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SELF ORGANIZED & MULTIROUTING BASED PROTOCOL FOR ENHANCING THE DISTRIBUTE ENERGY IN CLUSTERS IN WSN: A REVIEW

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ABSTRACT: This research explored the Architecture of clustering protocol and designed an algorithm for improving their network life time and energy consumption for self organized node. This required to decide the tool to implement follows proposed method and also studied the basics of tool.WSNs are utilized in environmental observation, security, medical applications, etc. To obtained simulation result justifies the feasibility of the proposed approach. Wireless Sensor Networks (WSN) consist of a large number of small sensor nodes with sensing, data processing, and communication capabilities, which are deployed in a region of interest and collaborate to accomplish a common task, such as environmental monitoring, fire detection, pollution detection, traffic monitoring, industry process control, object tracking and various other application domains. Distinguished from traditional wireless networks, a sensor network has many unique characteristics, such as denser node deployment, higher unreliability of sensor nodes, asymmetric data transmission, and severe power, computation, and memory constraints, which present many new challenges for the development and eventual application of wireless sensor networks. The Cluster Heads (CHs) collect the info from all the nodes in their cluster, combination it then finally sends it to the BS. These device nodes must follow a definite routing protocol to send their information efficiently to the BS. The prime objective of all routing protocols is to reduce the energy consumption, so the network period of time and notably the soundness period of the network is also enhanced. By introducing the self organized technique SORP in wsn network with formation of cluster, we tend to mean the time period from the beginning of the network until the death of the last node, whereas, stability amount suggests that the time period from the beginning of the network until the death of the primary node.

Keywords: TEEN Protocol, Self Organizing Nodes, Cluster Head, Wireless Sensor Network, A-SEP,SEP etc.

I. INTRODUCTION

A wireless sensor network (WSN) can be defined as a network of (possibly low-size and low complex) devices denoted as nodes that can sense the environment and communicate the information gathered from the monitored field (e.g., an area or volume) through wireless links; the data is forwarded, possibly via multiple hops relaying, to a sink (sometimes denoted as controller or monitor) that can use it locally, or is connected to other networks (e.g., the Internet) through a gateway.

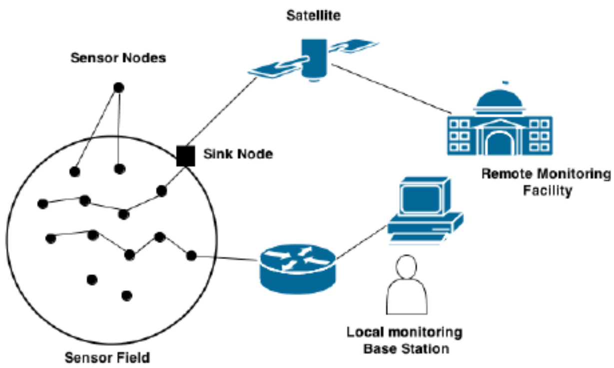


Fig 1: Typical WNS

Classification of sensor network on basis of their mode of functioning and the type of target application are:

Proactive Networks

Nodes in this network periodically switch on their sensors and transmitter, sense the environment and transmit the data of interest. Thus, they provide a snapshot of the relevant parameters at regular intervals.

These types of networks well suited for applications requiring periodic monitoring of data.

Reactive Networks

In this scheme the nodes react immediately to sudden and drastic changes in the value of a sensed attribute. These types of networks are well suited for time critical applications.

1.1 Teen (Threshold Sensitive Energy Efficient Sensor Network Protocol)

Threshold Sensitive Energy Efficient Sensor Network Protocol (TEEN) is a reactive protocol designed for time critical applications. In TEEN, nodes are arranged in hierarchical clustering scheme in which certain nodes act as cluster head (first or second level). After cluster head is elected, the user sets attributes for it. When the cluster head receives these attributes, it broadcasts the attributes (Hard Threshold (HT) and Soft Threshold (ST) values) to all member nodes of the cluster. The Sensor nodes sense the data and transmit only when the sensed data exceeds HT. HT is the minimum value above which values are noted. Sensed value (SV) is an internal variable which stores the transmitted sensed value. The sensor again senses data and when its value exceeds the ST, which is the minimum change in sensed value, it starts transmitting data. In this way, TEEN conserves energy since sensor nodes senses data continuously but transmits only when data is above HT. ST further reduces transmission, which could have otherwise occurred due to little or no change to level of sensed attributes. Since cluster-head performs extra computations, its energy consumption is more than other nodes. This problem is resolved by giving equal chance to every node to act as cluster-head for a fixed cluster period. We can reset the attributes during every cluster change time. No transmission from nodes to cluster-head occurs if the sensed value is below HT, so the cluster-head will not be aware of death of a sensor node. By giving smaller value to ST on cost of high energy due to frequent transmission, a clear scenario of the network can be obtained. Similar to LEACH, every node in the cluster is given a time slot for data transmission using TDMA schedule. Soft threshold is used to on or off the sensing node while hard threshold is activated while sensing value is being changed. Here two level of CH are being used.

1.2 ADVANTAGES OF TEEN

On the basis of two thresholds, data transmission can be easily controlled i.e. only the required data is transmitted. In this way it reduces the energy of transmission. Since TEEN is complementing for reacting to large changes in the sensed attributes, it is suitable for reactive scenes and time critical applications.

1.3 DISADVANTAGES OF TEEN

It is not suitable for periodic reports applications because if the values of the attributes are below threshold, the user may not get any data at all. There exist wasted time-slots and a possibility that the BS may not be able to distinguish dead nodes from alive ones, because only when the data arrive at the hard threshold and has a variant higher than the soft threshold did the sensors report the data to the BS. If CHs are not in the communication range of each other the data may be lost, because information propagation is accomplished only by cluster-heads.

II. BRIEF LITERATURE SURVEY

Heinzelman et al. [4] developed the LEACH protocol (Low Energy Adaptive Clustering Hierarchy) which can be classified as a hierarchical algoritm, due to its inherent creation of clusters. The LEACH operation is composed by two phases: a setup phase and a steady-state phase. The setup phase needed in order to create the clusters inside the network and elect the cluster heads in each cluster. During the steady-state phase the nodes inside each cluster sense data and transmit data to their cluster head. The cluster head collects all the data sent by the nodes in clusters, it aggregates all data and sends it to the sink. Aggregation is useful if the data collected in a cluster are correlated. LEACH protocol assumes that all cluster heads can directly communicate with the central base station of the network; therefore it is not applicable in large regions. Periodically, the network goes back to the setup phase, to allow the selection of new cluster heads. Arti Manjeshwar and Dharma p. Agrawal [2] proposed a formal classification of sensor networks, based on their mode of functioning, as proactive and reactive networks. Reactive networks, as opposed to passive data collecting proactive networks, respond immediately to changes in the relevant parameters of interest. They introduce a new energy efficient protocol, TEEN (Threshold sensitive Energy Efficient sensor Network protocol) for reactive networks. The performance of protocol for a simple temperature sensing application was being evaluated. In terms of energy efficiency, the protocol has been observed to outperform existing conventional sensor network protocols. TEEN is based on a hierarchical grouping where closer nodes form clusters and this process goes on the second level until the BS (sink) is reached. TEEN is a clustering communication protocol that targets a reactive network and enables CHs to impose a constraint on when the sensor should report their sensed data. After clusters are formed, the CH broadcasts two thresholds to the nodes namely Hard threshold (HT), and Soft threshold (ST). Hard threshold is the minimum possible value of an attribute, beyond which a sensor should turn its transmitter ON to report its sensed data to its CH. Thus, the hard threshold allows the nodes to transmit only when the sensed attribute is in the range of interest, thus reducing the number of transmissions significantly. Once a node senses a value at or beyond the hard threshold, it transmits data only when the value that attribute changes by an amount equal to or greater than the soft threshold, which indicates a small change in the value of the sensed attribute and triggers a sensor to turn ON its transmitter and send its sensed data to the CH. As a consequence, soft threshold will further reduce the number transmissions for sensed data if there is little or no change in the value of sensed attribute. Thus, the sensors will send only sensed data that are of interest to the end user based on the hard threshold value and the change with respect to the previously reported data, thus yielding more energy savings. One can adjust both hard and soft threshold values in order to control the number of packet transmissions. However, both values of hard soft thresholds have an impact on TEEN. These values should set very carefully to keep the sensors responsive by reporting sensed data to the sink.

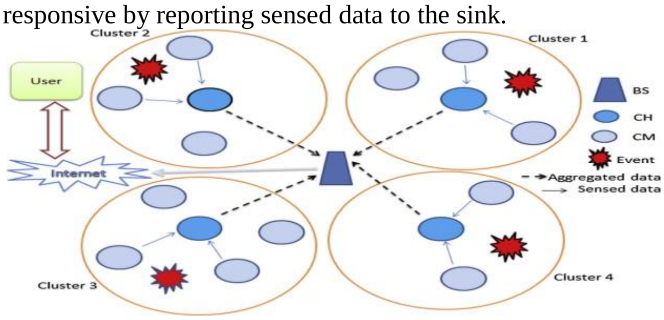


Fig 2: Clustering in TEENS

Arati Manjeshwar and Dharma P. Agrawal [2] proposed APTEEN just as an improvement to TEEN in order to overcome its limitations and shortcomings. It mainly focuses on the capturing periodic data collections (LEACH) as well as reacting to time-critical events (TEEN). Thus, APTEEN is a hybrid clustering-based routing protocol that allows the sensor to send their sensed data periodically and react to any sudden change in the value of the sensed attribute by reporting the corresponding values to their CHs. The architecture of APTEEN is same as in TEEN, which uses the concept hierarchical clustering for energy efficient communication between source sensors and the sink. APTEEN guarantees lower energy dissipation and helps in ensuring a large number of sensors alive. When the base station forms the clusters, the CHs broadcasts the attributes, the hard and soft threshold values, and TDMA transmission schedule to all nodes, and a maximum time interval between two successive reports sent to a sensor, called count time (TC). CHs also perform data aggregation in order to save energy. APTEEN supports three different types of query namely:

- History query: to analyze past data values,
- One-time query: to take a snapshot view of the network, and
- Persistent query: to monitor an event for a period of time.

Tejaswi et. al. [3] developed CAMP-TEEN is the extension of TEEN protocol, most suitable for the application of land slide prediction. Nodes sense the slight movement of soil and change in parameters that occur before land slide. CAMP enhances localization and energy efficiency of multi-hop routing protocol and TEEN is an extended version of LEACH which saves energy by using threshold values. It is useful in landslide prediction applications because each rock have different threshold values. In CAMP-TEEN, one node broadcasts a beacon pulse. Nodes which are nearby to that node receive this beacon and sends an acknowledgement return to beacon node. The acknowledgment has the distance between nodes and beacon node based on RSSI (Received signal strength indication). It constructs the neighborhood table for each node until all nodes have their neighboring table. CAMP uses distributed clustering in which CH is selected on the basis of local information of nodes. In CAMP-TEEN, CH selection criteria depend on a timer which is given as:

$T(v) = K/E - \alpha$

Where K is the proportionality constant which is taken as 1, E is the normalized energy of the node and α is the random number between 0 and 1. Timer starts for every node by using above equation. The node with least timer value will have high energy as they are inversely proportional to each other. The high energy node will be elected as a CH then neighbor nodes of CH will terminate their timers. CHs broadcast TDMA schedule to their cluster members. Nodes transmit data to CH, it collects the data and forwards it to BS.

Zibouda Aliouat, Saad Harous [5] developed WB-TEEN and WBM-TEEN: two hierarchical routing protocols, based on nodes clustering and improving the well known protocol Threshold sensitive Energy Efficient sensor Network protocol (TEEN). This improvement is accomplished in a way such that each cluster is nodes balanced and the total energy consumption between sensor nodes and cluster heads is minimized by using multi-hops intra-cluster communication. The proposed protocols exhibit better performance than Low Energy Adaptive Clustering Hierarchy (LEACH) and TEEN in terms of energy consumption and network lifetime prolongation. Problem with TEEN is group disparity in cluster formation due to unequal number of nodes in different cluster. WB-TEEN tries to solve this problem of disparity by equal number of nodes in each cluster. WB-TEEN computes degree based on that it selects membership of node or rejects node membership. WBM-TEEN is another protocol that apart from the improvements of WB-TEEN imposes multi-hop intra cluster data transmission to sink.

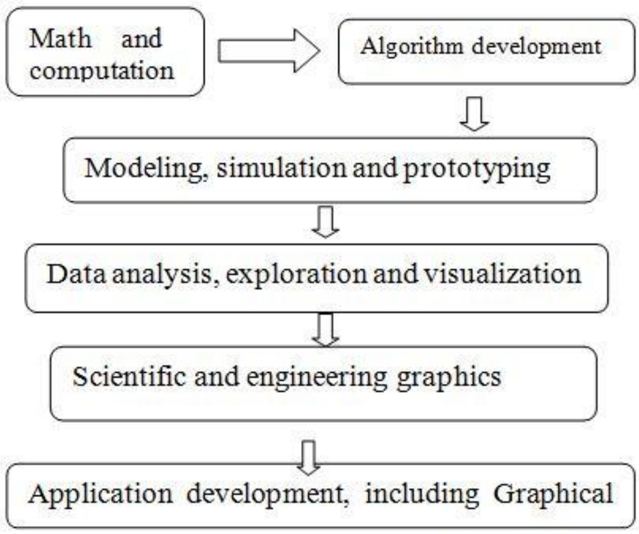
III. NEED AND SIGNIFICANCE

Proactive network protocols assume a sensor network collecting data periodically from its environment or responding to a particular query. They are not suitable for time critical applications. We think that there exists a need for networks geared towards responding immediately to changes in the sensed attributes. Therefore, we concentrate our work on Reactive protocols. WB-TEEN (Well Balanced TEEN) is a improvement of TEEN protocol which enables cluster balancing (avoiding cluster formation with a significant different in sizes). The problem with WB-TEEN is that the cluster head may not have enough energy and may die. To remove this problem we are implementing multi-hop and multi-path. Due to this we allow the nodes reduce load on the particular CH for a long time.

IV. OBJECTIVES

The main objective my research is to develop SORP protocol for increasing energy & lifetime by dynamic selection of cluster heads using multi-hops and multi-path, that leads to load balancing on different-different clusters. This results in the enhancement of cluster heads or normal nodes network lifetime. And also to evaluate the performance of our protocol, we have implemented it on the MATLAB simulator with the integrated model of Advance Clustering protocol

V. PROCESS FLOW



VI. SIMULATION WORK

MATLAB (matrix laboratory) is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar non interactive language such as C or FORTRAN. The name MATLAB stands for matrix laboratory. MATLAB was originally written to provide easy access to matrix software developed by the LINPACK and EISPACK projects, which together represent the state-of-the-art in software for matrix computation.

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