An Adaptive Routing Technique to Reduce Consumption of Energy in Wireless Sensor Network

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Abstract - The field of wireless sensor network (WSN)being growing in the present days and the researchers are finding the optimized solution for the applications such as military purposes, civilian applications, defense security, medical field etc. Energy consumption is a critical and major problem affecting the lifetime of WSN. It has been observed that energy consumed for processing the data to transmit is considerably less than used in transmission. Large amount of the wasted energy is in the transmission of content of data from the particular sensor to the central station or the head of the cluster. A number of techniques are proposed to solve this problem. Routing algorithms or protocols being used for wireless sensor applications need to be candid, and life time of the Wireless Sensor Network is increased. Here, we propose a smart and a reliable technique that reduces the consumption of energy of the sensor during the transmission. It's being assumed that the proposed protocol has much adaptive cluster maintenance, strong endurance of transmission energy, smart energy consumption mechanism. The given protocol has set good benchmark in consuming transmission energy and uses the network resource like bandwidth etc.

Keywords - consumption, WSN, reliable, endurance, transmission, cluster.

I. INTRODUCTION

The self-configured wireless networks to look after surrounding or environmental conditions, like sound, quiver, temperature, pressure, movement and to cooperatively move their data via network to a location where the information can be analysed and observed is the definition of Wireless Sensor Networks (WSNs). A station sink behaves like common boundary across the network and users. One can recover required data from the network by introducing questions and collecting output from the sink. A wireless sensor node is accomplished with computing and sensing devices, power components and transceivers of radio. Each and every node in a wireless sensor network (WSN) are inherently resource limited, they have constrained speed of processing, Communication bandwidth and storage capability. After the sensing nodes are exploited, they are accounted for self-organizing a systematic network base often with multi-hop communication. Then the on board sensing units starts collecting data regarding interest. Wireless sensor system also answer to queries sent from a "control site" to do the specific command or give sensing samples. Local positioning and Global Positioning System and series of steps can be utilized to obtain positioning information and location. Wireless sensor system can be furnished with actuators to "act" on few particular rules [1].

Most recent WSNs are bi-directional, allowing two-way communication, which could gather sensor data from sensing units to the base station as well as circulate commands from base station to end sensors. The growth of WSNs was inspired by military uses such as battlefield surveillance; WSNs are broadly used in, residential environments, industrial environments and wildlife area, healthcare applications, structure health monitoring, animal tracking, home automation represent WSNs uses.

A typical Wireless Sensor Network (WSN) is made up of several thousands of "sensing nodes". The topology of WSNs can differ amongst tree network and star network. Every node has the capability to communicate with every different node without wire, thus a sensor node has many components: a radio transceiver with an antenna which has the capability to receive or send packets, a microcontroller which can process the information and reschedule relative tasks, many kinds of sensing the surrounding information, and batteries providing energy [2].

II. LITERATURE REVIEW

A. Power-Efficient Gathering in Sensor Information Systems Protocol- PEGASIS-P

This algorithm makes chains of the sensing nodes. Depending on this, every single node sends to and be given from particular nearest node of its neighbours. Based on this aim, all the nodes accommodate to the power or strength of their respective transmissions [3]. Node execute information combined and sends it to the node in the line that communicates with station that is sink. In every single round, each node in series is selected to exchange information with sink. The series is made with greedy algorithm. This is referred for minimisation of the below protocol.

B. Low Energy Adaptive Clustering Hierarchy Protocol- LEACH-P

Here the cluster head role is regularly transferred amongst the network nodes so as to give away the consumption of energy. The behaviour of this protocol is decided on rounds. Then a head of cluster is selected every single round. And for this selection, the count of the nodes which are not heads of cluster and cluster heads percentages are being used [4]. Here, this schedule allows node interfaces to turn off while they are not made to work. The head cluster is the route to the station sink and responsibility is held by it for the information collection. While the head cluster controls the sensing unit's location, the information collection performed by the captain allows to take away sacking.

A consolidated type of the given protocol is C-LEACH [5]. This design is dependent on time rounds, they are separated into the constant phase. In the beginning phase, sensing units provide information to the base station about their energy level and about their positions. With this data, the base station confirms the architecture of clusters and also their respective cluster heads. Since the station base possess full data of the status of the network, and the cluster form resulting from C-LEACH is considered a minimisation for the output of LEACH.

C. Directed Query Dissemination Protocol-DirQ-P

The protocol DirQP targets at minimising the propagation of messages in a wsn. The important goal is that the messages are travelled by the less in nodes number which ensures that the messages come at the nodes which are been able to service the message. In order to make so, in the network some of the information is exchanged. Rate of change of the physical quantities that the network has been sensing is the depending parameter for the periodicity of the update messages. Later, each node by default maintains its own threshold (t). If P is the value of desired parameter of a sensor node and the next computational cycle gets the same number in the $(t - P, P + t)$ interval, then it take decision not to send anything to station sink. Station sink thinks that this particular node has a calculated number that has not varied much from what was declared recently if sink station does not get back any signal from a specific node. In order to have good delivery applications, all nodes in network should be able to store the content which is treated as step back depending on the content stored in the analysis suits and nodes. [6].

D. Threshold Sensitive Energy Efficient Sensor Network Protocol-TEEN-P

TEEN is pecking order protocol. This is used for networks that give response quickly to variations in the values. Here, in this protocol a cluster leader (CL) sends a soft one and hard cut off value. The nodes keep on sensing the surroundings continuously. The node switches on its transmitter and transmits its data. Nodes then sends data in the present group period if the order mentioned following are not false: the present value of the sensed things is more than the hard cut off value, and the present number of the sensed things varies from sensed number by an size equal to or substantial than the soft cut off value. Energy is reduced in transmitting messages in both strategies.

The main disadvantage of this protocol is that, the nodes will never exchange information, if the thresholds are not extended; data is not delivered to the user from the network and would not be noticed at all even if all the nodes expired. So, this protocol is not acceptable for the execution where the data is delivered to the user on a systematic basis [7].

III. PROPOSED PROTOCOL

The pro-activity of LEO makes it agile and smart, but the routing recommendations by this proactive mechanism are not enough efficient to pave an alternate ways to Base Station (BS).In LEO, there is information hiding within the network cluster, it means that the successive nodes have information about immediate nodes only. Therefore the nodes within a specified network cluster cannot interact with other nodes that are not specified as neighbour, thereby increasing an inter-cluster isolation. This inter cluster isolation is be predominant whenever any nodes tries to send a packet to its predefined neighbour. LEO is comprehensive and is restricted to work on specified network models. The inept nature of LEO encouraged us to propose a modified protocol that should efficiently utilize all resources available in the network. Our proposed algorithm has versatile cluster formation and maintenance. The proposed algorithm that is Adaptive Routing Technique to Reduce Consumption of Energy (ARTRCE) has efficient mechanism for the formation of neighbour table. ARTRCE has less energy requirement when compared to LEO. The ARTRCE has neighbour table containing information about the time required by the packet to arrive at Base Station, total energy available after current packet is transmitted. Unlike the existing popular protocols like LEACH, GAF, TEEN and GEAR, this protocol defends the intensity of consuming network energy that is involved formation of cluster heads (Hierarchical Routing), diffusion based routing protocol(s), overheads(in terms of communication) in routing protocols that involve geographical instructions. At last, the vital countenance of ARTRCE protocol is its efficiency, smart mechanism in formation of neighbour tables, less computational costs, thin overhead for routing information and enhanced mechanism for creation of forward tables.

A. Algorithm

Step.1 Deploy sensors (either in grid or random format). We use random format.
Step.2 Once Nodes are deployed, store there (X, Y, Z) coordinates in the array.
Step.3 Define a variable transmission range (let it be 30m).
Step.4 For each node N:

Calculate Euclidean distance with all other nodes. Those which are less than trans-mission range, from the neighbor set of the node N.

Step.5 Calculate forward set of the Node N: All those nodes which are part of its neighbor set and also lies between its location and sink location constitutes its Forward set.

Step.6 On the basis of two factors select the intermediate Node:

Factor 1. Remaining Energy: The node in the Forward set with maximum remaining energy must be selected.

Factor 2. Reliability: Node with least Euclidean distance and minimum packet loss must be selected.

The network node calculates the total time needed by an information packet to reach destination or base station from the node energy assigned during initialization phase.

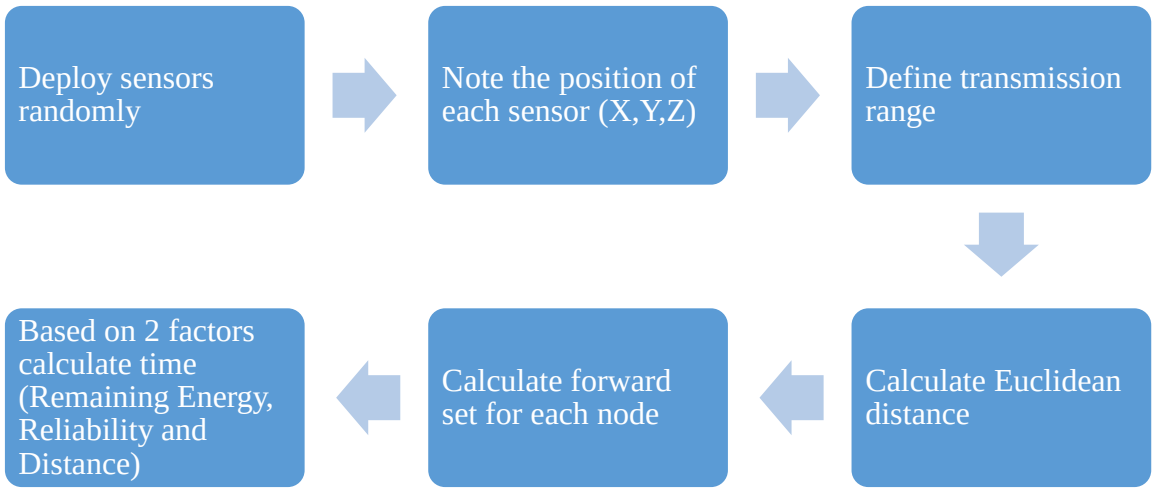

Fig. 1 Flow chart of proposed algorithm

IV. POSSIBLE OUTCOMES

Working of the proposed algorithm using Adaptive Routing Technique to Reduce Consumption of Energy (ARTRCE) with the help of simulators has the performance of Modified-LEO on different node clusters. Comparing the performance of Modified-LEO with the LEO algorithmic architecture, the proposed method has enhanced features. The comparison features include

- Throughput
- Latency
- Packet Dropped.

V. CONCLUSION

In this paper, we have proposed adaptive routing technique to reduce consumption of energy (ARTRCE) for packet delivery from source to destination. ARTRCE works on basic concepts throughput, reliability. For higher network dimension the ARTRCE is similar to Leo after nearest nodes (Nodes in future set) gets exhausted. We try to implement this in any of the simulators like MATLAB, NS-2 or any other. The proposed algorithm is more reliable and adaptive in nature can be applied in real time.

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