ISSN:0975-9646

Trusted Clustering Based Event Detection for Disaster Management in Wireless Sensor Network

Apurva Saoji[#], Prof.P.D.Lambhate[*]

[#]*M.E scholar Computer Department, Pune University, Pune ,India*
[*]*Associate Professor, JSCOE, Pune, India*

***Abstract*— Wireless Sensor network is having tremendous growth in current world due to low cost sensor and well planned techniques. Wireless sensor networks (WSNs) are large networks made of a large number of sensor nodes with power to sense the environment and communicate it with administrator. This technology can be used to detect the particular event which can be helpful to manage the disaster like fire. Until now various techniques of distributed event detection have come forward and effectively contributed to manage the disaster of fire. In this paper, we have studied various techniques used for distributed Event Detection in WSN. Also we have implemented the machine learning technique based on majority voting. We have deduced some results based on the implementation. The results are having drawbacks. To remove the drawbacks in current system, trusted clustering algorithm is proposed.**

***Keywords*— Wireless sensor network, distributed event detection, disaster management**

I. INTRODUCTION

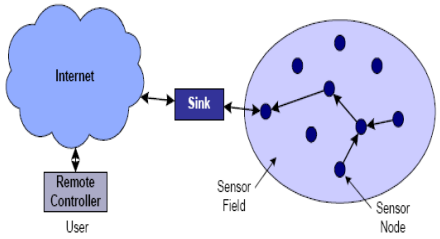


Fig 1: Architecture of Wireless sensor network

Wireless sensor Network consists of small microcontroller fitted with sensors and some means of communication radios. A sensor node, also known as a mote, is a node in a wireless sensor network that is capable of performing some processing, gathering sensory information and communicating with other connected nodes in the network. The sensor nodes are distributed over wide area and transmit gathered data to one or many central nodes called as Sink or also known as base station. With integration of information sensing, computation, and wireless communication, the sensor nodes can sense physical information, process crude information, and report them to the sink. The sink in turn queries the sensor nodes for information. The sink or administrator will collect data from nodes and apply machine learning technique and majority voting method to deduce the meaningful results. This will helps in disaster management at big level. Also it reduces time to get event detected. But in this method rate of transmission of packets in the network is not considered. Hence if any faulty node is present in the network, it can affect the result. To overcome this drawback we have proposed trusted clustering. Trust value of each cluster head is calculated along with reputation value. The disaster, any unavoidable situation which can cause harm to the lives and property is known as disaster. Disasters are of two types. Natural disaster and man made disasters. Natural disasters like fire, cyclone, earthquake etc. And man made disasters like accidents. To avoid the disasters from coming is not in our hand but we can manage the disaster by using wireless sensor network. In these projects we focus on Fire detection. Detection of fire in early stage can save many lives. Accuracy in this detection also plays important part because false and fake alarm unnecessarily produces chaos. To reduce that chaos and stress of fake alarm we are trying to achieve accuracy in fire detection in wireless sensor network.

II. RELATED WORK

This paper[1] aims at reducing residential fire disaster. In this paper Artificial intelligence techniques are used to detect residential fire more accurately. Use of techniques like feed forward neural network is used in which output of one detected event is set as input for other as reference. This feed forward mechanism helps to detect the event with fast and accurate manner.[2]In this paper distributed Bayesian algorithm is used to detect the event in efficient manner with less number of faults. This algorithm mainly removes faults in the transmission of data and detection of the event. Event detection in decentralized manner can help system in great extent.[3]In this paper collaborative approach for event detection is used. No centralized system is working. Data is not collected to the sink centrally, instead each node is independent alarm system which can sense the event, process the data and detect the event individually.[4]This paper aims at reducing residential fire disaster. In this paper Artificial intelligence techniques like FFNN are used to detect residential fire more accurately. Use of techniques like feed forward neural network is used in which output of one detected event is set as input for other as reference. This feed forward mechanism helps to detect the event with fast and accurate manner.[5]Fire detection is done by remote sensing mote and different combinations of sensors are used to detect the fire. Main function is to separate fire sources from noise sources to remove unnecessary chaos in the network.[6]Paper describes method distributed fuzzy logic to detect the event efficiently in wireless sensor network. A crisp input along with membership function is provided as input and event is detected successfully as output.

References	Advantages	Disadvantages
DISTRIBUTED BAYESIAN ALGORITHMS FOR FAULT TOLERENT EVENT REGION DETECTION IN WIRELESS SENSOR NETWORK	Fault tolerant	Delay factor is more
A SYSTEM FOR DISTRIBUTED EVENT DETECTION IN WIRELESS SENSOR NETWORK	Distributed system do accurate detection.	Data transmission is slow
USE OF AI TECHNIQUES FOR RESIDENTIAL FIRE DETECTION IN WIRELESS SENSOR NETWORK	FFNN techniques reduces fake alarm	There is possibility of bottleneck and delay.
AUTOMATIC FIRE DETECTION: A SURVEY FROM WIRELESS SENSOR NETWORK PERSPECTIVE	Manual admin does not require.	Possibility of fake alarm. And reliability is not achieved.
FUZZY EVENT DETECTION IN WSN	Fuzzy logic is very simple to execute.	Fuzzy logic is not trusted source

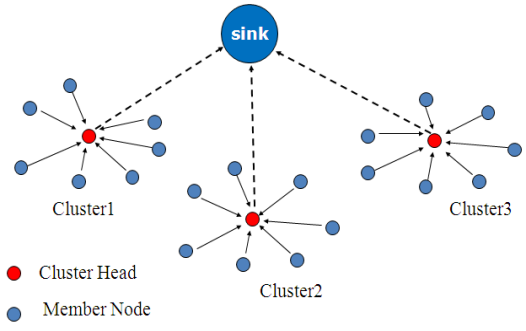
EXISTING SYSTEM

In the proposed work, we will implement distributed event detection in wireless sensor network which will be helpful to recover from disaster. To fulfill WSNs requirements mentioned previously, our proposed approach is a distributed machine learning (ML) technique that uses decision trees to detect events in a distributed manner. High computational overhead and complexity will be reduced in this approach. The decision tree will be learning algorithm which will give numeric result in the form of value. Here we M5p algorithm to optimal decision tree. Detected events, from various nodes are aggregated by a voter running a reputation-based voting technique. To show superiority of our reputation-based voting, we additionally investigate three other voting mechanisms based on the classical majority voting.

Local reputation Technique

1. Detect Event individually by each node.
2. Send Detection Value to all neighbour nodes.
3. DV is stored in NDVT.(Neighbour detection value table)
4. Each node should judge about neighbouring sensor node.
5. Compare values and difference in values of sensor node itself and other nodes.
6. If difference is less than threshold values, then vote . If vote is positive then
7. $v^{new} = v^{old} + 1$ **positive**.
8. Otherwise vote negative. If negative then $v^{new} = v^{old} - 1$ **negative**

Trusted clustering based event detection



CLUSTERING IN WIRELESS SENSOR NETWORK

Algorithm

Step 1:In the sensor network, Cluster formation is done

Step 2: Cluster head is decided with election algorithm all the nodes transmit their data to cluster head.

Step 3: Trust value is calculated to detect faulty node in the network

Step 4:The trust calculation between cluster head and sensor node at the time t is given by equation.

$$T_{n_i n_j, t} \frac{\sum_{k=0}^{n} T_{n_i,k}\,(t_{n_j,t-1}+1)}{\sum_{k=0}^{n}(t_{n_j,t-1}+1)}$$

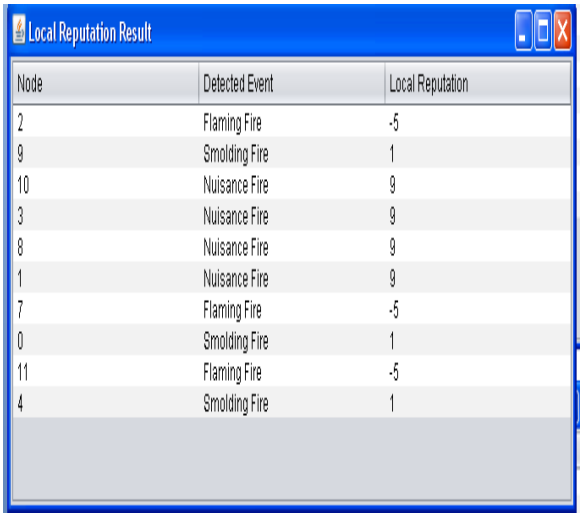
Step 5: Cluster head creates an index of sensor nodes based on their trust value and reputation.

Step 6: Whenever any event occurs decision is done based on sensors having high reputation and trust value

EXPERIMENTAL ANALYSIS

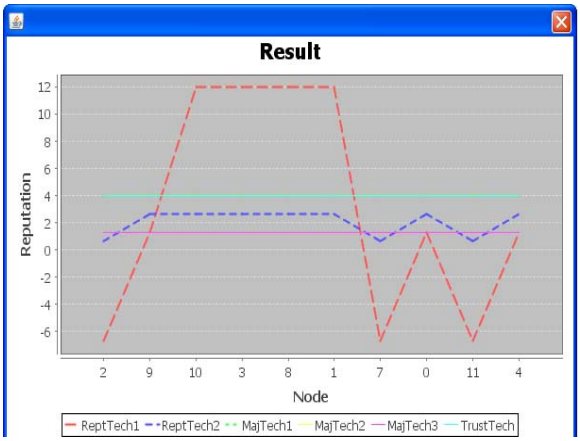
Data set:

•For implementation-A data set of residential fire data or smoke data is needed.Data set is gathered through (http://smokealarm.nist.gov/)



Node	Detected Event	Local Reputation
2	Flaming Fire	-5
9	Smolding Fire	1
10	Nuisance Fire	9
3	Nuisance Fire	9
8	Nuisance Fire	9
1	Nuisance Fire	9
7	Flaming Fire	-5
0	Smolding Fire	1
11	Flaming Fire	-5
4	Smolding Fire	1

Result of local reputation technique



Reputation versus each technique

CONCLUSION

In this paper, we have described the Distributed event detection technique. Best way to detect the event is majority voting by machine learning technique. We have shown the results of implementation by using distributed event detection. But it does not consider the rate of transmission of data and packet loss. Hence, we have proposed the trusted clustering algorithm and its mathematical model where we can find trust value of particular node. In this method only random topology is used until now. So we consider any change of topology as future enhancement for this method which can improve the efficiency and accuracy of distributed event detection in disaster. Complexity of the project depends on number of nodes situated in the network.

REFERENCES

[1] Majid Bahrepour, Nirvana Meratnia, Mannes Poel, Zahra Taghikhaki, Paul J.M. Havinga, “Distributed Event Detection in Wireless Sensor Networks for Disaster Management” IEEE Transaction on distributed computing,December, 2010

[2] Majid Bahrepour, Nirvana Meratnia, Paul J. M. Havinga, “Use of AI Techniques for Residential Fire Detection in Wireless Sensor Networks,” Pervasive Systems Research Group, Twente University, the Netherlands

[3] Georg Wittenburg, "Cooperative Event Detection in Wireless Sensor Networks”, Norman Dziengel, Stephan Adler, Zakaria Kasmi, Marco Ziegert, and Jochen Schiller,IEEE transaction, 2010

[4] Mihai Marin-Perianu and Paul Havinga “D-FLER: A Distributed Fuzzy Logic Engine forRule-based Wireless Sensor Networks.” University of Twente, Enschede, The Netherlands

[5] Somsri Jarupadung, “Distributed Event Detection and Semantic Event Processing,” Centre for Communication Systems Research, Electronic Engineering Department University of Surrey, Guildford, GU2 7XH, UK

[6] M. Bahrepour, N. Meratnia, and P. J. M. Havinga, "Automatic Fire Detection: A Survey from Wireless Sensor Network Perspective," 2008.

[7] S. Li, Y. Lin, S. H. Son, J. A. Stankovic, and Y. Wei1, "Event Detection Services Using Data Service Middleware in Distributed Sensor Networks," Telecommunication Systems, vol. 26, pp. 351-368, 2004.

[8] C. T. Vu, R. A. Beyah, and Y. Li, "Composite Event Detection Wireless Sensor Networks," in Performance, Computing, and Communications Conference, 2007. IPCCC 2007. IEEE International, 2007.