ISSN 2395-1621

Node Recovery In Wireless Sensor Network Using Grade Diffusion Algorithm

#1Makhdoom Shahebaz Sardar, #2Pote Pradnya Satish, #3Savale Sonali Anil, #4Thorat Kakasaheb Bajirao, #5Prof. Devendra. P. Gadekar

1makhdoomshahebaz@yahoo.com
2potepradnya@yahoo.in
3sonusavale@gmail.com
4thoratavinash123@gmail.com

#1234Student, Department of Information Technology
#5Prof, Department of Information Technology

ICOER, Wagholi, Pune.

ABSTRACT

Fault node recovery algorithm is a combination of Genetic algorithm and Grade Diffusion algorithm which is used to increase the lifetime of Wireless sensor network when sensor nodes gets fail or found to be faulty. The Fault Node Recovery algorithm results in less replacement of nodes and reuse of different routing path. This increase the lifetime of Wireless Sensor network and reduce the data loss.

ARTICLE INFO

Article History

Received: 19th May 2016

Received in revised form : 19th May 2016

Accepted: 22nd May 2016

Published online : 27th May 2016

Keywords: **Grade diffusion algorithm, Fault node recovery algorithm, Genetic algorithm, Wireless sensor network.**

I. INTRODUCTION

In Wireless sensor network sensors have limited lifetime .They have tendency to fail due the reasons like energy depletion, network failure and environmental conditions etc. Fault tolerance is one of the critical issues in wireless sensor network. This paper proposes a Fault node recovery algorithm which is used to increase the lifespan of wireless sensor network. Fault node recovery algorithm is the combination of Grade Diffusion algorithm and Genetic Algorithm which helps to find which sensor node in wireless sensor network is not functioning and replacement of them. And also finds the alternative path for data transmission which increases the number of active nodes and reduces the data loss and rate of energy consumption.

Recent advances in micro processing, wireless and battery technology, and smart sensors have enhanced data processing wireless communication, and detection capability. In sensor networks, each sensor node has limited wireless computational power to process and transfer the live data to the base station or data collection center. Therefore, to increase the sensor area and the transmission area the wireless sensor network usually contains many sensor nodes. Generally, each sensor node has a low level of battery power that cannot be replenished. When the energy of a sensor node is exhausted, wireless Sensor network leaks will appear, and the failed nodes will not relay data to the other nodes during transmission processing. The previous approach to sensor network routing includes the directed diffusion (DD) algorithm and the grade diffusion (GD) algorithm. This algorithm is actually based on the GD algorithm, with the purpose of replacement of less number of sensor nodes that are not functioning properly or it may have less battery power of reusing the maximum number of routing paths. The optimizations will ultimately increase the WSN lifetime and reduces sensor node replacement cost.

II. LITERATURE SURVEY

Many techniques have been proposed till now for fault detection and recovery. Sony Jia et al. [1] A recovery Algorithm based on Minimum Distance Redundant Nodes. By employing redundant nodes carefully, the recovery algorithm is deployed on the sink node with unconstrained energy consumption which knows the locations of all active nodes and redundant nodes in the Wireless sensor network. Simulation results demonstrate that, by choosing appropriate number of redundant nodes, this algorithm will have great

recovery accuracy and coverage quality, also achieve the purpose of prolonging the lifecycle of Wireless sensor network.

Muhammed Asim et al. [2] extended the cellular approach and proposed a new fault management mechanism to deal with fault detection and recovery of wsn. They proposed a hierarchical structure to properly distribute fault management tasks among sensor nodes by introducing more "self-managing" functions. The proposed failure detection and recovery algorithm has been compared with some existing related work and proven to be more energy efficient.

Charu virmani and Khushboo Garg [3] discussed about already implemented algorithms and existing approaches of network fault management and compare their features for an effective one.

Prasenjitchanak et al. [4] proposed an energy efficient node fault diagnosis and recovery for wireless sensor networks referred as fault tolerant multipath routing scheme for energy efficient wireless sensor network (FTMRS).The FTMRS is based on multipath data routing scheme. One shortest path is use for main data routing in FTMRS technique and other two backup paths are used as alternative path for faulty network and to handle the overloaded traffic on main channel. Shortest path data routing ensures energy efficient data routing. The performance analysis of FTMRS shows better results compared to other popular fault tolerant techniques in wireless sensor networks.

III. EXISTING SYSTEM

Wireless sensor network may get fail because of various reasons like break in routing path, leakage in wireless sensing network. In fault node recovery algorithm using Grade Diffusion algorithm routing table, grade value and payload value for each sensor node is generated. Using FNR algorithm the number of non-functioning nodes are calculated during sensor network operation.

IV. PROPOSED SYSTEM

This paper proposes an algorithm to find out and replace sensor nodes that are not functioning and to reuse the most routing paths. The Fault Node Recovery algorithm based on Grade Diffusion algorithm combined with Genetic Algorithm. The FNR using Grade Diffusion creates routing table and replaces the nodes that are not working. So, this algorithm reuses the routing paths and increases the lifespan of WSN.

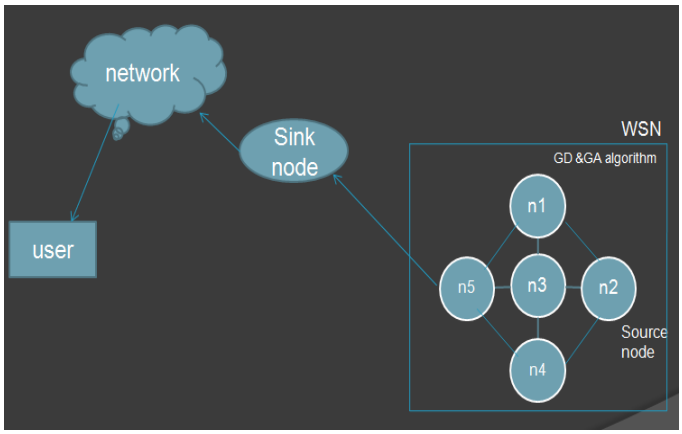


Figure 1. System Design

In sensor networks, each sensor node has limited wireless computational power to process and transfer the live data to the base place. Therefore, to increase the sensor area and the transmission area the wireless sensor network typically contains numerous sensor nodes. In general, each sensor node has a low level of battery power that cannot be replace. When the energy of a sensor node is tired then wireless sensor network leak will appear and the down nodes will not transmit data to the other nodes through diffusion processing.

There are total five steps in genetic algorithm, Initialization, Evaluation, selection, crossover and mutation.

A. Initialization

Genetic algorithm generates chromosomes and each and every chromosome is an expected solution. According to population size the number of chromosomes is defined .Chromosomes size is defined by number of sensor nodes that are depleted or non-functioning. The elements in genes are either 0 or 1.If it is 1 that means the node should be replaced and if it is 0 that means the node will not be replace. In initialization step chromosome's length is chosen randomly.

B. Evaluation

Using the fitness function the fitness value is calculated. Genes are parameters of this function. The genes are either 0 or 1.It simply indicates which node is working or not, but the main goal of Fault Node Recovery algorithm is also to find out the available routing path.
Fitness function is as follows

$$f_n = \sum_{i=1}^{\max(\text{Grade})} \frac{P_i \times \text{TP}^{-1}}{N_i \times \text{TN}^{-1}} \times i^{-1}. \quad \ldots\ldots (1)$$

C. Selection

In this walk the chromosomes with the lowest fitness value will be eliminate and the rest will be retain .The worst chromosomes will be deleted and the new chromosomes will be made to replace them after the crossover step.

D. Crossover

This crossover step is used to change the individual chromosome. To produce two new off springs two individual chromosomes are chosen from the mating pool. Between the first and last gens of the parent individual a crossover point is selected.

E. Mutation

The mutation step can introduce traits not found in the original individuals and prevents the GA from converging too fast. The chromosome with the best fitness value is the solution after the iteration. The FNR algorithm will replace the sensor nodes in the chromosome with genes of 1 to extend the WSN lifetime.

Fault node recovery algorithm:

Step1:- Encoding of the problem in a binary string.

Step2:-Random generation of population or grade value.

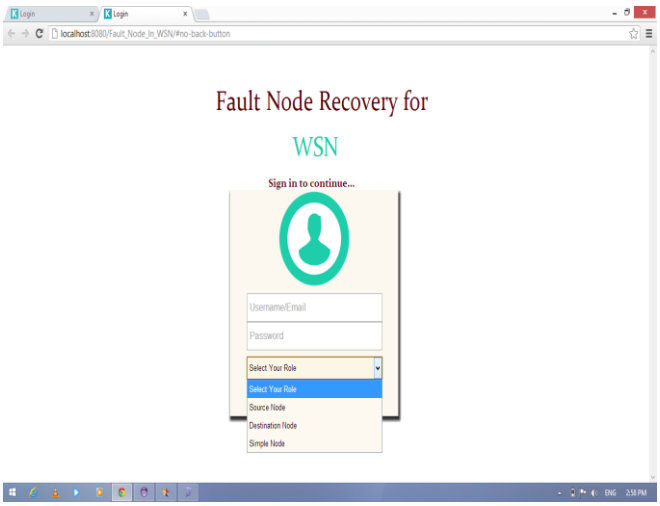
Step3:-Calculate fitness of each solution.

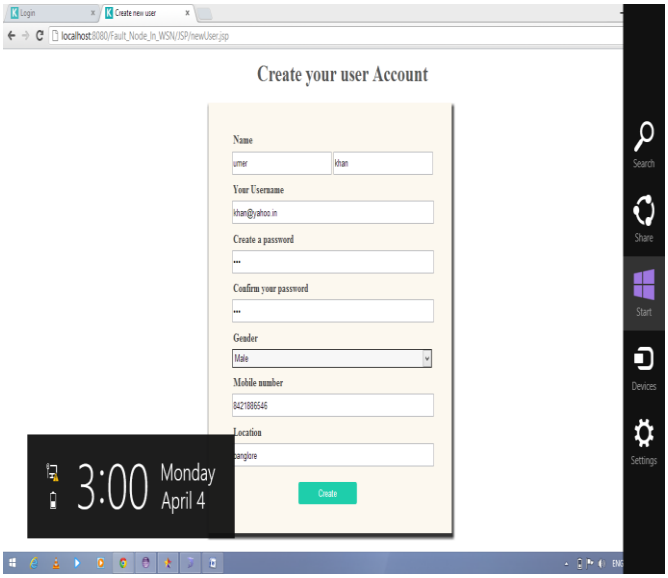
Step4:-Select pair of parent strings based on fitness.

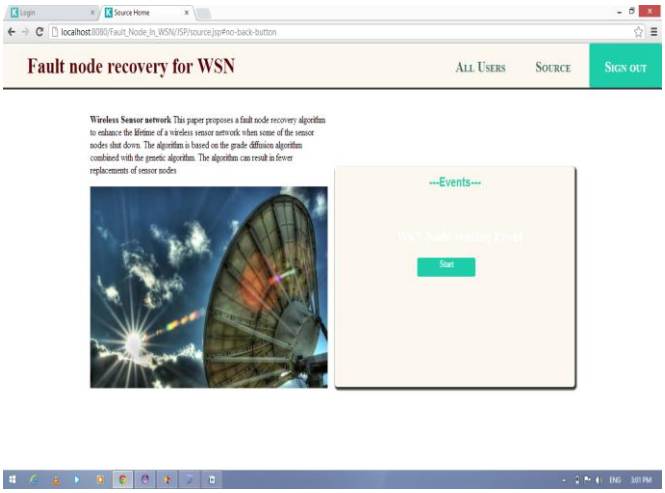
Step5:-Generate new string with crossover and mutation until a new population or grade value has been produced.

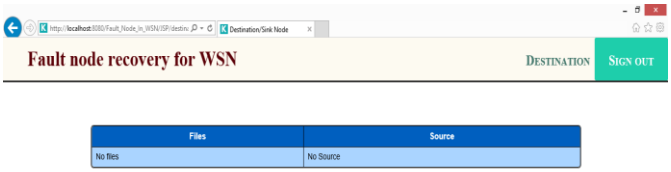
Repeat step 2 to 5 until satisfying solution is obtained.

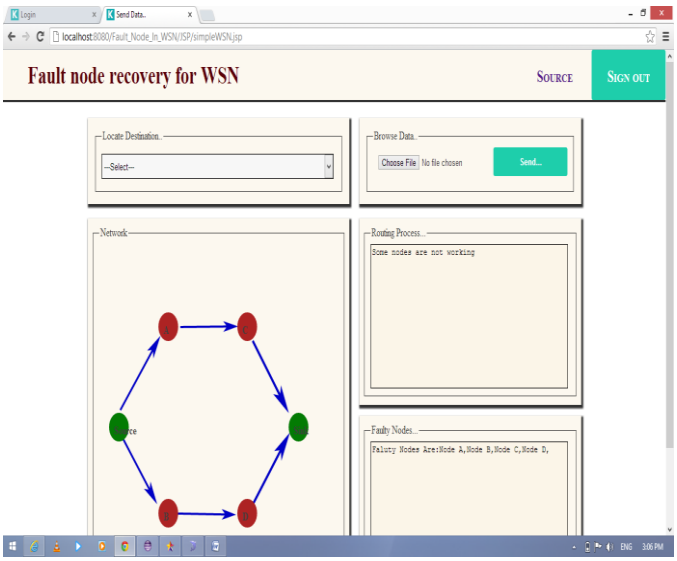
V.RESULT











VI. CONCLUSION

This paper proposes a fault node recovery (FNR) algorithm to enhance the lifetime of a WSN when some of the sensor nodes defuse, either because they have reached their operational threshold or they have no longer power. Using the FNR algorithm can result in more reused routing paths and fewer replacements of nodes.

ACKNOWLEDGMENT

We would like to sincerely thank our guide for his support and encouragement.

REFERENCES

[1] Sony Jia, Wang Bailing, Ping Xiyar, Li Jianfeng and Zhong cheng, “A Recovery Based on Minimum Distance redundant Nodes Fault Management in WSNs,” International Journal of control and automation, vol 6,No.2 April 2013.

[2] Muhammed Asim, Hala Mokhtar and Madjid Merabti, “A self-managing fault management mechanism for wireless sensor networks,” International Journal of Wirele& Mobile Networks (IJWMN) Vol.2, No.4, November 2010.

[3] Sanam Hasseini, Elmira Moghaddami Khalilzad, “MISR: Multiple Inheritor Selection for Recovery of Nodes in

FaultyCluster in Wireless Sensor Networks," IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 4, No 1, July 2012.

[4] Charu virmani, Khushboo Garg, "Comparative study of fault management algorithms in WSNs," IJERT VOL.1 may 2012.

[5] Prasenjitchanak, Tuhinasamanta, Indrajit Banerjee, "Fault tolerant multipath routing scheme for energy efficient WSNs", IJWMN vol 5.No.2 April 2013.

[6] Jian yang, Zhenzhang ye, Zhiyou Ouyang, "A stratergy for fault recovery of wireless sensor networks based on v-svc," Journal of Information and computational science April 2013.

[7] Lilia Paradis and Qi Han, "A survey of fault management in WSNs," Journal of Network and systems management, 2007.

[8] Beenu Baby and Joe Mathew Jacob, "A self-managing fault management in WSNs," ISSN vol 1 July 2013.

[9] Carballido, I. Ponzoni, and N. B. Brignole, "CGD-GA: A graph based genetic algorithm for sensor network design," Inf. Sci.,vol. 177, no. 22, pp. 5091–5102, 2007.

[10] F. C. Chang and H. C. Huang, "A refactoring method for cache-efficient swarm intelligence algorithms," Inf. Sci., vol. 192,no. 1, pp. 39–49, Jun. 2012.

