

Survey on Fault Tolerance in Wireless Sensor Network

Ajay Kumar ^[1], Jasmeet Singh ^[2]

Department of Computer Science and Engineering ^{[1] & [2]}
PTU/RIMT Institute of Engineering and Technology
Mandi Gobindgarh
Punjab – India

ABSTRACT

In The WSNs Energy is the main things of wireless sensor networks (WSNs), A sensor node consume a limited power sources , and it is a irreplaceable part of the sensor node , there are number of researchers find to reduce the energy consumption of the sensor node and increase the time period of the sensor node , some researcher used the cluster head and some researchers used the Gateway to reduce the load of the sensor node , but all are the battery operated so it is difficult to increase the life time of the sensor node , In the DFCA the researcher used the run time recovery of the sensor node when immediately change occurs in the cluster head, but if the sensor node link with the another gateway at run time and cover that sensor whose are uncovered by the gateway it will do increase the load on the another gateway so it will also die very soon , In this paper sensor nodes will find a new cluster head in their own group at run time .

Keywords:- wireless sensor network, DFCA , Energy consumption

I. INTRODUCTION

Sensor:

Sensors are hardware components that can detect and respond us the some types of input from the all surrounding environment ,these info could be any form like light, heat vehicles movement pressure or any another specific environment phenomena, sensor collect all information and store it in the memory , after that we can use that information at any time ,

Different types of sensors

There are different types of sensors which are used to measure the activities those happen our surroundings,

1. Speed Sensor
2. Temperature Sensor
3. PIR Sensor
4. Ultrasonic Sensor

1. *Speed sensor:* - which sensors used to detecting the speed of vehicles and another object is called the speed sensor there are numerous sensors whose are used to detect the speed like speedometer sensor, wheel speed sensor, LIDAR

, ground speed RADAR, air speed indicator and Doppler Radar etc

These types of the sensor network mostly used from the traffic police because with the help of this they can easily detect the speed of the vehicles whose moving on the road at fast speed,

With the help of RADAR sensor it can detected

On the other hand with the help of air speed indicator we can detect the or indicate the speed of that vehicles whose moves under the space



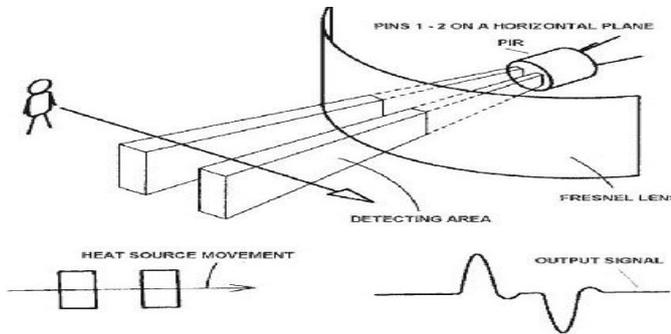
SPEED SENSOR

2. *Temperature Sensor:-* which device used to detect the temperature of the environment is called the temperature sensor, the temperature measured by the sensor as an electrical signal which is in the form of electrical voltage and it is proportional to the temperature, the numerous types of temperature sensor which is useful for us, like contact type temperature sensor, non contact type temperature sensors,



TEMPERATURE SENSOR

3. PIR Sensor:- this type of electronic sensor used for measure the infrared light radiation emitted from object in a particular field every object emit heat energy in the form of radiation (because object has temperature above absolute zero) at IR wavelengths , these radiations are invisible to human eye, but it can detect by the PIR motion detector devices



PIR SENSOR

4. Ultrasonic Sensor:-the ultrasonic sensor similar to the sonar and radar principal, its transducer is useful to convert the energy into the ultrasound waves with range above the human hearing capacity range



ULTRASONIC SENSOR

A. WIRELESS SENSOR NETWORK OVERVIEW

WSNs:-A wireless sensor network is a group of specialized transducers with a communication infrastructure for monitoring and recording condition at diverse location commonly monitored parameters are temperature , humidity , pressure ,wind direction and speed ,illumination ,intensity, vibration intensity ,sound intensity and power line voltage The sensor nodes can communicate using radio signals. A wireless sensor network consist of three main components: nodes, gateway

or cluster head and base station, the spatially distributed measurement nodes interface with sensors to monitor assets or the environment, the acquired data transmit to gateway from the sensor node, gateway operate on the data then send it to base station (BS). Sensor node consume a lot of energy when it collect the local information so the sensor node die very soon, the energy consumption is the big issue for the sensor node ,The uses of WSNs is enormously increased in last decades and at the same time it faces the problem of energy constraints in terms of limited battery lifetime. As each node depends on energy for its operations, this has become a major problem in wireless sensor networks because once sensor nodes dead, it is not possible to replace or recharge the batteries. When one node in the cluster fails then it interrupt the all system or application,

- There are three application classes of the sensor node
- 1.environmental data collection
 2. Security monitoring
 - 3 sensor node tracking

In the wireless sensor network the nodes link with the gateway in the form of different topologies, the topologies whose are used are given below:

1. Star topologies
2. Cluster tree topologies
3. Mesh topologies
 1. star topologies:-in the star topologies every node directly link with the gateway
 2. tree topologies:-in which the each node link with the higher node in the particular area then that higher node will link with the gateway and with the help of this data is routed from the lower level node to the gateway
 3. mesh topologies:-in this topologies the nodes connect with multiple nodes in the system and it pass the data through the reliable path

B. Clustering System Of Wireless Sensor Network

In order to increase the Energy efficiency and increase the life time of the sensor node in the wireless sensor network ,for this efficient algorithm must be developed and designed , and clustering system is used for the life time of the cluster head , Clustering is the efficient technique to reduce the energy consumption of the wireless sensor network , In the clustering system the numbers of node grouped together in a single unit , with a main leader called cluster head , each cluster link with only a single cluster head , the cluster based wireless system reduce the energy consumption of the nodes , because in this system the node can share the backup with the cluster head , and cluster head reduce the extra load of the every node whose are under the area of the

cluster head, the cluster head processed on the data and it remove the redundant and uncorrelated data and after that send it to the base station, the cluster head is also a sensor node which is selected by all the sensor nodes, because it has a lot of residual energy, so it work for only store the backup of all the sensor node and then transmit it to the base station

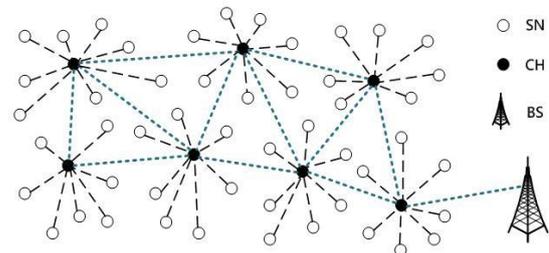
Beside this some researchers used the gateway to store the backup of all the cluster head basically the gateway also work

as the cluster head, but it have a large capacity to store the data, but the gateway and the cluster head both are also a battery operated system and the limited life time period so if the gateway and the cluster head will die at the run time then a large number of data can loss so solve this type of problem and increase the time period of the gateway and the cluster head the researcher using the number algorithm it not possible to save the data which losses at the run time because all are battery operated and limited life period, proper assignment of the sensor nodes to the gateways for cluster formation is very important by considering the remaining energy of the gateways. Particularly, this is a big issue when the nodes are not distributed uniformly by the main cluster head, in which some sensor nodes may be uncovered by the gateways. To remove this type of the problems the researchers used the number of algorithm and techniques

C. DFCA

Distributed Fault-tolerant Clustering Algorithm, In this algorithm the sensor node select a particular cluster head by considering the cost function and which consist of residual energy of the cluster head, In this formation the DFCA care about that sensor node also that have no cluster head within their communication range, the DFCA also present the run time recovery of the faulty cluster due to sudden failure of the cluster head, In which if the cluster head die then its member cluster connect with the another with the help of the cost function, the cluster will connect those cluster that located in its communication range and have a cluster head, so with this the cluster run time recovered by the DFCA algorithm, In which The fault is detected when the member sensor nodes does not receive any acknowledgement receipt message which is used for synchronization from the CH and also the failure of the CH can be confirmed by the neighbour sensor nodes which those are situated in the same cluster. When fault Is detected the member of sensor nodes of the faulty cluster send a message it can be in the form of help message which send by the sensor node within near communication range. Then the another cluster accept the help message of the cluster whose have own cluster head and in the communication range of the cluster.

In the DFCA node is selected by the all nodes randomly, the initiator node which will start the process of cluster head selection, all nodes compare their residual energy which node have a more residual energy capacity that node selected as the cluster head from all the nodes



In the above image show us how the nodes link with the cluster head and cluster head link with the base station, there are a one cluster head of the number of sensor node in the particular location, the sensor can link with the base station with the help of the base gateway, in which the sensors node firstly collect all information in of the particular area and store it of in the base station, the base station will do analyze all the information process on that information and after that it remove the redundancy of the data and extra unuseable data, at the end the base station is the main head where all data stored, If we want to access any information then base station will provide us information

II. LITERATURE SURVEY

- [1] In which researchers use the DFCA algorithm And use the cost function with which is useable to care the those sensor nodes which is not covered by any cluster head, besides this the DFCA recover the faulty cluster at the run time
- [2] in this paper researcher use clustering to determine the position information of sensor nodes the researchers show the benefits of the cluster-based approach, it provide the accurate information with walls and other concave structure
- [3] in which researcher present a cost based single hop homogeneous and heterogeneous networks, it also used the multi-communication within cluster, it tells the
- [4] The GESC research protocol is based on a novel localized metric for measuring the value of a node in covering the neighbourhood with its rebroadcast.
- [5] The researcher compares the different LEACH descendant, and they found that the some energy efficient algorithms increase the network lifetime
- [6] In this paper the researcher have researched the current state of proposed clustering protocols, specifically with respect to their power and reliability requirements. Protocols presented in this paper offer a promising improvement over conventional clustering

[7] In which the researcher calculate a clustering thereof, it present the generic distributed data clustering algorithm which capture a wide range of algorithm

M-LEACH is more energy efficient than LEACH

[8] Researcher proposed a algorithm which constructs multilevel clusters and the node in each cluster reach the cluster head through the link with neighbour node, DWEHC generate well balanced cluster, intra and inter cluster energy consumption improved by heed-AMRP algorithm

[15] In this paper the fault tolerance recover by the researcher in the two phase ; detect and recover , the sensor node recover from the failed gateway without shutting down the system it can easily suffer from the range failure or link failure of the node caused due to software or hardware failure

[16] In this paper research the main and current state of the clustering protocols which gives information of their power and reliabilities related it offer a promising improvement over conventional clustering

III. CONCLUSION

In this paper we have analysed various techniques that are focused on improving lifetime of wireless sensor networks, Researchers have used various clustering techniques to reduce energy consumption in the network, In order to avoid fault in the nodes arising out of energy consumption the focus must be given upon reducing energy consumption

ACKNOWLEDGMENT

The authors wish to thank the reviewers and editors for their suggestions and constructive comments that help in bringing out the useful information and improve the content of paper

REFERENCES

[1] Md Azharuddin, Pratyay kuila Prasanta k.jana survey in their paper “A Distributed Fault-tolerant clustering Algorithm For Wireless Sensor Networks” @2013 International conference on advances in computing , communication and informatics(ICACCI)

[2] Haowen Chan,Mark Luk , and Adrian perrig “Using Clustering Information for Sensor Network Localization , Carnegie Mellon University

[3] Vivek Mhatre¹ ,and a Catherine Rosenberg² in their survey paper “compare of Homogeneous and Heterogeneous Clustered Sensor Networks: with the Comparative Study” School of Electrical and Computer Eng., Purdue University, West Lafayette

[4] Nikos Dimokas¹ Dimitrios Katsaros^{1,2} Yannis Manolopoulos¹ “Node Clustering in wireless

Sensor Network to consider it with Characteristics of Structural of the Network Graph

[5] Vinay Kumar² and , Sanjeev Jain¹ and Sudarshan Tiwari³, IEEE Member³ “Energy Efficient Clustering Algorithms in Wireless Sensor Network :” IJCSI Vol. 8, At the issu no. 5 and the issue No 2, September 2011

[6] “A Survey on clustering algorithms for wireless sensor networks,” Computer Communications, vol. 30 by the A. Hamed Abbasi and Mohamad Y

[7] Ittay Eyal · Idit Keidar · Raphael Rom “Distributed Data Clustering in Sensor Networks”

[8] Ping Ding, Jo Anne Holliday, Aslihan Celik “Distributed energy-Efficient Hierarchical Clustering For Wireless Sensor Networks” Santa Clara University

[9] Priya Vyas#, Manoj Chouhan* ”Survey on Clustering techniques in Wireless Sensor Network” the paper published by the International Journal of CSE &IT in the Vol. 5, 2014,

[10] Monique Becker, Ashish Gupta, Michel Marot, Harmeet Singh “Improving Clustering Techniques in Wireless Sensor Networks Using Thinning Process”

[11] Supreet kaur Varsha kumari “Efficient Clustering with Proposed Load Balancing Technique for MANET, *I J C A Volume 111 – No 13, February 2015*

[12] .bhasker krishnamamachari “An Introduction to wireless sensor network” Tutorial Presented at the 2nd International Conference on Intelligent Sensing and Information Processing chennai ,India January 2005.

[13] .Navmeet kaur¹, Kamaljit Kaur² “Fault Tolerance Mechanism using Clustering for power Saving in Wireless Sensor Networks IJETT – Volume 4 Issue 8- August 2013

[14] Pedro A. Forero survey in ,”Distributed Clustering Using Wireless Sensor Networks “IEEE JOURNAL OF SELECTED TOPICS IN SIGNAL PROCESSING, VOL. 5, NO. 4, AUGUST 2011

[15] G. Gupta and M. Younis, “Fault-tolerant clustering of wireless sensor networks,” IEEE WCNC, vol. 3, pp. 1579–1584, 2003:

[16] A. Hamed Abbasi ¹and Mohamad Y ²., “A Survey on clustering algorithms for wireless sensor networks,” Computer Communications, vol. 30,2007.

[17]

[18] Pratyay K. and Jana P. K, “Improved load balanced

- [19] clustering algorithm for wireless sensor networks,” ADCONS 2011, LNCS, vol. 7135, pp., 2012.
- [20] 18. Low, C. P@., Fang, C., Ng, J. M., &Ang, Y. H, “Efficient load-balanced clustering algorithms for wireless sensor networks,” Computer Communications, vol. 31, no. 4., 2008.
- [21] 19. D. C. Hoang,* P. Yadav#, R. Kumar@, and S. Panda& “Node clustering based on overlapping FOVs for wireless multimedia sensor networks”. In IEEE on Communications Workshops
- [22] 20. L. Chang-RI#, Z.. Yun@, Z. Xian-ha*, and Z. Zibo\$ “A clustering algorithm based on cell combination for wireless sensor networks” In 2nd International Workshop on EducationTechnology and Computer Science,
- [23] 21.] R. Wang*, L. Guozhi*, and C. Zheng“ A clustering algorithm based on virtual area partition for heterogeneous wireless sensor networks”. In ICMA
- [24] 22. F. Bai 1, H. Mu*, and J.Sun* “ Power-efficient zoning clustering algorithm for wireless sensor networks” Proceedings of the Information Engineering and computer science.