Sensor Selection Using Attention Control Modeling Method Based on Fuzzy Neural Network Learning

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Abstract- *Attention control is one of the best ways to reduce information resources and processing. Discontinuous modeling has been used in attention control and has proven some advantages of attention control. In this paper we present an attention control architecture based on continuous modeling for mobile robot platforms. By using fuzzy neural network we construct efficient attention control which is capable of decreasing sensors sampling rate and also choosing the most efficient set of sensors. We also build a novel method for gathering information to construct fuzzy neural networks. We experimentally proved that fuzzy neural networks. Once the attention nodes will be identified, the next work is about to identify the agent nodes that will monitor these critical nodes over the network. Here, an intelligent approach will be applied so that minimum nodes will be taken to monitor all the critical nodes. Once the agent nodes will be defined, the next work is to identify the alternate nodes to the attention nodes that can replace the nodes so that effective results will be drawn from the network.*

Keywords- Clustering, Data Aggregation, Leach protocol, Nodes and Sensor Network

I. INTRODUCTION

Sensor network is defined an organized adhoc network in which large number of sensor nodes and the resources are combined to perform the communication. These networks are generally defined with limited resources such as battery, bandwidth, power supply.

The concept of sensor networks is fairly new and the first article on the wireless sensor network (WSN) concept was published in 1998 (Asada et al., 1998). It is considered as the most sensitive research area with the specification of physical environment so that the wide range of communication applications comes under sensor network. These applications includes statistical applications, war zone applications, disaster application and scientific research application.

The constraints of sensor network include the memory, computing power, energy etc. To perform the communication over the network, one of common adaptive approach is aggregation. According to this approach, the data is transferred from one node to other in a series till the destination node not arrived. There are number of aggregation approaches defined under network capabilities to perform the communication over the network nodes. These nodes are defined under the physical and environmental conditions such as humidiy, temperature, pressure, vibration etc. These network are able to perform bi directional communication over the network and to control the network activity. As a result of this variety, WSNs support a wide range of applications. Arora et al. (2004) proposed a WSN for security and defence applications while Shen, Wang and Sun (2004) used WSNs for industrial automation. Some researchers also studied WSNs for habitat monitoring (Mainwaring, Culler, Polastre, Szewczyk &Anderson, 2002). Another application is a traffic control system demonstrated by Wenjie, Lifeng, Zhanglong and Shiliang (2005). Malan, Fulford-Jones, Welsh and Moulton (2004) offer a health careapplication using WSNs. One final example is a fire tracking application established on a WSN is demonstrated by Fok, Roman and Lu (2005). WSNs pose various challenges such as limited resources of motes, heterogeneity of nodes, network deployment, communication failures, security, routing, and programming. According to Boulis, Han and Srivastava (2003).

In WSNs, each sensor node has various sensors depending on the WSN application. Each sensor nodes is able to perform the communication under energy constraint. It means each participating nodes gives some energy loss. This loss depends on the role of the node in communication. A communicating node gives different level of energy loss based on the operation such as transmission of data, receiving, forwarding or aggregating data. The communication in such network can be single hop or multi-hop. The data transmitted from these nodes is collected by the base station. This connectivity network can also include laptop, PC or PDA as seen in Figure 1.1. Senor network is defined with 3 main components :

- Node itself that sense the environment or the resource
- Another component is process component to perform the communication

Communication components are responsible for the information exchange.

Data Aggregation is the another communication architecture applied in sensor network to gather the information from different nodes and pass to next node or to the base station.

III. PROPOSED WORK

A. Problem Definition

A sensor network is defined with large number of energy nodes. In this present work, an intelligent parametric approach is defined to identify the critical nodes over the network so that effective node monitoring will be done.

B. Objectives

The objectives associated with presented work are defined here

- To define intelligent attention node identification and monitoring in sensor network.
- To define an effective fuzzy improved probabilistic neural approach to identify attention nodes.
- To identify the agent nodes so that effective monitoring will be done.
- The objective of the work is to perform network reconstruction by performing the critical node substitution.
- The objective of the work is to improve the network life and communication over the network.

C. Research Methodology

The present work is about to provide the solution to the Attention Node Analysis problem.. The presented work is divided in two main phases. In first phase, we have defined eligibility criteria for the node to be the member of coverset. A node can be the member of coverset and will cover the Attention node if it satisfy the following criteria

(i) Sensing Range : The sensing range is defined in terms of the actual communication distance for that the communication is possible with extra energy loss.

(ii) Energy Vector**:** The second parameter for deciding the coverset eligibility for a node is the energy of the node.

(iii) Load **:** In the communication, But as the communication over that node is increased or the load over that node is increased it require more energy for the communication. If the load is lesser than the .5 than the node will taken as the eligible to that node.

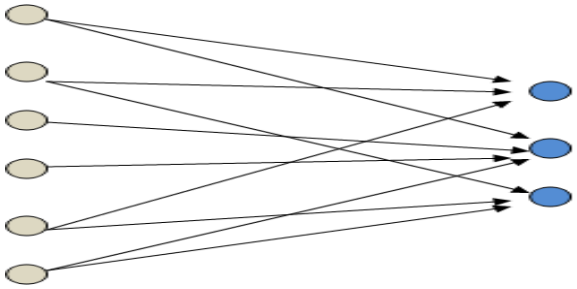

Figure 3.1 : Attention Nodes Covered By Sensor Nodes

As we can see in figure 3.1, the description is identified that nodes Node Criticality to the Attention nodes. As s1 covers t1 and t2 in same way, the Node Criticality of each node is identified. Whereas figure 2 is showing the reverse work, each Attention is covered by k number of nodes. As we can see t1 is covered by s1, s2 and s3.

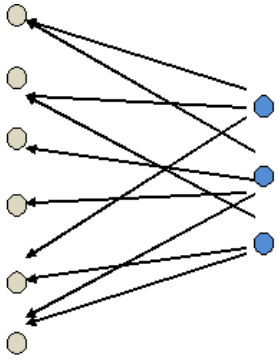

Figure 3.2 : Attention Nodes covered by Nodes

Once we get all the eligible nodes to be the cover node members. The next work is to generate the coverset. A coverset will be defined under the following constraint

- A cover set will contain k number of sensor nodes so that all m number of Attentions will be covered.
- A sensor node can be the part of any number of coversets.

(1) Coverset Energy

A Coverset will be activated, if the overall energy of the nodes is higher than the defined threshold value.

D. Research Design

One of the common problems of sensor network is Attention Tracking problem. According to this problem, N numbers of Attentions are defined over the network with m sensor nodes. To track the Attentions, the ACO based approach is suggested in this work.

- In this work, each node over the network will communicate to particular Attention node. The communication will be defined as (Si,Tj) i.e. between sensor node Si and Attention node Tj.
- For this communication we have to identify the m disjoint coversets over the network. Each coversets will be active sequentially for a communication session.
- The communication will be performed by a coverset node directly as the Attention node is present in the range of the node itself.
- A coverset will track the Attention nodes effectives.
- The Attention nodes are in moving stage because of which, it is required to track the position of Attentions.
- To track the Attention nodes, ACO approach is suggested in this work.

E. Simulation Parameters

The must simulation parameters include: number of sensor nodes and number of Attention nodes The various simulation parameters are given below:

Table 4.1: Simulation parameters for the network establishment

Parameters	**Specifications**
Area	500×500
Sensors	30
Attentions	3
Base Station	(450,400)
Energy of each Sensor	0.5 J
Sensing Model	Binary
Sensing Range	150m

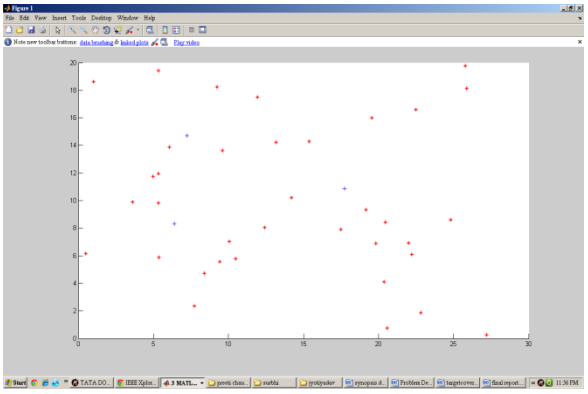

Figure 4.1 Sensor Network Establishment

Sensors and Attentions are generated at random positions in terms of their coordinates assuming that no two sensors are at the same position. The location of base station is fixed and predetermined.

F. Generate the sensor covers

The sensor covers are generated till all the Attentions are covered. For the generation of sensor cover we first find the Euclidean distance of each Attention from the sensor. Figure 4.2 shows the matrix containing the Euclidean distance of sensors from Attentions.

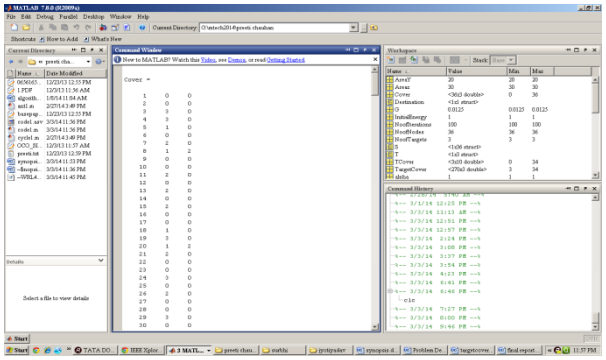

Figure 4.2: Euclidean Distance Matrix

G. Assign lifetime

Each generated cover is assigned a lifetime. And the cover will be active only until its lifetime expires. The total network lifetime is the product of number of sensor covers and their respective lifetime associated with each cover.

Network Establishment

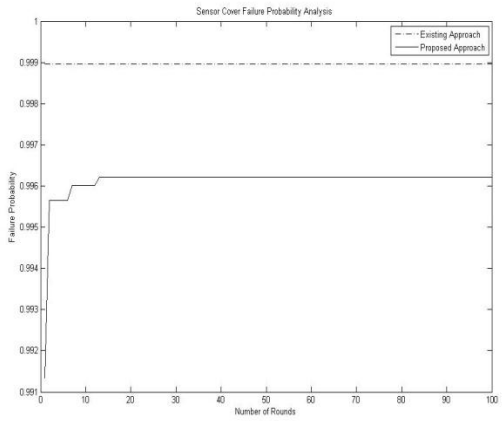

Figure 4.3: Number of iterations vs. Failure Probability

Figure 4.3 shows that the presented work has reduces the failure probability of the network. Here x axes represents the rounds and y axis represents the number of rounds and y axis represents the failure probability.

Table 4.2 The lifetime of Sensor Networks with 5 Attentions and 30m sensing range with G=0.0125

Number of Sensors	20	25	30	35	40	45	50
Proposed Algorithm	10.5	19.5	24.50	25.5	38.25	45.25	55.5
Existing Algorithm	8	12.25	15.25	20.5	30.25	40.25	45.5

V. CONCLUSION

A sensor network is generally a hybrid communication network in which some nodes are identified as critical nodes called attention nodes. It is required to monitor these critical attention nodes regularly. The presented work is about to identify a set of nodes that can monitor the attention nodes regularly. The work is here defined under criticality vector and fault factor so that effective generation of coverset will be done. The coversets are here defined to perform regular monitoring of attention node. The work is also define a scheduling mechanism to decide the order in which these coverset will be activated. The presented work is here implemented in matlab environment and analyzed under the network life parameter. The obtained results from the work shows the effective generation of coversets so that network life get improved.

VI. FUTURE WORK

In this present work, an effective identification of coverset is defined to monitor the critical attention nodes. The can be improved in future in following ways

- In this work, a fault based analysis approach is identified to generate the coverset. In future some other parameters can be used such as barrier analysis, inconsistent localization etc.
- In this work, the statistical and mathematical model is defined for failure node identification, in future some optimization approach can be implemented to track the failure nodes.

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