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Enhancement of Signal Strength Using GSTEB Routing Protocol In WSN

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ABSTRACT

A Wireless Sensor Network (WSN) composed of an enormous quantity of multifunctional wireless sensor nodes. Wireless sensor network is used to collect and send various kinds of messages to a base station .Wireless sensor networks are deployed where the physical environment is so harsh. For better performance of the network we should analyse and increase the signal strength. The current work involves comparing the signal strength of routing protocols such as LEACH, LEACH-C and GSTEB. General Self-Organized Tree-Based Energy-Balance Routing Protocol (GSTEB) is a protocol which is proposed for wireless sensor networks and is used to increase the source, channel and Destination signal strength. This protocol enhances the efficiency of the network. Among these protocols GSTEB provides higher signal strength compared to LEACH and LEACH-C.

Keywords: Wireless Sensor Network; Signal Strength; Routing Protocols

I. INTRODUCTION

A Wireless Sensor Network (WSN) has been deployed at an accelerated pace. It is reasonable to expect that whole world will be covered through the WSN in 10-15 years and access them through internet. It provides huge number of such nodes to communicate through wireless channels for information sharing as well as cooperative processing. The upcoming technologies `are built with unlimited features for numerous applications including environmental, medical, military, transportation, entertainment and smart spaces. A wireless sensor network can be referred as a group of nodes organized into a combined network. The sensor nodes are deployed randomly and densely in a targeted region. After the initial deployment of the network, sensor nodes are responsible for self-organizing an appropriate network infrastructure with multi-hop connections between sensor nodes.

Various components of a wireless sensor node includes sensing, computing, communication, actuation, and power components. These components are then incorporated on a single or multiple boards and packaged in a small number of cubic inches. A number of sensors and Analog to Digital Converters (ADC) are contained in sensing unit which are used to collect and spread environmental data. The processing unit is composed of microprocessor to store temporary data. During processing small memory storage units are used. Each node has a range between 2 to 512 kilobytes of RAM which is allocated for commercial purpose. The main function of transceiver unit is to send and receive data through a

wireless channel which is powered by batteries within the power unit.

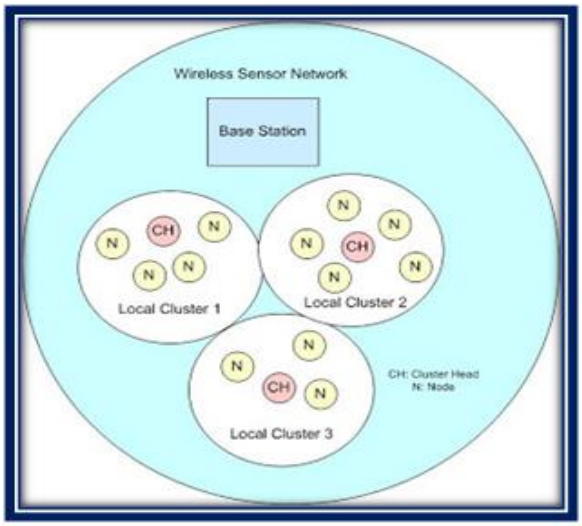

Figure 1. Architecture of WSN

Architecture of WSN is shown in Fig.1. Wireless Sensor Network comprises of a number of sensor nodes. Target node sends data to internet through Sink Node. This will broadcast to user [1]. WSNs are very useful and can be deployed to support variety of applications. These are based on growing technologies like Wireless Communication Technology, Information Technology, Semiconductors, MEMS, Micro Systems Technology, Micro-Sensors, Military Application, Health Monitoring Warehouse Management Temperature Monitoring and to check the concentration of chemicals and gases [2].

In this paper, the signal strength of LEACH, LEACH-C and GSTEB are compared. The paper is organized as follows. Section 2 describes the Methodology. In section 3 Simulation Results and discussions are presented. Section 4 concludes the paper.

II. METHODOLOGY

The Signal strength can be increased by using GSTEB protocol. This protocol is compared with LEACH and LEACH-C protocol which are used to increase the performance of the system. GSTEB protocol is based on tree structure and organizing nodes themselves automatically when signal strength decreases in root node [3].

Modules:

- Network Formation & Node Deployments
- Low Energy Adaptive clustering Hierarchal (LEACH)
- Centralized Low Energy Adaptive Clustering Hierarchal (LEACH-C)
- General Self-Organized Tree-Based Energy-Balance routing protocol (GSTEB)

A. Network Formation & Node Deployments:

Remote Sensor Network is eminent as most vital innovation in twenty-first century. A remote sensor arrangement works from huge number of sensor hubs that unite themselves to shape a remote system.Sensor hubs are in little size and battery-fueled gadgets.WSNs are utilized for some applications, for example, surge identification, home mechanization, ecological observing, woodland fire discovery and so forth. Sensor hubs are generally conveyed close to the Base station targets of enthusiasm for request to do short proximity detecting. All the sensor hubs are permitted to convey through a remote medium. The remote medium may be radio frequencies and infrared or some other medium, obviously having no wired association.

B. Low Energy Adaptive grouping Hierarchy (LEACH):

LEACH protocol is a type of hierarchical routing protocols and it is self-adaptive and self-organized in nature. LEACH protocol uses round as unit and each round is made up of cluster set-up stage and steady-state stage, for the purpose of reducing unnecessary energy costs and the steady-state stage must be much longer than the set-up stage .

i. **Set-up stage:**

In setup stage group heads are made utilizing course ask for correspondence process. Set of hubs which are not chosen as bunch head in past rounds and is later round. Hubs select themselves as CH in the interest of proposed rate and it's before record of CH. The hub that is chosen as bunch head in current round, will progress towards becoming group head again after secured all rounds. This is for uniform vitality dispersal all through the system. Chosen CHs send an ad parcel to different hubs which are not chosen as bunch go back to join their group. These hubs send joint demand to those CHs. from which they get ad parcel with most grounded flag control. After arrangement of group, CH make TDMA(Time Division Multiple Access) plan for its CM in bunch, CSMA (Carrier Sense Multiple Access) code and send TDMA plan table to its bunch individuals.

ii. **Steady state stage:**

In Steady State Phase group individuals transmits information to its CHs as per dispensed TDMA schedule openings. Bunch heads assembles information from its group individuals and totals this information to diminish measure of information that communicate to base station.

Downsides

1. LEACH does not give any thought regarding the quantity of group heads in the system.
2. Because of any reason if Cluster head passes on, the group will wind up futile in light of the fact that the information assembled by the bunch hubs could never achieve its goal i.e. Base Station [4], is the greatest drawback of LEACH.
3. Clusters are partitioned haphazardly, which brings about uneven dispersion of Clusters. For e.g. some groups have more hubs and some have lesser hubs. Some group heads at the focal point of the bunch and some group heads might be in the edge of the bunch; this wonder can cause an expansion in vitality utilization and have awesome effect on the execution of the whole system [5]

C. Centralized Low Energy Adaptive Clustering Hierarchy (LEACH-C):

Filter C is not the same as unique LEACH in bunch development yet its activity is alike unique LEACH Protocol. Drain C performs incorporated group calculation for choice of bunch heads (CHs). In LEACH-C setup stage is like unique LEACH yet Steady state stage is extraordinary. Base station (BS) gathers area information and vitality level related data from every hub. Presently base station has worldwide data of system. Base station ascertains normal hub vitality. Hubs having vitality more than normal vitality is chosen as group heads. Filter C utilize GPS or other area following strategies.

Base station sends its choice back to hubs about the selection of hubs as bunch heads. Base station communicates CHs ID(identifier) to hubs in system and hubs having the same ID are chosen as CH and the information from its group individuals utilizing TDMA plan are gathered. Concentrated LEACH utilizes a deterministic edge calculation to measure the vitality in the hub regardless of whether the hub was a bunch head in late time. The quantity of CH hubs and their position can't be guaranteed.

The focal control calculation is utilized as a part of Centralized LEACH to frame the bunches which create enhanced groups by disseminating the bunch head hubs through the system. Preferred standpoint of this convention over fundamental LEACH is the deterministic approach of picking the number of group head hubs in each round which is foreordained at the season of arrangement. Drain C causes better conveyance of bunch head hubs in the system .But LEACH-C requires current area data of all hubs utilizing GPS which isn't hearty [6] [7]

D. General Self-Organizing Tree Based Energy Balance Routing Protocol

General Self-Organized Tree-Based Energy-Balance Routing Protocol (GSTEB) [8] constructs a routing tree via a procedure in which for every single round, a root node is allocated by base station and transmits root node's choice to every nodes of sensor network. Then, every one node chooses its parent by taking into consideration simply itself as well as its neighbor's information, as a result making it a powerful protocol. It consists of four phases.

a. Initialization Phase
b. Tree constructing phase
c. Self-organized data collection and transmission
d. Information exchange phase

a. Initialization Phase:

The parameters of network are introduced in this phase. The parameters considered are such as required area, number of nodes, initial energy, radio model, packet size, maximum packet size, routing protocol and so on. Following these assumptions, Base Station (BS) sends packet to all sensor nodes in specific area to inform regarding the starting time. Each sensor nodes send its location awareness to all sensor nodes i.e., in the specific radius circle. This packet consists of node ID, Energy Level (EL) and distance of nearest nodes.

b. Tree Constructing Phase:

In tree constructing phase, each node elects parent node from its neighbors according to Energy Level (EL) and every node records its neighbors' neighbor information. The parent node is selected within the cluster by using EL. Lowest energy level nodes are acting as child nodes. These child nodes send packets to their parent node. That parent nodes send packet

to their respective CH. CH sends the packets to Base Station (BS). So distance will be reduced. EL should not be suddenly decreased.

c. Self-Organized Data Collection and Transmission:

After construction of tree, each node gathers information and it will produce data packet. The data packet of child node is send to CH through parent node. CH sends packet to Base Station. Nodes are self-organized with respect to the EL.

d. Information Exchanging Phase:

In this phase, parent node is exchanged when node exhausts its energy. After recognition of EL is reduced, the parent node exchanges in the next round of this phase. All nodes are monitoring the neighboring nodes. Automatically nodes are updating changes. It will move to next round after sending all packets.

III. SIMULATION RESULTS AND DISCUSSION

The simulation is carried out using NS2. The following Table 1 shows simulation parameter of protocols.

Number of nodes	1000*1000m
Area size	200ms
Simulation time	1118 bytes
Packet size	100 bytes
Maximum number of packets	1500
Routing protocol	LEACH, LEACH-C GSTEB
Initial energy level	20 watts
Model	Two ray model

Table 1. Simulation Parameters

IV. SIGNAL STRENGTH ANALYSIS:

Source signal strength, Channel signal strength and destination signal strength are used to evaluate the signal performance of LEACH, LEACH-C and GSTEB.

1) Source signal strength:

Fig.2 shows strength of the source over the time period. LEACH AND LEACH-C has less signal strength at source when compared to GSTEB protocol.

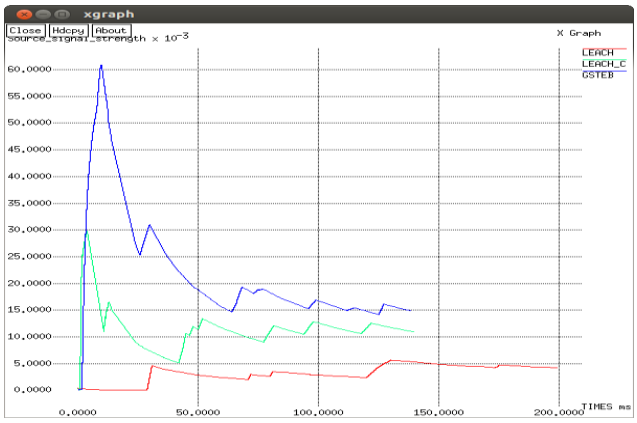

Figure. 2: Source Signal Strength Comparison

2) Channel Signal Strength:

Fig.3 shows the signal strength of the channel over the time period. LEACH AND LEACH-C has less signal strength at channel when compared to GSTEB protocol

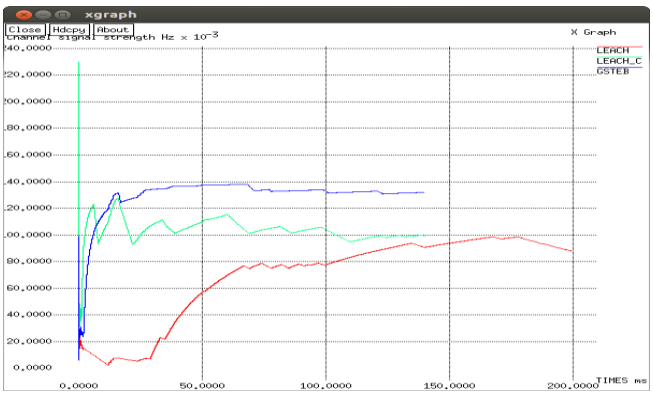

Figure 3. Channel Signal Strength Comparison

3) Destination Signal Strength:

Fig.4 shows the signal strength of the destination over the time period. LEACH AND LEACH-C has less signal strength at channel when compared to GSTEB protocol upto 75ms.

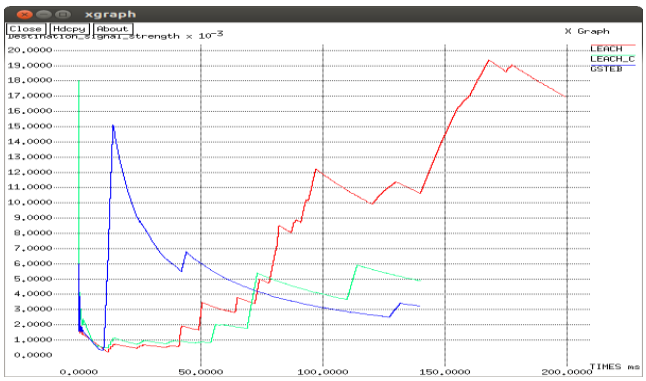

Figure 4. Destination Signal Strength Comparison

IV. CONCLUSION

The GSTEB protocol was compared with other two routing protocols (LEACH and LEACH-C). From the results obtained, it is analyzed that GSTEB provides better signal strength compared to other two protocols. Source, channel and Destination signal strength analysis are used to compare these protocols performance.

Our NS-2 simulation results show that GSTEB protocol outperforms than LEACH and LEACH-C. So we conclude that When compared , GSTEB protocol gives better performance in large area connection problem.

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