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Efficient Energy Management Routing in WSN

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***Abstract*— 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.**

Index Terms— Neural network, WSN, adhoc network

I. INTRODUCTION

A Wireless Sensor Network (WSN) contains hundreds or thousands of these sensor nodes. These sensors have the ability to communicate either among each other or directly to an external base-station (BS). A greater number of sensors allows for sensing over larger geographical regions with greater accuracy. Figure 1.1 shows the schematic diagram of sensor node components. Basically, each sensor node comprises sensing, processing, transmission, mobilizer, position finding system, and power units (some of these components are optional like the mobilizer). The same figure shows the communication architecture of a WSN. Sensor nodes are usually scattered in a sensor field, which is an area where the sensor nodes are deployed. Sensor nodes coordinate among themselves to produce high-quality information about the physical environment. Each sensor node bases its decisions on its mission, the information it currently has, and its knowledge of its computing, communication, and energy resources. Each of these scattered sensor nodes has the capability to collect and route data either to other sensors or back to an external base station(s). A base-station may be a fixed node or a mobile node capable of connecting the sensor network to an existing communications infrastructure or to the Internet where a user can have access to the reported data. Networking unattended sensor nodes

may have profound effect on the efficiency of many military and civil applications such as target field imaging, intrusion detection, weather monitoring, security and tactical surveillance, distributed computing, detecting ambient conditions such as temperature, movement, sound, light or the presence of certain objects, inventory control, and disaster management. Deployment of a sensor network in these applications can be in random fashion (e.g., dropped from an airplane) or can be planted manually (e.g., fire alarm sensors in a facility). For example, in a disaster management application, a large number of sensors can be dropped from a helicopter. Networking these sensors can assist rescue operations by locating survivors, identifying risky areas, and making the rescue team more aware of the overall situation in the disaster area.

In the past few years, an intensive research that addresses the potential of collaboration among sensors in data gathering and processing and in the coordination and management of the sensing activity were conducted. However, sensor nodes are constrained in energy supply and bandwidth. Thus, innovative techniques that eliminate energy inefficiencies that would shorten the lifetime of the network are highly required. Such constraints combined with a typical deployment of large number of sensor nodes pose many challenges to the design and management of WSNs and necessitate energy-awareness at all layers of the networking protocol stack. For example, at the network layer, it is highly desirable to find methods for energy-efficient route discovery and relaying of data from the sensor nodes to the BS so that the lifetime of the network is maximized.

The most important application [1] of neural networks in WSNs can be summarized to sensor data prediction, Sensor fusion, path discovery, sensor data classification and nodes clustering which all lead to less communication cost and energy conservation in WSNs.Neural Network based methods can be according to neural network topologies that applied such as Self Organizing maps, Back propagation neural networks, recurrent neural networks Radial Basis Functions etc. Self Organizing Map neural networks . Main advantage of this paper is Low communication costs and energy conservation and Reduction of energy consumption in sensor node after deployment and designing, Prediction of sensor node. But it srequires continuous monitoring and less applicable in dense area.

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Wireless ad-hoc sensor networks [2] due to their abilities are being rapidly developed to collect data across the area of deployment.the collected data and facilitate communication protocols, it is necessary to identify the location of each sensor. localization algorithms use trilateration or multilateration based on range measurements obtained from RSSI,TOA,TDOA and AOA. This paper deals with localization techniques in ad-hoc wireless networks, where anchors and unknown nodes are randomly positioned in a uniform distribution in a squared area. We have proposed a localization method that with use of probabilistic Neural network estimates the location of unknown nodes. we can reduce calculations and energy consumption with the help of independent Component Analysis by removing some unnecessary anchor nodes. A PNN can estimate the location of unknown nodes, properly and with the help of ICA we can reduce calculations and therefore energy consumption by about 43 percent in dense networks.

Due to use of RSSI the hardware of nodes are simpler and cheaper.One of the advantage of using this algorithm is its simple calculations that can easily be done in every node which has a simple microcontroller. Its noise sensitivity is much less than many other approaches. With the help of ICA, energy consumption and calculation will decrease and it make network simpler.

Wireless sensor Networks [3] are design with energy constraint.Energy attempt is being made to reduce the energy consumption of the wireless sensor node. Communication amongst nodes consumes the largest part of the energy. The paper focuses on use of classification techniques using neural network to reduce the data traffic from the node and there by reduce energy consumption. The sensor data is classified using ART1 Neural Networks Model. Wireless sensor network populates distributed nodes.

Directed diffusion routing protocol is implemented to carry out performance comparison.this paer focuses on classification techniques using ART1 neural network models. Lifetime improvement is carried out in both routing techniques.The sensor network is populated with 50 nodes.communication over the network is carried out by cooperative routing in one case and with difiusion routing it is used for randomization and determines the network topology.

Many sensor network routing protocols have been proposed, but none of them have been designed with security as a goal. Security goals are proposed [4] for routing in sensor networks, show how attacks against ad-hoc and peer-to-peer networks can be adapted into powerful attacks against sensor networks, introduce two classes of novel attacks against sensor networks inkholes and hello floods, and analyze the security of all the major sensor network routing protocols. We describe crippling attacks against all of them and suggest countermeasures and design considerations. This is the first such analysis of secure routing in sensor networks. We present crippling attacks against all the major routing protocols for sensor networks. Because these protocols have not been designed with security as a goal, it is unsurprising they are all insecure. We use the term sensor network to refer to a heterogeneous system combining tiny sensors and actuators with general purpose computing elements. Sensor networks may consist of hundreds or thousands of low power, low-cost nodes, possibly mobile but more likely at fixed locations, deployed en masse to monitor and affect the environment. For the remainder of this paper we assume that all nodes locations are fixed for the duration of their lifetime.

Wireless sensor networks [5] consists of small nodes with sensing , computation and wireless communication capabilities. many routing , power management and data dissemination protocols have been specifically designed for WSns where energy awareness is an essential design issue. The routing protocols which might differ depending on the application and network architecture. These protocols can be classified into multipath-based, query-based, negotiation-based, QoS-based and coherent-based depending on the protocol operation.We study the trade-off between energy and communication overhead savings in every routing paradigm.

II. EXISTING SYSTEM

Energy management is important to the reliability of the network. The nature of the application may make it infeasible for interaction with the sensor once it has been deployed. Frequently the sensors are located in remote areas making it impossible to access them. Smart dust nodes are designed to be disposable, making it more cost effective to deploy additional new nodes rather than replace batteries in existing nodes. Many wireless sensor applications require the sensors to be operational for many years. It is thus essential that the sensors are reliable and work on their own for the duration of the application. If the sensor loses power, it is gone and so is the reliability of the network. Energy management techniques include those that reduce communication and increase computation, power down certain components of the node or the entire node, nodes that cover smaller areas, and renewable sources of energy. The desire to save energy has also affected routing algorithms, scheduling, data collection and aggregation and MAC (Medium Access Control) protocol research. The tradeoff between energy savings and latency are of major concern. Some time critical applications cannot tolerate delay in packet delivery. The lifetime of the network can only increase by preserving the energy in the sensor nodes. Number of techniques has been evolved to increase the lifetime of the wireless sensor network. Since most of the energy consumption of each node is due to sensing and routing operations, many of the proposed techniques try to optimize these two tasks. Some approaches update the routing path when a sensor node in a path is low in energy thus that they would exclude the node from the routing path and preserve its energy.

Many techniques such as MCFA, GBR and Rumor routing use the shortest path method to reduce the communication and energy consumption. Many of WSN management techniques use an agent-based method to manage the wireless sensor network and its energy consumption. It is monitored for the network resources continuously.

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III. PROPOSED SYSTEM

There are two methods suggested here for energy efficient routing in WSNs. First is Most Significant Sensor Node prediction and another is Group Head selection. Now, we discuss both of these problems in any WSN and seek possible solutions using neural networks, which will actually use to determine the shortest routing path in any WSN for minimizing the energy consumption. Selecting Group Heads amongst all the nodes is also energy conserving scheme for a WSN is proposed herewith. Sensor nodes are initially powered by batteries with full capacities. Each sensor collects data which are typically associated with other sensors in its neighborhood, and then the associated data is sent to the Base Station through Group Head for evaluating the tasks more efficiently. Assuming the periodic sensing of same period for all the sensors and Group Head is selected. Inside each fixed group of nodes, a node is periodically elected to act as Group Head through which communication to/from Group nodes takes place.

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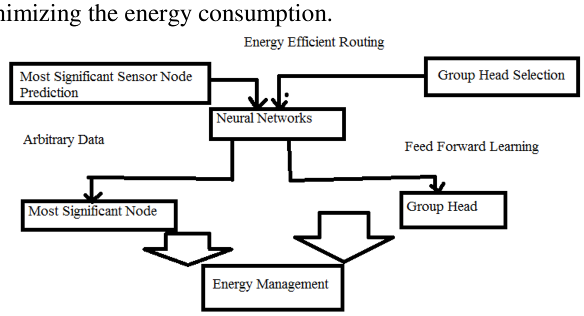

Fig.1. System Architecture

Usually WSNs life-time ends by having a single sensor node which uses all its energy and the other sensors consuming the remaining energy. This sensor (which is the cause of the networks end of lifetime) is most likely located in a very significant sensor node which always is in the routing path of many nodes to the base station. By predicting these Significant nodes, it is possible to allocate tasks to the nodes in a more efficient way and thus increase the lifetime of the network. In order to predict WSN.s most significant nodes, we propose a method based on Neural Networks. With it we would be able to know the energy level finally at the last of a WSN.s life time also we can be able to conclude that which node is consuming more energy. Such nodes which are blocking most of the energy in the network are the most significant nodes of the network.

Selecting Group Heads amongst all the nodes is also energy conserving scheme for a WSN is proposed herewith. Sensor nodes are initially powered by batteries with full capacities. Each sensor collects data which are typically associated with other sensors in its neighborhood, and then the associated data is sent to the Base Station through Group Head for evaluating the tasks more efficiently. Assuming the periodic sensing of same period for all the sensors and Group Head is selected. Inside each fixed group of nodes, a node is periodically elected to act as Group Head through which communication to/from Group nodes takes place.

In order to predict Most Significant Node (MSN) in a WSN we are depicting a set of input patterns for a five layered feed forward neural network. These input patterns belong to one wireless sensor node and by using them as the inputs of the neural network we can predict the energy level of the sensor at the last of WSN.s lifetime. These patterns may be in the form of features coded from
-Sensor node's distance from sink,
-Sensor node's distance from the neighboring border,
-Sensors number of neighbors, the number of neighbors which initially route their data through this sensor. The neural network can be trained with different network parameters. Thus, if the neural network be executed for each one of WSN at the start of the WSN.s lifetime it would be possible to predict the Most Significant Sensor nodes of the WSN. The result of this prediction is dependent of initial energy management scheme followed by the WSN. For example if in a WSN management algorithm the energy of those nodes which are located at the corners of the sensing field is mostly used, after successful training, the network would be able to understand this behavior of the algorithm and then it can predict that the final energy level of the nodes at the corner of the sensing environment must be the lowest to conserve the overall energy of the system.

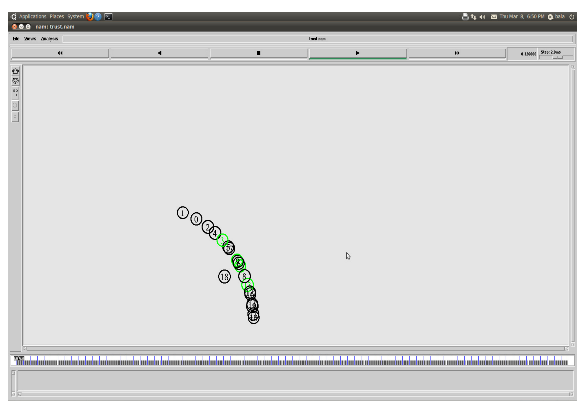

Fig.2. Creation of node and deployment in an area

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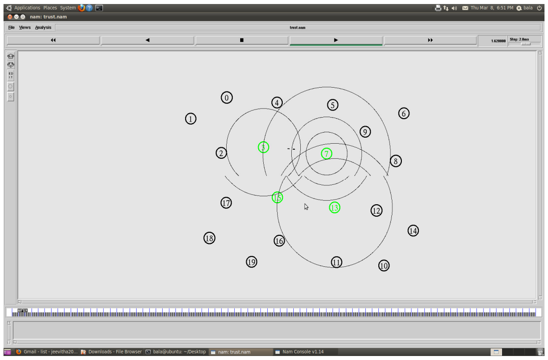

Fig.3. Sensing of data to nearer nodes with sensing of maximum energy

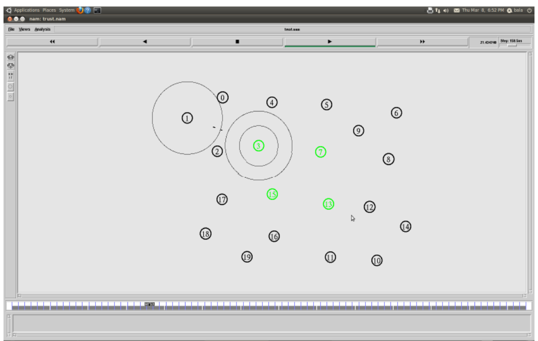

Fig.4. Transmission of data from node to cluster head.

IV. CONCLUSION

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.

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