Research Article

COMBINED ANALYSE TRUST SECURE ROUTING STRATEGY AND BUILD A GENTIC FUZY BASED MODEL FOR WIRELESS SENSOR NETWORKS

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Abstract:
In recent times, the development sensors wirelessly have been an essential requirement for cutting-edge areas like environment surveillance and intelligent cities. En-route filtering systems are mainly focused on energy efficiency by preventing fraudulent report injection attacks. However, the lifetime of networks is typically neglected. They also have fixed path routing as well as fixed responses to attacks. Additionally, the hot-spot issue is regarded as one of the biggest problems in the extension of network life. In this paper, we propose an algorithmic basis for a fuzzy genetic optimized re-clustering technique to overcome these restrictions and thus reduce the impact of the hot-spot issue. This fuzzy algorithm is employed to analyze the network conditions. In re-clustering key issue is when to conduct the subsequent clustering. To determine the exact time of the next clustering (i.e. the energy draining from the nodes to zero) as well as the fuzzy member functions are optimized by using a the genetic algorithm. Simulation tests verify the proposed algorithm. It has shown that the network's lifetime can be extended by up to 3.64 times while maintaining the detection capability and energy efficiency.

Keywords: wireless sensor networks; fuzzy logic systems; genetic algorithms; optimization; en-route filtering; network lifetime; re-clustering

1. INTRODUCTION:

An Wireless Sensor Network (WSN) is a network that consists of a variety of geographically dispersed sensor nodes. Sensor nodes form the brain and heart for the network which are intended to collect information from the surrounding environment and interact with other sensors. The sensor gathers data from the surrounding environment and then forwards it onto the node that is sinking. The sink node can either process the data, or it may forward it to the network. Therefore, a sensor is capable of acquiring and processing, as well as forwarding the data by itself. To accomplish this every sensor node is constructed with four distinct units. they include sensing, processing energy, transceiver, and sensing units.

The sensing device consists of a sensor as well as the Analog to Digital Converter (ADC). The ADC converts the sensed data into digital form and sends it to a processing unit. The processing unit will perform simple calculations from the data it has sensed. The transceiver device is intended to facilitate communication between sensor nodes. This can be done either directly or in indirect ways. Direct communication is in between the sending party and receiver. The direct method of communication does not require a mediator for the communication to take place. However the indirect method of communication needs an intermediary between sender and recipient. The mediator is responsible for making connection between the sensors.

There may be many nodes that connect the sender and the receiver depending on the nature of the networks. In order to carry out the various tasks power is the primary component and is provided through the power unit. This unit comes fitted with a battery that allows all the functions of the sensor. The four components work in concert to fulfill the function that the sensors serve. Realizing the potential of sensor nodes, sensors are widely used to a variety of areas. A few of the most prominent uses of sensor networks are surveillance of healthcare, environmental monitors for battlefield surveillance applications based on tracking smart transportation systems, and more. The application of WSN are readily used in many different areas. Despite the wide applications, WSN has a number of research challenges , such as inaccessibility, energy-stiffness the dynamic topology of security coverage and connectivity problems.

II Related Work

The most important activity of sensor nodes is communication. The main goal of the network's information sharing is to communicate the collected data with the powerful node. Communication is not always possible in direct mode.

It makes sense that while the source cannot directly reach the destination, it can be made possible through intermediate nodes. Intermediate nodes are responsible for transferring the message quickly to the destination without any modification. Routing is the entire process of moving a message from source into destination. Routing is the most fundamental activity of any sensor node, and consumes more energy per unit than all other activities. The sensor network's lifespan is affected by how much energy the nodes consume. The network's purpose cannot be fulfilled if the lifetime of sensor nodes decreases. It is important to be careful when consuming energy. Because energy consumption and network lifespan are closely linked, The network lifetime automatically decreases as the energy consumption rises. There are many energy-efficient routing schemes that can be used to address this problem. A routing scheme's main goals are to reduce energy consumption, improve network lifespan, provide availability, and minimize latency. These factors all increase efficiency and performance.

Flat Routing Schemes

This network organization assigns the same responsibility to all sensor nodes that are part of the network. This network architecture allows the base station to send queries region-wise to the sensor nodes, and the sensor nodes to reply to the base stations. This network organization has the advantage that it does not require any special arrangements, but the communication costs are higher.

Hierarchical routing schemes

WSN is a big fan of hierarchical routing. This scheme allows the central authority to control and organize the sensor nodes. Hierarchical routing organizes the sensor nodes into multiple clusters, each one containing several sensor nodes. Each cluster has a cluster head, which manages the activities of the nodes that are present within it. This is a fellow-node with greater power than the other nodes. The activities of its member nodes are managed by the cluster head.

It helps to transmit messages. This hierarchical network organization reduces energy consumption, and allows for scalability, management and so forth. These factors all contribute to the network's longevity.

Sensor nodes in a network transmit data to multiple nodes, and receive data back from many nodes. This is known as data sharing or communication. It is not essential that all networks use the same type of communication. The communication style of the network will vary depending on the requirements and design of the application. Therefore, routing schemes can be differentiated according to whether they are query-based, negotiation-based or coherence-based. These techniques are summarized as follows.

Routing based on queries

The query-based routing technique uses a node to forward a query over a network, to the node that has the data. Once the query is answered, the node will return the data. These queries can be presented in simple or complex language. Directed diffusion is one of the most effective examples of query-based routing, as described by Intanagonwiwat and al. 2000. This technique involves the base station sending a message to the network. Let's say that the base station has the data and the sensor nodes match it. Then they send the data along the path.

Routing based on Negotiation

Negotiation-based routing protocols are designed to eliminate duplicate data. The sample routing techniques that are based on negotiation are Sensor Protocol for Information via Negotiation.

Flooding can lead to data duplication which is more costly and consumes more energy. Negotiation-based routing protocols prevent data duplication by sending a series of negotiation messages before the actual data transmission.

III METHODOLOGIES

This section outlines the elements of the work in its initial stages that include the foundational assumptions for this research. The most important components involved in this research include sensor node clustering and cluster leader node recycling and selection, and creating routes and optimal routes. To achieve the aim of this research it is necessary to formulate certain assumptions and are described in the following manner.

* This device is the capacity of a base station, with a solid power backup, and isn't static in nature.
* The nodes that are participating are fixed and don't move.
* All of the nodes within this group are conscious of the geographic location, but Global Positioning System (GPS) is not used here. A node within this network could be a leader of the cluster or cluster participant.
* A leader of the cluster as well as the participant node serve as members and heads of cluster as well.

A cluster leader is able to receive packets from all the participants and is able to connect to the base station directly or via other nodes in the cluster.

Based on these assumptions, the general outline of the approach is shown in figure 1. It is categorized into three major parts, and they comprise clustering, route creation and routing selection. Each main component is comprised of several sub-phases, and is described in this section. The clustering component is designed to bring a certain number of sensor devices together and selects a node that is eligible as a leader of the cluster. The cluster leader is accountable to oversee and control the activities of all the participating nodes. The majority of existing projects pick the node that is the leader of the cluster by making a special focus upon the power.

This routing policy determines the cluster leader by utilizing the energy aspects like energy backup packet delivery rate, energy backup integrity of the node. The rationale behind the inclusion of these energy elements are based in the following manner. The energy backup is included because it is the primary factor in determining the lifespan that the sensor will last. The performance of the node is linked with the lifespan of the sensor, and in the end, the efficiency of the system is determined by the lifespan that the system. Thus, energy backup can be thought of as an energy source. Although an energy back-up of the sensor is not unreasonable, it could not be interested in forwarding packets. This behavior of the nodes can be identified by using the The Packet Delivery Ratio (PDR). Therefore the PDR will determine the forwarding capability of this sensor. In this way, the PDR is considered to be part of the energy variables of this research. This Node Honesty (NH) is the third major energy factor that reflects the behavior of a particular node. Certain nodes could be involved in malicious actions like data manipulation, data deletion and the like. This can seriously impact the integrity of the data as well as causing security problems. Thus, the integrity of the node is considered to be one of the energy variables.

The addition of additional energy factors can increase the complexity of computation, consequently, this study considers three crucial energy factors that can be used to evaluate the credibility of a node. A sensor's energy sensor is determined by two nearby sensors that are nodes. The cluster leader control its participating nodes, and the leaders of the cluster are controlled via the base station. The leader of the cluster gets recycled each time to maintain an equilibrium in the work load. A sensor's energy is calculated for every interval of time since the position of the sensor may alter at any point in time. If a message is to be sent by the forwarder towards the destination all possible routes between two entities are calculated and then the best route is determined through the Cuckoo Search Optimization (CSO) algorithm. All of the components that are of the proposed method are listed in the following manner.

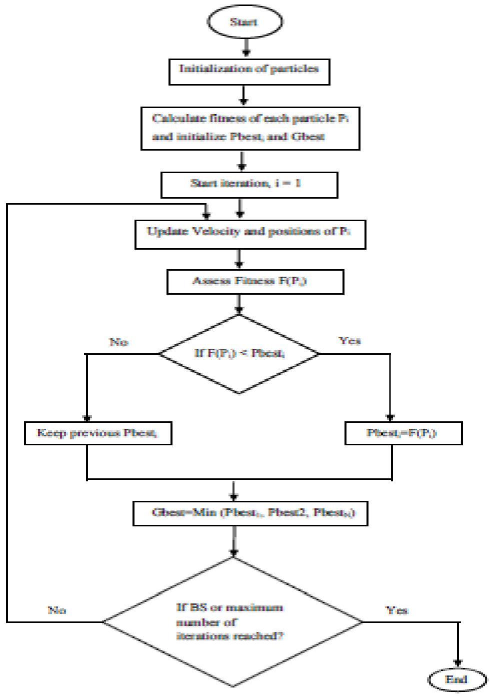


Figure 1: Flowchart for PSO_based routing algorithm.

Each node processes data from the group of nearby sensor nodes and transmits the transformed data directly to BS via the multiple hops. It is the BS can be the largest and most important component of a sensor network because all the relevant information that sensors collect are sent to this BS which is where data gets then aggregated and processed. If you compare the distance between two nodes, those that are closer to the sink must transmit more information since all messages can be processed Sinks can be reached only by their neighbor.

Input:

S : Set of sensors

N : Set of neighbors

RC : Communication Range

n : Total number of sensors

v : Number of Neighbors

m : Maximum number of random points that can be generated within the communication area represented by a circle.

c : Count of overlapped points

Output:

Cov_Area_Overlap: The percentage of Communication Area of the Sensor overlapped by its neighboring sensors.

1) Start

2) Repeat for every sensor Si in S { i = 1,2....,n}

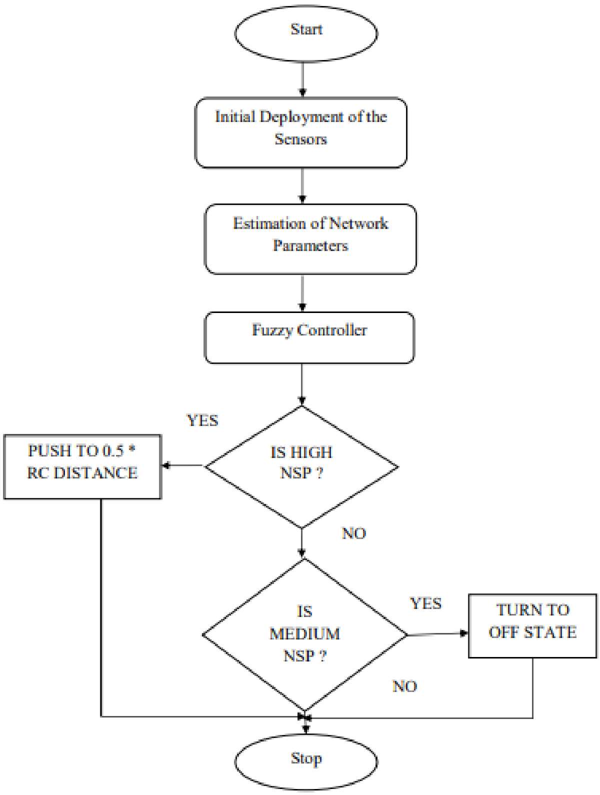
3) c=0

4) Generate K Random Points Xk in Si {k = 1,2.........,m}

5) Repeat for every Nj in Si {j=1,2...........,v}
6) dk // Euclidean Distance between Nj and Xk
7) if dk < RC
8) c = c + 1
9) Estimate Cov_Area_overlap = (c/k)* 100
10) Stop

A high number of neighbors creates overhead , while an insufficient number of neighbors can cause data loss. The precise number of neighbors for a particular application cannot be established prior to the time of implementation. Optimize a objective throughput function using how many neighbors are in the middle. suggest that a predetermined number of neighbors equal to 6 is enough to ensure network connectivity , regardless what the number n.Later the magic number was changed to eight. There isn't a magic number, however it is a matter of how many neighbors needed increases with Flog n, which is constant. Particularly the study, the authors concluded that in order to attain the desired network connectivity the number of neighbors must be greater than 0.074 log n but lower than 5.1774 log n. The authors (Song and co. 2005) have provided a more accurate lower bound on neighbor count to be 0.129 per log.

The primary goal of this work is to cut down on energy usage by eliminating redundant sensors. The proposed system is composed of two phases. The first step is to find redundant sensors using the parameters of the network. The second phase utilizes a fuzzy controller in order to make the best decision about the actions to be taken with respect to the redundant sensors that are identified. The general structure for the system is shown in the figure.



Figre 2 : Each time the following steps will be considered:

Step 1. Randomly place your sensors (n) in two-dimensional space by using the Air Drop Technique.

Step 2: Collect the details about the location of the sink and estimate the distance from the source of water (xs , the ys).

Step 3: Calculate the amount of neighbours in the vicinity Nneigh (Near to neighbours in a particular node are nodes located within a shorter distance in comparison to its RC and that are overlapped by its neighbours (Co overlap))
Step 4 Step 4: Feed the inputs like The Probability of Connectivity (pcon) and distance to sink (Dsink) and Nneighbors Nearby (Nneigh) as well as the percent of coverage overlap (Co overlap) to the Fuzzy controller.
Step 5: Using the fuzzy inference technique using the fuzzy inference mechanism, using the fuzzy inference mechanism, the Node selection Probability (NSP) is determined. In accordance with the NSP some of the actions below are taken into consideration:
Case 1 1. In the event that there is a low NSP falls below a certain level, no action is taken on this node.
Case 2. When the NSP is in medium, sensors will get switched in to "inactive (off)" mode for the time being, then changed back to "active (on)" mode to the next time.
Case 3. When you find that the NSP exceeds the threshold, it will get pulled toward the sink at a length that is 0.5 + RC.
Step 6: End.
Lifetime Extension Methods for WSN

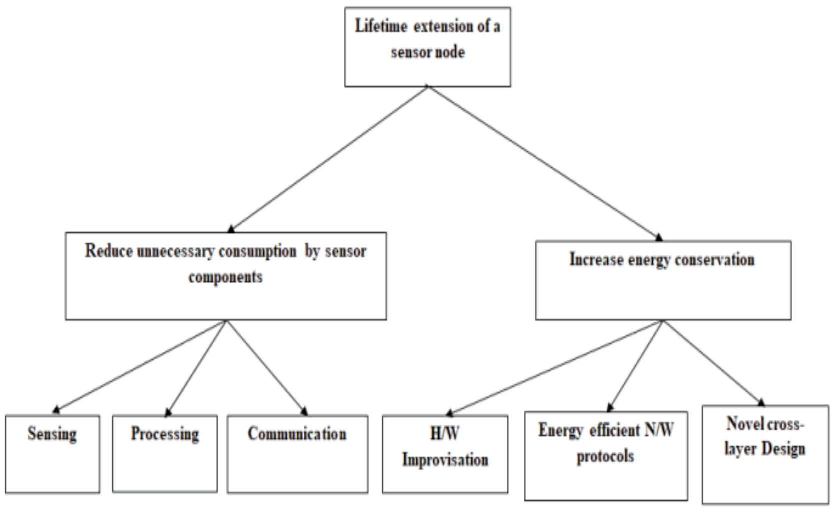


Fig 3 shows a basic set of energy saving mechanisms for nodes, a brief explanation for these is given below.

IV PROPOSED MODELS

Experimental Setup

The primary objective of the algorithm is to improve the life span of the wireless sensor network. it strives to do this by forming the largest number of disjoint cover. Each cover represents a single-lifetime duration for the WSN and the overall duration that the WSN has (maximized duration) is the number of disjoint-set covers created by the algorithm following the installation of the system. The graphs created here illustrate the number of covers created in relation to the number of generations which show the highest longevity, which is equivalent to the number of covers produced. The performance of the proposed algorithm is tested using an experimental setup, hich was designed and tested using an experimentation technique. The algorithm presented here is implemented using MATLAB and runs on Windows XP platform with 4GB RAM.

The simulations were conducted to evaluate the performance on fitness-related functions, F1 as well as F2. Ten targets were considered, and the 10 targets.

Table 1 Parameters

Parameter	Value
NP	60
C1	1.4625
C2	1.4630
W	0.7968
Vmax	0.5
Vmin	-0.5

Table 2 Simulation Parameters

S. No.	No. Of Nodes	Area m^2	Transmission Radius
1	50	10000	[15 - 23]
2	100	40000	[23 - 34]
3	150	90000	[29 - 43]
4	200	160000	[35 - 50]
5	250	250000	[40 - 57]
6	300	360000	[45 - 63]

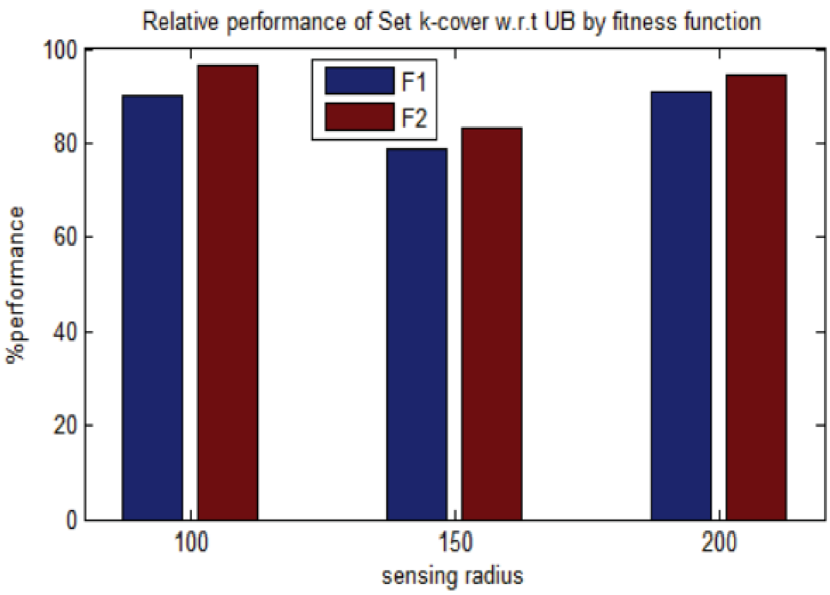


Figure 4 Set-K Covers Generated for Different Sensing Radius

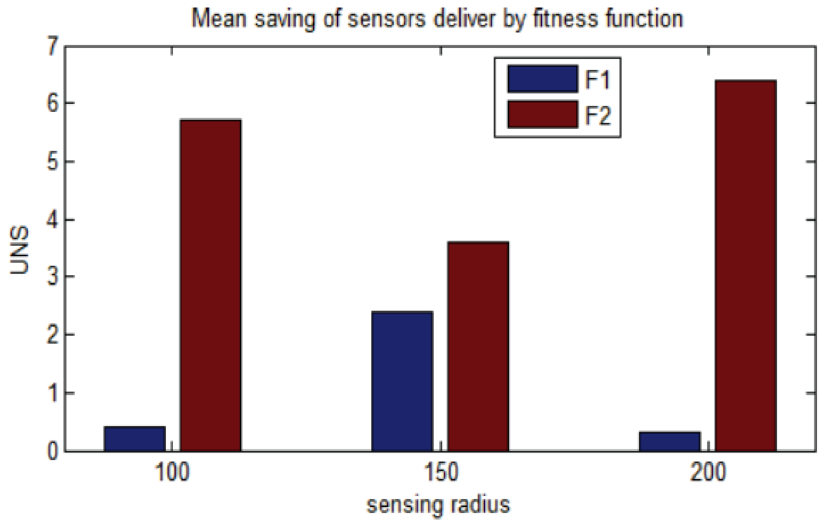


Figure 5 Comparative Performance of F1 and F2 using less number of Sensors to form Covers

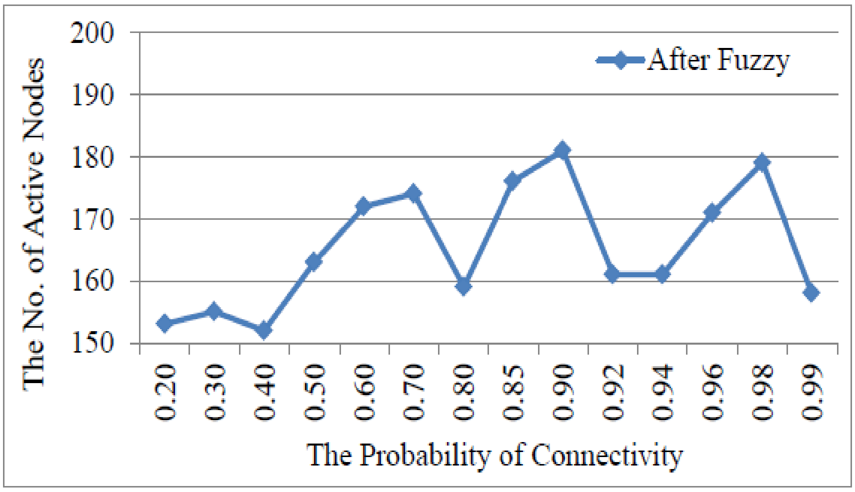


Figure 6 The Number of active sensors Vs The Probability of Connectivity (200 Nodes deployed in the area of 160000 m2)

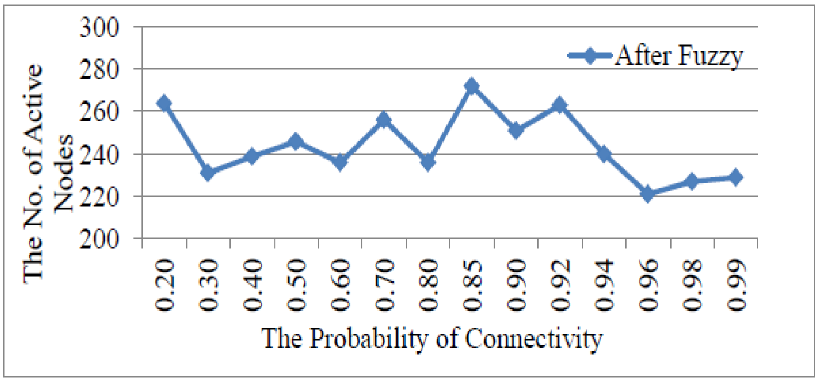


Figure 7 The Number of active sensors Vs The Probability of Connectivity (300 Nodes deployed in the area of 360000 m2)

V CONCLUSION

WSN is an essential component in a variety of areas of use. Redeploying and deploying sensors is essential in real-time massive networks. There is a balance between the necessity and necessity of redundancy in the network. The fuzzy-based approach is applied in the solution proposed to reduce redundancy and to distribute sensors according to the necessity. There are a myriad of network variables that affect directly or indirectly the impact of redundant sensors. In this respect, components such as proximity coverage and distance and overall density, which determine the amount of redundancy, are incorporated. A fuzzy-based system for decision-making lets the system be tuned to detect redundant sensors, and make optimal choices, whether with or without or pushing. Simulation results show that the fuzzy-based system is better when it is able to retain energy, as well as coverage and throughput. The work in the near future will focus on a fault tolerance systems. It concerns the way in which an inactive sensor can be used to replace failing nodes in the network by altering how the networks are structured using only a few changes.

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