Energy Aware Routing using Improved Election Mechanism in LEACH

Shweta Malviya[1], Prof. Bhawna Pillai[2]

[1]*M-Tech Research Scholar,* [2]*Research Guide*

Department of Computer Science and Engineering, LNCT, Bhopal

Abstract - Wireless sensor networks are the integrated part of modern wireless communication networks and these networks benefiting several monitoring and research applications like earthquake, fishing, temperature monitoring, weather monitoring and wild life monitoring. These networks need to optimize for the energy to reduce the energy consumption for longer life time of the network. In this work we are going optimize the collection pattern of information from the nodes to base station or server. The analysis of energy is also important due to all the WSN nodes are battery depended and it has a limited source of power and this limitation is also motivation to develop efficient routing technique. In this work we have proposed modified routing algorithm of low energy efficient clustering (LEACH) with improved election mechanism and changes in the pattern of cluster head election probability. The simulation had been performed for 4500 transmission rounds and the network live longer more than 4500 rounds and throughput is approximately 4.03x10^4.

Keywords - WSN, LEACH, Cluster Head, Efficient Election.

I. INTRODUCTION

wireless Sensor Networks have developed as a vital new approach in wireless innovation. Soon, the wireless sensor networks are required to comprise of a huge number of cheap nodes, each having detecting capacity with restricted computational and communication control and which empower us to send a vast scale sensor organize.

A wireless network comprising of small gadgets which monitor physical or environmental conditions, for example ,temperature ,weight , movement or contaminations and so forth at various zones. Such sensor systems are relied upon to be broadly conveyed in an endless assortment of situations for business, common, and military applications, for example, observation, vehicle riding , atmosphere and living space monitoring, knowledge, therapeutic, and acoustic data gathering. The key confinements of remote sensor networks are the capacity, power and preparing. These restrictions and the particular engineering of sensor hubs call for vitality effective and secure communication conventions. The possibility of these cheap sensor systems is optimized by the advances in MEMS (Micro Electromechanical Systems) innovation, joined with low power, minimal effort computerized signal processors (DSPs) and radio frequency (RF) circuits .They comprises of a radio handset, microcontroller, control supply, and the real sensor. The detecting hardware measures encompassing condition identified with the earth encompassing the sensor and transforms them into an electric signal. Preparing such a signal uncovers a few properties about items located and additionally occasions happening in the region of the sensor. The sensor sends such collected data, usually by means of radio transmitter, to a control room (sink) either directly or through a data transmission center or uplink station (an gateway).

The advancement of minimal effort, low-control, a multifunctional sensor has gotten expanding consideration from different enterprises. Sensor nodes or motes in WSNs are little estimated and are equipped for detecting, assembling and handling data while communicating with other associated nodes in the system, by means of radio frequency (RF) channel.

WSN term can be comprehensively detected as devices range from portable workstations, PDAs or cell phones to exceptionally small and basic sensing devices. At present, most accessible remote sensor devices are extensively compelled as far as computational power, memory, productivity and communication capacities because of monetary and innovation reasons. That is the reason the greater part of the exploration on WSNs has focused on the plan of vitality and computationally proficient calculations and conventions, and the application space has been kept to straightforward data-situated monitoring and reporting applications.

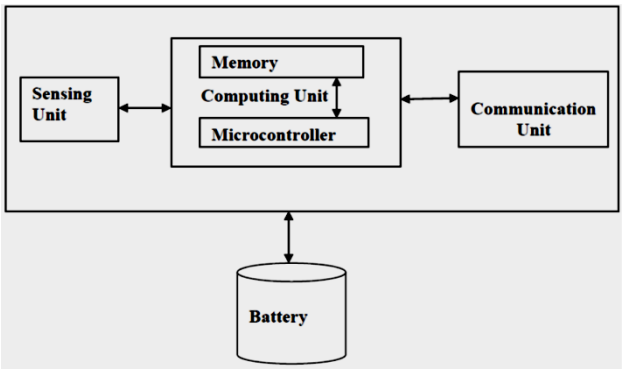

Figure 1. 1: Architecture of a Wireless Sensor Node.

The fundamental square graph of a network sensor node is introduced in Figure 1.1. It is made up four essential

components: a detecting unit, a processing unit, a transceiver and a power unit. There can be application subordinate extra components, for example, an area discovering framework, a power generator and a mobilizer.

Detecting Unit: Sensing units are typically made out of two subunits: sensors and simple to advanced converters (ADCs). Sensor is a gadget which is utilized to make an interpretation of physical quantity to electrical signals. Sensors can be delegated either simple or computerized devices. There exists an assortment of sensors that measure ecological parameters, for example, temperature, light power, sound, attractive fields, image, and so on.

Processing Unit: The processing unit essentially gives knowledge to the sensor node. The preparing unit comprises of a microchip, which is in charge of control of the sensors, execution of communication conventions and signal handling calculations on the assembled sensor data. Usually utilized microchips are Intel's Strong ARM chip, Atmel's AVR microcontroller and Texas Instruments' MP430 microchip.

Transceiver Unit: The radio empowers remote communication with neighboring nodes and the outside world. It comprises of a short range radio which more often than not has single channel at low data rate and works at unlicensed groups of 868-870 MHz (Europe), 902-928 MHz (USA) or almost 2.4 GHz (worldwide ISM band).

Power Unit :The battery supplies energy to the total sensor node. It assumes an imperative part in deciding sensor hub lifetime. The measure of force drawn from a battery ought to be painstakingly monitored. Sensor hubs are by and large little, light and modest, the extent of the battery is restricted.

II. SYSTEM MODEL

Routing in Wireless Sensor Network:

Routing system assumes a crucial part in the wireless sensor organize. It is to a great degree hard to allot the worldwide Ids for an expansive umber of conveyed sensor nodes. Along these lines, customary conventions may not be pertinent for WSN. Not at all like ordinary network communication systems (MANET, cellular network, and so on.), WSN has intrinsic qualities. It is profoundly alterable system and particular to the application, and also it has constrained vitality, stockpiling, and handling capacity. These qualities make it an exceptionally difficult errand to build up a routing protocol . In the greater part of the situations, different sources are required to send their data to a specific base station. The node close to the sink, drained more vitality and consequently die . This causes parceling of the system; subsequently, the lifetime of the system gets the opportunity to lessen. The principle limitation of the sensor hub is vitality. The sensors are battery-fueled registering device. It's difficult to supplant the batteries in numerous applications. In this manner, WSN requires a vitality productive routing protocol .

Because of thick arrangement, the sensor nodes create the excess data, and the base station may get numerous duplicates of similar data. Along these lines, it pointlessly devours the vitality of the sensor nodes. WSN does not have any altered system and is exceedingly alert . There are principally two reasons in charge of the dynamic system. The principal reason is the vitality; the sensor nodes have constrained vitality as batteries. On the off chance that the convention can't adjust the heap among the nodes, the sensor node consumes unnecessary power. It prompts to the dynamic system structure. The second reason is the portability; in numerous situations after the sending, sensor hubs are static however sink can move inside the system. It makes the system dynamic, and the convention that works for static sink may not be appropriate for portable sink . In numerous applications, sensor hubs are required to know their location information .

Hierarchical-based Routing:

In the hierarchical architecture, some higher-vitality nodes can be utilized to receive and send the data to the base station while bring down vitality nodes can play out the detecting in the objective range. As it were, the system is divided into numerous groups. In every bunch, a node is chosen as a cluster head with some bunch individuals. A two-level chain of command is framed where cluster heads are in the higher level while bunch individuals are made a lower level. cluster individuals sense the data from the physical environment and send it to their particular bunch heads. Bunch heads handle the data and transmit it to the sink either straightforwardly or in the multi-bounce way.

Low-Energy Adaptive Clustering Hierarchy (LEACH) :

convention has been proposed by Heinzelman et al. It is the main hierarchical clustering approach in WSN. In the LEACH convention, the operation comprises of numerous rounds. Each round has two stages; the set-up stage and relentless state stage. In the setup stage, the group is framed and in the enduring state stage, data is transmitted to the base station. The bunch head are chosen in light of the predefined rate of group heads and how frequently the hub has been a group head in past rounds. Drain can adjust the heap among the group makes a beeline for some degree. Singular schedule opening keeps group head from superfluous crashes and maintains a strategic distance from extreme vitality dispersal. Despite what might be expected, LEACH is not material to substantial zone systems, and

uneven appropriation of group head brings additional overhead.

Low Energy Adaptive Clustering Hierarchy (LEACH):

LEACH (Low Energy Adaptive Clustering Hierarchy) is intended for sensor networks where an end-client needs to remotely monitor the planet. In such a circumstance, the data from the individual nodes must be sent to a focal base station, frequently situated a long way from the sensor network, through which the end-client can get to the data. There are a few alluring properties for protocols on these networks:

a) Use 100's - 1000's of nodes
b) Maximize system lifetime
c) Maximize network coverage
d) Use uniform, battery-operated nodes

Traditional network protocols, for example, coordinate transmission, least transmission vitality, multi-jump steering, and bunching all have downsides that don't permit them to accomplish all the alluring properties. Drain incorporates dispersed bunch arrangement, neighborhood preparing to diminish worldwide communication, and randomized pivot of the group heads. Together, these elements permit LEACH to accomplish the wanted properties. Introductory recreations demonstrate that LEACH is a vitality effective protocol that expands framework lifetime.

III. PROPOSED METHODOLOGY

Wireless sensor network (WSN) is foremost application of wireless communication networks to collect information to facilitates several need of human being and businesses, research around the world and such networks benefiting several montioring and research applications like earthquake, fisshing, temperature monitoring, weather monitoring and wild life monitoring. The wireless sensor network a subset of mobile ad-hoc network has lot of challenges to reduce the energy consumption of sensor nodes or wireless nodes to live longer in network and keep communicating with the network. Here we have to work out main areas by which a node can live longer and i.e. either make batteries (source of energy) equipped with nodes having larger in size or the material having larger charges saving capability but this approach having limited capabilities because the larger battery size make sensor node more bulk which is not feasible in any case, and to finding out the material has larger charge storing capability is also tough task to do. Instead doing above things another method is to make transfer of information on network more efficient. For this many routing protocols has been given as we discussed in the previous sections.

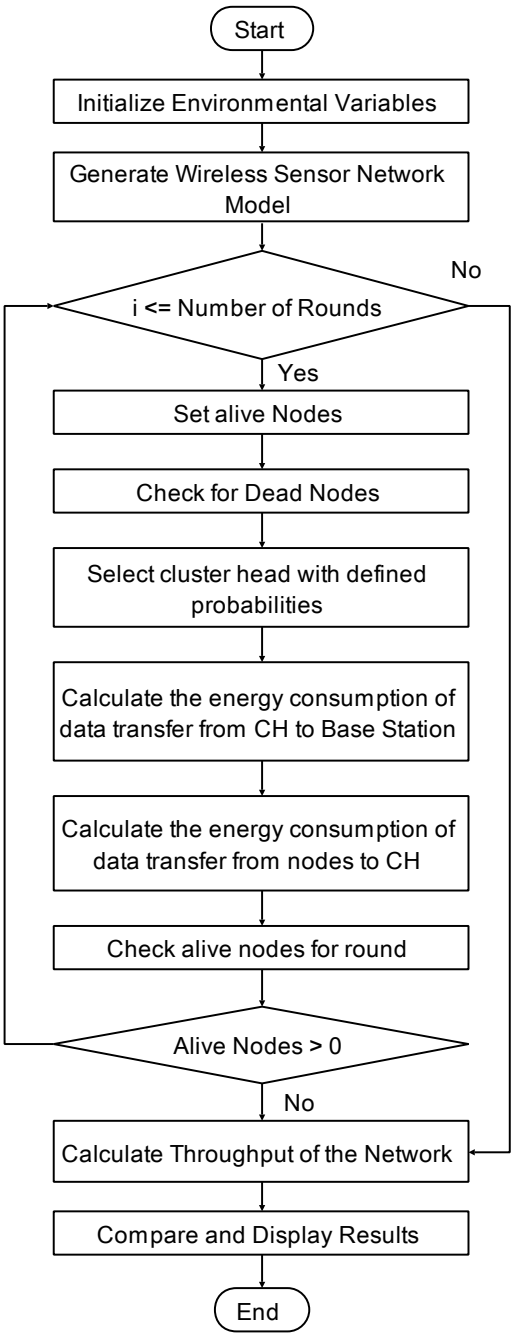

Fig. 3.1 Flow Chart of the Proposed Methodology.

IV. SIMULATION OUTCOMES

The proposal for the improvements explained in this work previously and the simulations performed on the simulation tool for results and outcomes of proposed routing of Wireless Sensor Network(WSN) to make network life span more than the previous work. The simulation performed on low energy efficient clustering (LEACH) which is based on reducing the data aggregation energy. The simulated results are in terms of number of alive nodes and numbers of dead nodes versus number of transmission rounds and packets sent to base station and packets sent to cluster curves.

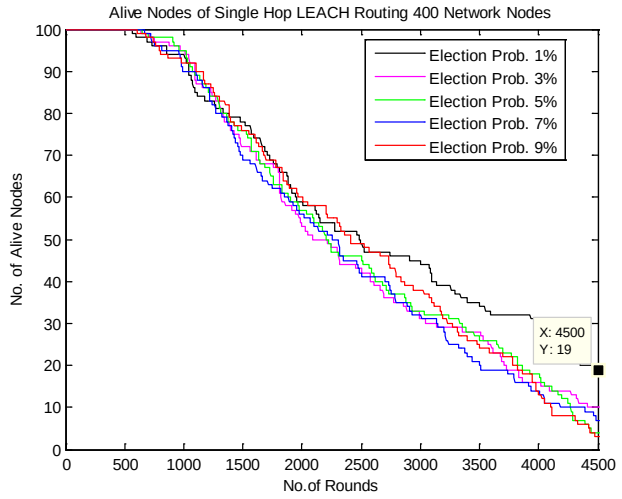

Fig. 4.1 Network Life Time (Alive Nodes vs Rounds) of Proposed Methodology.

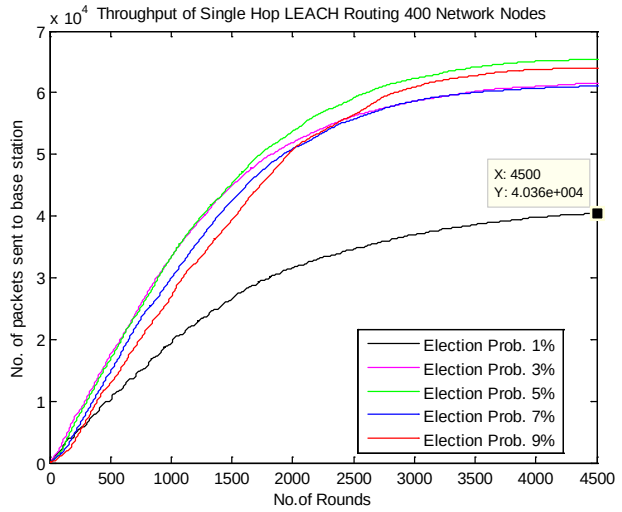

Fig. 4.2 Packets Sent to Base Station of Proposed Methodology.

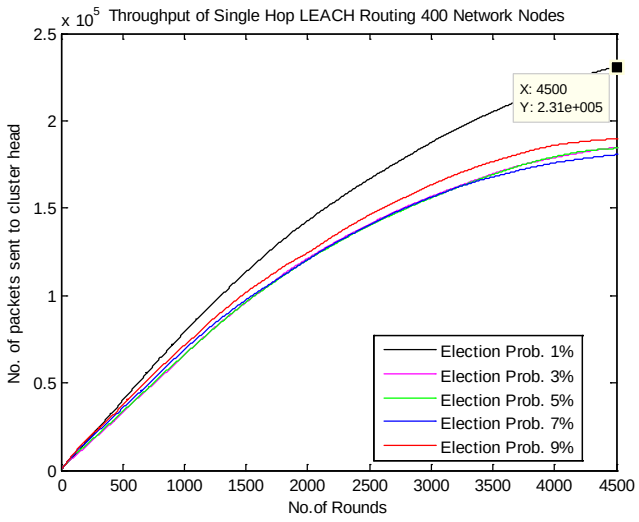

Fig. 4.3 Packets Sent to Cluster Head of Proposed Methodology.

In existing work life span of the network is calculated up to 4500 transmission rounds. If the network sustain for more number of rounds means life span of the network is going better. In proposed approach the life span of the network reaches more than 4500 rounds in 400x400 network, which is greater than the previous work.

V. CONCLUSION AND FUTURE SCOPE

The proposed routing with efficient election mechanism in wireless sensor network (WSN) is need to be better than the previous network, and from the proposed methodology and its simulation results analysis it can be concluded that with the lower election probability of cluster head in the low energy efficient clustering (LEACH) routing will have longer network lifetime which is higher than the previous routing models. and during simulation of proposed methodology number of alive nodes vs. transmission rounds are calculated and the same done for dead nodes and throughput i.e. packets send to base station also calculated for optimized election mechanism and found longer network lifetime (the sensor nodes live longer to more number of rounds) with improved throughput. From the analysis of other network parameters like network area, different energies like transmission energy, reception energy and aggrgation energy etc. will make out something new with more robust routing protocols with longer lifetime and lower energy consumption.

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