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MAXIMIZE THE COVERAGE AND CONNECTIVITY WITH LOAD BALANCING FOR WIRELESS SENSOR NETWORK

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ABSTRACT-Wireless sensor network consists of many spatially -distributed sensor devices for monitoring physical or environmental condition and co-operatively passing their data through the network to a main location. Coverage is an important issue in WSN, which reflects how well a sensor network is monitored or tracked by sensors. WSN have strict coverage accuracy requirements and need to operate as long as possible. In this project, a novel meridian coupled load balancing cover tree algorithm (MCLCT) is proposed which is used to enhance the coverage as well as BS-connectivity of each sensing node by dynamically forming load balanced routing cover trees. The proposed MCLCT algorithm is used to find the maximum number of disjoint sets. The node in each disjoint set able to co –operatively monitor all the discrete point of interests. The discrete points of interests sense the data and transmit to the cluster head. Cluster head gets the data from the disjoint sets of sensor node and transmit it to the BS, so that energy consumption among node is reduced and packet loss is minimized.The simulation is done using network simulator -2 and graph is plotted between time vs. Packet loss, consumed energy, throughput and packet loss vs. disjoint set.

I.INTRODUCTION

A Wireless Sensor Network (WSN) is a collection of spatially distributed smart nodes that use wireless communication for build a network with the aim of monitor, in a cooperative way, an interested parameter within a determined region. These smart nodes (or autonomous sensors) are low power devices equipped with one or more sensors, a processor, memory, a power supply, a radio, and an actuator. Often, the spatial distribution of the nodes is not pre-determined. This allows random deployment in accessible or disaster relief zones. Of course that in a controlled environment, the deployment can follows a pretended order. WSNs can be classified into two types: structured and unstructured. An unstructured WSN is one that contains a dense collection of nodes deployed in a random manner. The network is left unattended to perform monitoring and reporting functions.

Managing and detecting failures is difficult since there are so many nodes. In the other hand, in a structured WSN, all or some of the sensor nodes are deployed in a preplanned manner improving management and maintenance of the network. Features that must have a WSN are flexibility, fault tolerance, high sensing delay, low cost, rapid deployment and self-organizing capabilities. These characteristics are attractive for develop applications in different research areas such as military, security, natural disaster, biomedical health, hazardous environment exploration and seismic sensing. The new technology presents unique features and requirements that are take account by neither traditional hierarchical networking nor ad hoc networking techniques.

It is widely accepted that the energy consumed in one bit of data transfer can be used to perform a large number of arithmetic operations in the sensor processor. Moreover in a densely deployed sensor network the physical environment would produce very similar data in near-by sensor nodes and transmitting such data is more or less redundant. Therefore, all these facts encourage using some kind of grouping of nodes such that data from sensor nodes of a group can be combined or compressed together in an intelligent way and transmit only compact data.

This process of grouping of sensor nodes in a densely deployed large-scale sensor network is known as clustering. The intelligent way to combined and compress the data belonging to a single cluster is known as data aggregation. There

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are some issues involved with the process of clustering in a wireless sensor network. First issue is, how many clusters should be formed that could optimize some performance parameter. Second could be how many nodes should be taken into a single cluster. Third important issue is the selection procedure of cluster-head in a cluster. Another issue that has been focused in many research papers is to introduce heterogeneity in the network. It means that user can put some more powerful nodes, in terms of energy, in the network which can act as a cluster-head and other simple node work as cluster-member only.

II. MERIDIAN COUPLED LOAD-BALANCING COVER TREE ALGORITHM (MCLCT)

In wireless sensor network (WSN), coverage and connectivity plays important role. Coverage issue is related to how well a sensor network is monitored or tracked by sensors. Area coverage is used to cover a specific area by using sensor nodes. Wireless sensor networks are formed by connecting sensor nodes. Sensor nodes with limited energy is arranged into a maximum number of set cover to monitor all the discrete point of interests (DPOIs) to provide full coverage. Coverage is usually interpreted as how well a sensor network will monitor a field of interest.it can be measured in different ways depending on the application. In addition to coverage, it is important for a sensor network to maintain connectivity.

Connectivity can be defined as the ability of the sensor nodes to reach the data sink. If there is no available route from a sensor node to the data sink then the data collected by that node cannot be processed. Each node has a communication range which defines the area in which another node can be located in order to receive data. This is separate from the sensing range which defines the area a node can observe. The two ranges may be equal but area often different. Christo Ananth et al. [5] discussed about a system, In this proposal, a neural network approach is proposed for energy conservation routing in a wireless sensor network. Our designed neural network system has been successfully applied to our scheme of energy conservation. Neural network is applied to predict Most Significant Node and selecting the Group Head amongst the association of sensor nodes in the network. After having a precise prediction about Most Significant Node, we would like to expand our approach in future to different WSN power management techniques and observe the results. In this proposal, we used arbitrary data for our experiment purpose; it is also expected to generate a real time data for the experiment in future and also by using adhoc networks the energy level of the node can be maximized. The selection of Group Head is proposed using neural network with feed forward learning method. And the neural network found able to select a node amongst competing nodes as Group Head.

In this MCLCT algorithm is used construct connected cover trees. By doing so, a longer network lifetime and full a coverage can be acquired. The MCLCT algorithm aims at finding a maximum number of disjoint sets of nodes, which can be achieved by one of the sensor nodes (such as the sink node).First, the network is formed by using network simulator (step1). Creating a disjoint set among sensor nodes (step2).Then. The set of available nodes is generated by eliminating the unavailable nodes without covering any DPOIs (step3). Selecting the relay nodes using load balancing dynamic cover tree (step 4). The discrete points of interests sense the data (step5) and transmit to the cluster head. Cluster head gets the data from the disjoint sets of sensor node and transmit it to the BS, so that energy consumption among node is reduced (step 6) and packet loss is minimized.

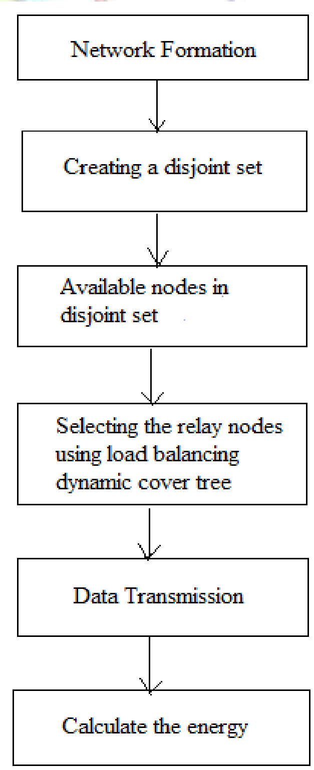

Figure1 The flowchart of the proposed MCLCT

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Finally, network lifetime is obtained. Due to limited energy as well as computation ability of sensor nodes to manage the WSN while preventing wasting energy. The MCLCT maximizes the network lifetime while preventing both full coverage and BS-connectivity.

III.RESULT

In this section, we implement the MCLCT algorithm, 71 sensor nodes are considered. These nodes are placed in a fixed node pattern covering the area of 50 m. The transmission range of each sensor node in discrete point of interests. Here, transmission range is 50 m and frequency is 914 MHz.Setting base station and cluster head among the sensor nodes. Here, node 0 is base station, node 33 and node 38 is the cluster head. The disjoint set among sensor nodes. The MCLCT algorithm is used to find the maximum number of disjoint sets. The nodes in each disjoint set able to monitor all the discrete points of interest.Here, discrete points of interest [DPOIs] senses the data and transmit it to the cluster head.Cluster head further transmit it to the BS.In this,only minimum number of sensor nodes is activated in each DPOIs to tranmit the data.Other nodes are in idle state.Thus,energy consumption is maintained then load is balanced among the sensor nodes and connectivity is also maintained.

From this figure 2, lifetime of the WSN using MCLCT with an initial energy of 23 joules is about 16 seconds. Packet loss occurs when one or more packets of data travelling across a sensor network fail to reach their destination. From the figure 3, it is shown that packet loss increases as time increases. Throughput refers to how much data can be transferred from one location to another in given amount of time. From the figure 4, it is shown that time increases as throughput of the network decreases. From the figure 5, it is shown that maximizing the disjoint set, packet loss is reduced.

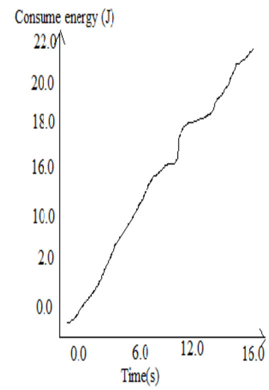

Figure 2 Consume energy vs. time

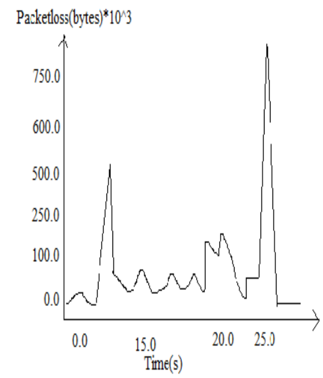

Figure 3 Packet loss vs. time

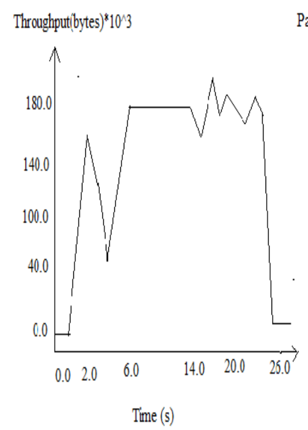

Figure 4 Throughput vs. time

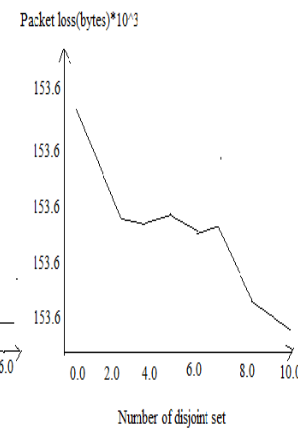

Figure 5 Packet loss vs. number of disjoint set

IV.CONCLUSION

In this project, Meridian Coupled Load Balancing Cover Tree (MCLCT) algorithm is proposed based on routing cover trees to achieve coverage as well as BS-connectivity of each sensing node. The goal of the MCLCT algorithm is to sustain full sensing coverage and connectivity of WSNs for a long time. The proposed MCLCT algorithm is used to find a maximum number of discrete points of interest (DPOIs) using global information. At the same time, each cover set comprises only a minimum number of sensing nodes and determines the best parent node to relay sensed data using local information among neighbor while achieving even energy consumption of nodes. The simulation is done using Network Simulator-2 and the graph is plotted between time vs. packet loss, consumed energy and throughput, packet loss vs. disjoint set. From the graph, it is shown that packet loss increase as time increases. Thus, throughput of the network decreases. When disjoint set is increased packet loss is reduced. The performance of the network is maximum.

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