EFFECTIVE LOCALISATION ERROR REDUCTION IN HOSTILE ENVIRONMENT USING FUZZY LOGIC IN WSN

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ABSTRACT

Placing a node and estimating a distance in a network plays a crucial role in wireless sensor network [WSN]. Now-a-days neural network [NN] scheme be used for estimating a distance between node and anchor nodes. By using NN scheme the localization error be increased and success rates should be reduced. Due to this problem the data send from the sink be loosed, and energy also is wasted. In the proposed scheme initially the node be placed randomly, then the energy should be assigned, each node transfers their energy to the anchor nodes. Then the anchor nodes communicate with the sink. Then sink collects all the data from the anchor nodes. Fuzzy logic is used for selecting an anchor node based on the rounds. Then the topology to be created and stored in the database with the help of the sink. In WSN the anchor node communicates with sink. The above process to be carried out repeatedly on comparing with old topology to new topology. When a new node is detected, by using the location of the new node to the nearest anchor node. The distance between the sink and new nodes is estimated accurately. Online training is carried out for training a topology in a database. By using these technique the accuracy and success rate be increased and the localization error be reduced. Efficiency increase due to fuzzy logic.

Index Terms: Neural Network,Fuzzy Logic, Anchor Nodes.

I. INTRODUCTION

Wireless sensor network is basically an interconnection of sensor nodes, it has an ability to senseand transmit data between node and sink. In WSN, node localization plays an important role in transferring the amount of data in a network. In a sensor node around the sink consumes relatively more energy and use up their energy first, this many to one WSN cause “energy hole problem”. It is due to the fact that that the sensor node must forward the relay traffic from the rest of the sensor nodes. Hence, how to effectively balance the consumption in a WSN and how to avoid an energy hole problem become an important issue. To this end, this paper introduces a Fuzzy logic based anchor node selection and localization. Localization scheme implemented in MATLAB 2013.MSACCESS 2007 be used for database connection with Matlab. The global positioning system (GPS) is a good, but expensive choice because is equipping all non-recyclable sensor nodes with GPS will cost heavily. To reduce the cost,

we tend to embed GPS in anchor nodes only and locate the other nodes by their estimated distances to the anchors. Popular artificial intelligent (AI) -based node localization approaches usually adopt renowned optimization techniques, such as neural networks (NNs) or particle swarm optimization (PSO), to enhance localization accuracy at a reasonable cost. The training of NN-based localization schemes can be offline or

online. Among existing localization schemes, 'Dana' involves offline training, centralized localization calculation and received signal strength indication (RSSI) to estimate the inter-node distances but generates accumulated errors and low localization success rates in sparse topologies. The back propagation ('BP') scheme, which is also an offline training and centralized localization calculating approach, uses the estimated distances of hop counts (HCs) to train and produce a network model similar to that of the DV-hop but turns over large localization errors. The results show that, at reasonable cost, our new scheme constantly out performs others by yielding higher localization success rates and smaller localization errors.

II. RELATED WORK

To enhance both localization accuracy and localization success rates, a new neural network scheme is introduced by a author . The new scheme is distinct because it can make the trained network model completely relevant to the topology via online training and correlated topology-trained data and therefore attain more efficient application of the neural networks and more accurate inter-node distance estimation.the Received Signal Strength. Experimental evaluation is conducted to measure the performance of the proposed scheme and other artificial intelligence-based node localization schemes. The results show that, at reasonable cost, the new scheme constantly produces higher localization success rates and smaller localization errors than other schemes. This paper presents a new NN-based localization scheme to upgrade the performance of a WSN.

Using online training and correlated topology-trained data to make the trained network model completely relevant to the topology, our new scheme can achieve more efficient application of NNs and more accurate inter-node distance estimation. By employing both RSSI and HCs to estimate the inter-node distance, it is able to increase the distance estimation accuracy and localization accuracy at no additional cost. We can also estimate the distance by the HCs between the unknown node and an anchor node. The anchor node will first calculate its distance to the other anchors and get the average hop distance. The estimated distance between the anchor and the unknown node will be the average hop distance multiplied by the HC between the two nodes. Using HCs to estimate distances will cut down the cost, but accumulate more errors. This scheme works in a centralized sensor network where the sink will completely dominate the training of the model and the locating of unknown nodes. As the training data come from the complete topology which covers all situations, Narea × Narea training data are included.

In a random deployment, sensor nodes are scattered randomly in the sensing field. Hence, the coverage cannot be guaranteed. In contrast, the coverage of uniformly deployment is in general larger than the random deployment. However, the uniformly deployment strategy may cause the unbalanced traffic pattern in wireless sensor networks (WSNs). In this situation, larger load may be imposed to CHs (cluster heads) around the sink. Therefore, CHs close to the sink use up their energy earlier than those farther away from the sink.

To overcome this problem, we propose a novel node deployment strategy in the concentric model, namely, Region-based Intelligent Cluster-Head selection and node deployment strategy (called Rich). The coverage, energy consumption and data routing issues are well investigated and taken into consideration in the proposed Rich scheme. The simulation results show that the proposed Rich alleviates the unbalanced traffic pattern significantly, prolongs the network lifetime and achieves a satisfactory coverage ratio. A significant amount of research has studied the node deployment problem in terms of the network lifetime. The majority of the researches can be classified into the random deployment and the deterministic deployment. Random deployment

is more applicable in many scenarios where the area of interest (AOI) is hostile, or the sensing area is enormous. Liu [9] addressed the deployment issue to prolong the network lifetime in a multihop WSN. Simulation results show that the proposed algorithm has an energy-efficient clustering and gradient-based routing algorithm. Maleki and Pedram [10] determined the densities of sensor nodes at the beginning. They also provide a continuous space model in the random deployment that can be used to provide the minimum required energy depletion. Xin et al. [11] first studied the biased energy consumption rate (BECR) phenomenon in a multihop WSN. They consider the joint problem of relay node deployment and transmission power control in order to prolong the network lifetime. Deterministic deployment can be applied in the conditions where the AOI is human accessible. The consumed energy for transmitting m data unit over a distance d is m × (Eelec + Eamp×dα), where else is the energy consumed in a sensor node for transmitting 1 bit of sense data, amp is the amplified energy (multi-path model), d indicates the transmission distance and α denotes the path loss exponent.

Generating fuzzy rules from training data is the most vital assignment in design of fuzzy classification system. In this paper, we present an approach to deal with the classification problem where fuzzy logic is used. We intend to show that fuzzy logic introduces new elements in the identification process, to manage imprecise information. A method to generate set of definitive fuzzy rules from initial training data is introduced. A triangular membership function is used for generating fuzzy rules from training data as they are simpler and more human understandable with high interpretability. Fuzzy rules are simply IF-THEN rules, used for knowledge representation with high interpretability. For a pattern classification problem, Fuzzy IF–THEN rules include two clauses viz. Antecedent and consequent. Antecedent clause includes conditions for the occurrence of the event; while consequent contain consequence of antecedent clause. For generating fuzzy rules we need to draw membership function for corresponding input data.

The length of membership function is obtained using the difference between maximum and minimum value of the attribute. Membership function recycled each input attribute to unit interval [0, 1] by using linear transformation that preserves the distribution of training patterns. Then, partitioning the pattern into fuzzy subspaces took place where each subspace is identified by a fuzzy rule. By assigning linguistic values of each input attribute we can do partitioning. Generally, triangular membership functions are used for this purpose, as they are simpler and more human understandable with high interpretability.

The fuzzy classification system is one of the important applications of fuzzy set theory [11]. We proposed a procedure for generating fuzzy rules from input dataset and then to construct a set of definitive rules that are generalizations of initial rules. Fuzzy rules are used for knowledge representation. Two methodologies to get hold of fuzzy rules for fuzzy classification systems. One is given directly by experts; and the other is produced through an automatic learning process. The main purpose of this paper is to obtain an automatic procedure able to get the structure of a fuzzy rule from a given input data set. Fuzzy rules generated must contain fewer components in the antecedent clause of the rule and identifying simultaneously the largest number of examples in given input data set.

III. SYSTEM ARCHITECHTURE

Initially the node be placed randomly, then the energy should be assigned, each node transfers their energy to the anchor nodes.Then the anchor nodes communicate with the sink. Then sink collects all the data from the anchor nodes. Fuzzy logic is used for selecting an another anchor node based on the rounds. Then the topology to be created and stored in the database with the help of the sink. In WSN the anchor node communicates with sink.

The above process to be carried out repeatedly on comparing with old topology to new topology.When a new node is detected, by using the location of the new node to the nearest anchor node. The distance between the sink and new nodes is estimated accurately.

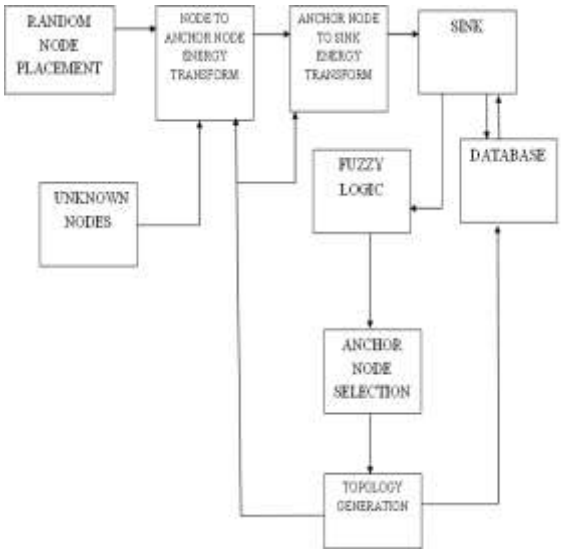

Fig3.1 Architecture diagram

IV. IMPLEMENTATION AND RESULTS

To implement the project the following assumptions are made with regard to the cloud computing, physical machine, virtual machine, resource management. The following section lists the implementation with the results.

4.1 Tool Descriptionmatlab

A wireless sensor network consists of spatially distributed autonomous sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance. They are now used in many industrial and civilian application areas, including industrial process monitoring and control, machine health monitoring, environment and habitat monitoring, healthcare applications, home automation, and traffic control [1-2].

A smart sensor node is a combination of sensing, processing and communication technologies. The basic architectural components of a sensor node. The sensing unit senses the change of parameters, signal conditioning circuitry prepares the electrical signals to convert to the digital domain, the sensed analog signal is

converted and is used as the input to the application algorithms or processing unit, the memory helps processing of tasks and the transceiver is used for communicating with other sensors or the base stations or sinks in WSN.

Sensors can monitor temperature, pressure, humidity, soil makeup, vehicular movement, noise levels, lighting conditions, the presence or absence of certain kinds of objects or substances, mechanical stress levels on attached objects, and other properties. Their mechanism may be seismic, magnetic, thermal, visual, infrared, acoustic, or radar. A smart sensor is also capable of self-identification and self-diagnosis. The mechanisms of smart sensors work in one of three ways: by a line of sight to the target (such as visual sensors), by proximity to target (such as seismic sensors), and by propagation like a wave with possible Simulating A Simple Wsn In Simulink MATLAB

V. MODULES

Implementation takes place by the means of the following modules

- Node Placement
- Anchor node selection
- Topology generation
- Node location in database
- New node placement
- Updated topology in the database
- Estimating the distance

5.1 Module 1: Node Placement

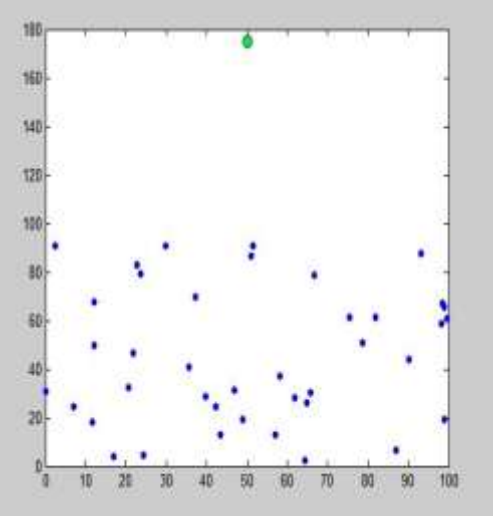

Fig 5.1 Node placement

Nodes are deployed randomly in the simulation environment. Totally fifty nodes are deployed for implementing the concept. Each node has individual initial energy. The energy is assigned initially Next data transfer between the sensor nodes and the anchor nodes, the sink be placed at the middle of the environment.

5.2 Module 2: Anchor Node Selection

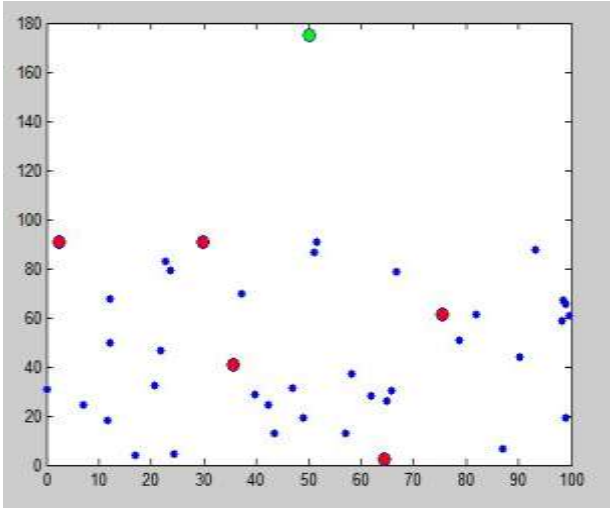

Fig 5.2 Flow modeling

Based on the node having higher energy is selected as the Anchor nodes after completing the rounds of Energy Transmission between the nodes. The Fuzzy logic is used for selecting an anchor node in the environment. Then the anchor nodes collects all the hop-counts and RSSI from the nearby nodes.The anchor nodes tabulate the location of the nodes based on the RSSI received from the nodes. Now the anchor node is ready to communicate with SINK.

5.3 Module3: Topology Generation

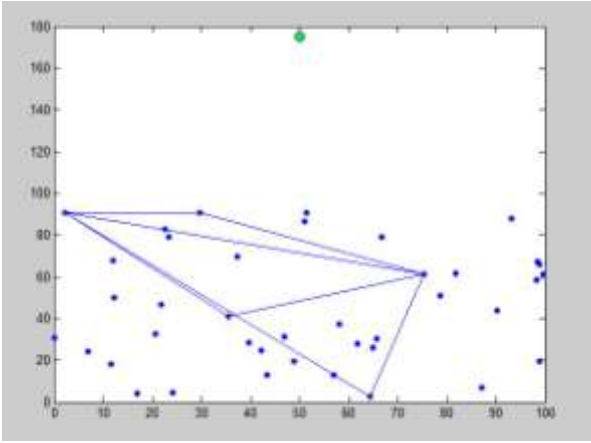

Fig 5.3 Topology Generation

The sink collects all the data from the Anchor nodes and place the co-ordinates in the region based on the signal strength and energy. Sinks connects the anchor nodes to form the topology.Then the location of the anchor nodes is stored in the database.Finally the topology is generated and stored in the database for future comparison.

5.4 Module 4: Node Location In Database

When the topology is stored in the database the location of the anchor node can be viewed in the database

VI. CONCLUSION

Using of the LEACH algorithm for energy efficient and using the fuzzy logic for anchor node selection reduces the localization error and increases the high success rates. The distance between the new node to sink is estimated accurately by the comparison of topology in the database. In future works a part of my work I completed the first four modules and as a part of my future work in phase II, I am going to implement that the location of the new node entered in topology and the accurate distance calculation from node to sink.

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