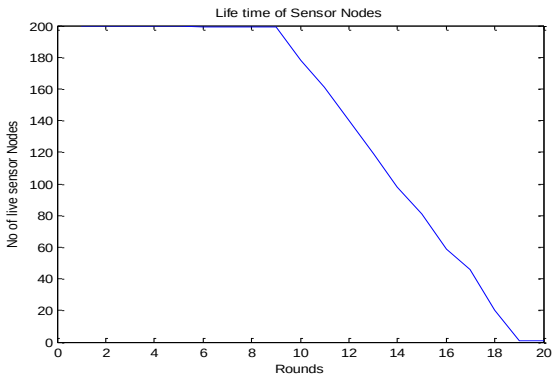

Fig 3. Number of alive node in LEACH.

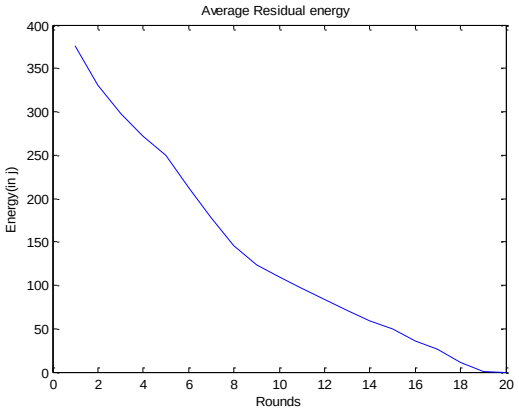

Fig 4. Total energy Dissipated for Leach.

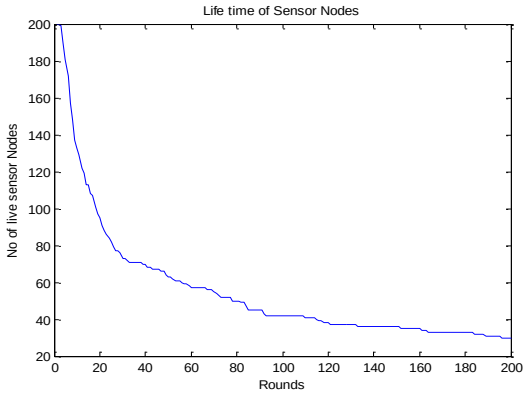

Fig 5. Number of alive node in Improved Leach.

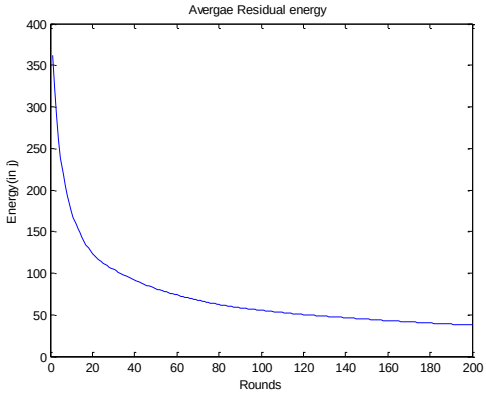

Fig 6. Total energy Dissipated in Improved Leach.

V. CONCLUSIONS

In this paper, a new improved protocol is proposed. The commonly known protocol for WSN is called LEACH. It is the first and the very important protocol in wireless sensor networks. It uses clusters based distribution to transmit data between nodes. The improvement on the LEACH protocol is achieved by dividing the network into clusters. The proposed improved protocol is better than the classic LEACH in many terms . From the results of the simulation, improved protocol decreases the energy usage and automatically increases the network lifetime as compared to the classic LEACH protocol by minimizing the number of dead nodes and maximizing the number of alive nodes through the 180 rounds to continue the process of transmitting data in wireless sensor network.

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