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A Survey – Algorithm For Fault Node Recovery For Wireless Sensor Network

Vaishali.B.Nikhade[#1],R.N.Devikar[*2]

[#]*Department of Information Technology,Pune University*

Abstract:-Fault node recovery algorithm is used to increase the life time of wireless sensors network when some node stop working or found to be faulted .This algorithm is a combination of grade diffusion an genetic algorithm it result in less replacement of node and reuse of routing path .At the same time it increases the no of active nodes, reduces the data loss and rate of energy consumption.

Key words:-Genetic algorithm. Grade diffusion algorithm, Ladder diffusion algorithm ,Wireless sensor network.

I. INTRODUCTION

In sensor networks each sensor node has limited Computational power to process and transfer the live data to the base station or data collection center .for increasing the sensor area and transmission area wireless sensor networks usually contains many sensor nodes. Every sensor node has low battery power. When the energy level of node decreases then wireless sensor leak will appear and these tell that the node is failed and it will not transfer the data to another node during the transmission session .Thus other nodes will be loaded with more data for further transmission to be continued

Fault node recovery algorithm is used to increase the life time of wireless sensor network .when some of the sensor node may stop working either because of low energy or reached their operational threshold .By using fault node recovery algorithm we can replace the sensor nodes and can reuse routing paths more time.in search and replace few sensor node and reuse routing path.

II. OVERVIEW

A. *Existing System*

Wireless sensor network fails due to variety of cause such as break in routing path, Leakage in wireless sensing network sensing, The FNR algorithm create the grade value ,routing table, neighbor nodes and payload value for each sensor node using grade diffusion algorithm. In FNR algorithm the numbers of not working nodes are calculated during wireless sensor network operation. This algorithm is proposed to search and replace few sensor node and to reuse routing path.

B. *Proposed System*

Proposes an algorithm to search for and replace fewer sensor nodes and to reuse the most routing paths.. One scheme, the genetic algorithm (GA). The fault node recovery (FNR) algorithm [3] based on the Grade Diffusion (GD) algorithm [2] combined with the GA [1]. The FNR algorithm creates a routing table using the GD algorithm and replaces sensor nodes that are not functioning. This algorithm not only reuses the most routing paths to increase the WSN lifetime but also reduces the replacement cost.

C. *Traditional Approach*

Sensor network routing includes the directed diffusion algorithm and grade diffusion algorithm. Grade diffusion algorithm goal is to replace few sensor nodes that are not functioning and have low battery power and repeatedly using the routing path .The above approach will ultimately increase the life time and deduce the cost of node replacement.

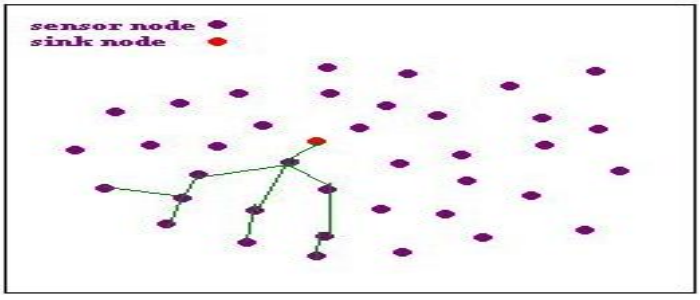

Fig .1 wireless semsor routing path when some node r not function

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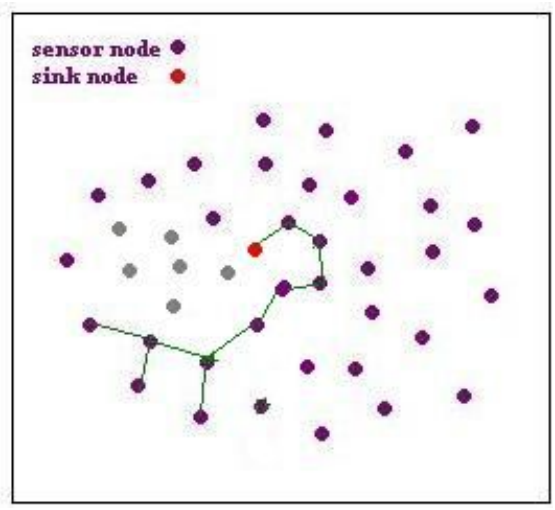

Fig .2 Wireless sensor node routing

Failure in WSN may occur due to break in routing paths WSN sensing area may find leakage in it,insufficiency of battery power, it may require more nodes being used for long time node may not work properly.

In fig: 2, through inside node ouside nodes transfer data to the sink node. inside node have largest data transmission loading use of energy .if all the node will get depleted then event data cannot be sent to sink node and the WSN will not function.

1) Directed Diffusion Algorithm:

The DD(directed diffusion algorithm)[4] aim to decrease the data relay in order to proper management of power consumption .It is based on query driven transmission protocol the data is transferred the query get matched from the sink node otherwise data transmission does not take place. Here if routes are built in circle then ,it can result in wastage of power consumption .the circle route problem take place with large size system which can lead to wastage of power consumption as well as space for storage .This algorithm was proposed to reduced the circular route and wastage of power.

2) Ladder Diffusion Algorithm:

A ladder diffusion algorithm is used for solving power consumption and routing problem while transmission in wireless sensor network. The LDA (Ladder diffusion algorithm)[5] is used to find path for data transmission in wireless sensor network, using less power and time to build. Routing table and avoiding forming of cycle in a route the data transmission take place from high grade value to low grade value. This algorithm is used for load balancing, incase in transmission efficiency and life of sensor node due to redundant relay. The LDA avoid power consumption.

3) Grade Diffusion Algorithm:

Grade diffusion algorithm is propose to improve the ladder diffusion algorithm by using ant colony algorithm optimization for wireless sensor network .GD algorithm identifies routing for sensor and also set of neighbor node to reduced transmission .the sensor nodes can be selected from neighbor node when it grade able does not have a node for perform transmission. This algorithm can record some information of transmission .The sensor node can selected a node can with less node and more energy having node than other node. The algorithm update the routing path and event data is forwarded to sink node. In GD the power consumption is unavoidable so FNR algorithm is proposed for replacement of node reuse of path. The FNR is algorithm uses a scheme of genetic algorithm.

III. FAULT NODE RECOVERY ALGORITHM

Fault node recovery algorithm is combination of grade diffusion algorithm with genetic algorithm [5].fig (4) shows the flow chart of FNR .

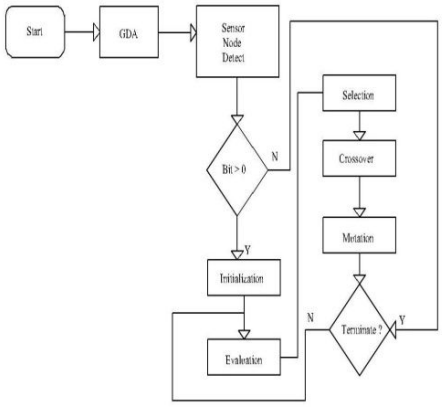

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Fig.4 flow chart of fault node algorithm

Grade diffusion algorithm is used in fault node algorithm to creates. The grade value, payload value for each sensor node. During wireless sensor operation we can calculate the no of nonfunctioning sensor node and the parameter used for calculating is S_{th}. According to GD algorithm when event appear the sensor node transfer it data to the sink node. If S_{th} is obtain larger than zero then algorithm start working and replace not working node by working nodes which will be selected by the genetic algorithm. The wireless sensor network will work as far as the operation wishes to replace sensor node

$$S_{th} = \sum_{i=1}^{max\{grade\}} Ui$$

$$U_i = \begin{cases} 1, \frac{M_i^{new}}{M_i^{original}} < \beta \\ o\ , otherwise \end{cases}$$

Eq(1)

In (1) grade gives the grade value of sensor nodes. Number of sensor nodes with the grade value is given by $M_i^{Original}$ number of sensor node not functioning current with grade value *i* is given by M_i^{now} .The user set the parameter as β which has the value between 0 and 1.If sensor node functioning for each grade is less than β. U_i become 1 and S_{th} will be larger than zero .Then the algorithm will use genetic algorithm to replace sensor node

8	6	9	80	43	56	68	71
0	0	1	0	1	1	0	1

Fig.5 Chromosome and its gene

In fig (5) the binary string serves as chromosomes for genetic algorithm .The bit represent as genes in binary string. Here 0 mean the node should be replaced and 0 means the node will not be replace it means they are working .The gene are adjusted in binary string according to their fitness value .At every step of GA all individual will produce fitness value related to chromosomes.

Genetic algorithm consists of five steps: initialization, Evaluation, Selection, crossover and Mutation, all the steps are described as follows:-

1) Initialization:

In initialization step GA generate chromosomes. Number of chromosomes depend upon the size of population i.e. .defined by the user. Chromosome length gives the number of sensor node that is not working or depleted. The 1and 0 represent the node which are to be replaced and which are not to be replaced.

In fig(5) node number i.e 8,6,9,80,43,56,68,71.these 8 number represent the length of chromosomes as 8 and 0 and 1 represent the gene. Here there are 8 non functioning nodes.

2) Evaluation:

In evaluation fitness value is calculated by using fitness function parameter used for fitness function are chromosomes and gene .Gene can be used directly in fault node algorithm because the gene are just used to see whether the node should be replaced or not . The FNR also reuse the most routing path and replaced the sensor nodes. Hence we can find the number of routing path obtain if some not working nodes are replaced then it is calculated and fitness function is revealed in eq (2)

$$fn = \sum_{i=0}^{\max(grade)} \frac{P_i \times UP^{-1}}{M_i \times UM^{-1}} \times i^{-1}$$

Eq(2)

M_i =number of node and heir grade value at i.
P_i = number of reusable routing path from sensor nodes with grade value i.
UM = total number of sensor node in the original WSN.
UP = total number of routing path in the original WSN.
In eq (2) by finding highest fit value WSN will get routing path and the least number of sensors.

good

8	6	9	80	43	56	68	71

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0	0	1	0	1	0	0	1
1	0	1	1	0	1	0	1
0	1	1	0	1	1	0	0
0	0	0	1	1	0	1	1
fn							
1	0	1	0	0	1	1	0
0	0	0	1	0	0	0	1
0	0	1	0	1	1	1	0
0	0	1	0	0	1	0	1

bad
Fig.6 selection

3) Selection:

In selection the lowest fitness value will be eliminated and other will be kept. Here elitism strategy is used and the chromosomes with best fitness value are kept in matting pool. as in fig (6).The chromosomes with less fitness value will be deleted and new chromosome will be replaced after crossover .

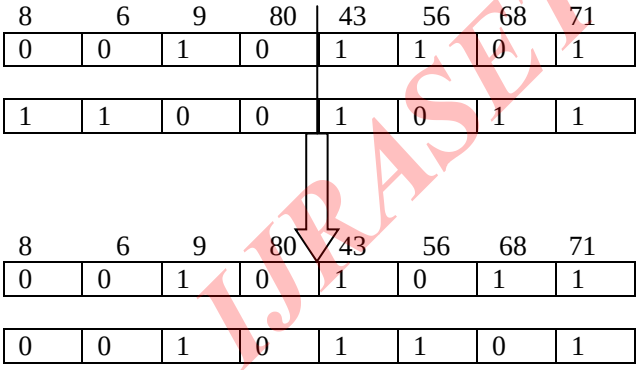

Fig.7 crossover

4) Crossover:

In genetic algorithm the crossover step is used change individual chromosomes. For creating new chromosomes one cross point is used as shown in fig (7). For creating new offspring two chromosome were taken from matting pool. A cross point is taken between first and last genes of parent. Each individual half part is exchanged and concatenated. Here the choice is made by using roulette-selection and the fitness value.

5) Mutation :

Mutation will prevent the genetic algorithm from convering fast. It can also introduce the trait that cannot be found in the parent. In FNR we just flip the gene randomly in chromosomes.The sensor node in chromosomes with genes of 1 to extend the WSN lifetime by the FNR algorithm.

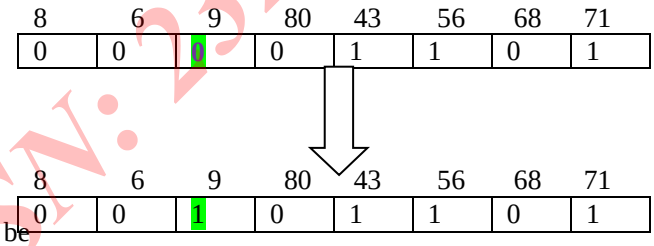

Fig.8 mutation

IV. APPLICATION

1. Area monitoring
2. Landslide monitoring
3. Forest fire detection
4. Industrial monitoring
5. Data logging
6. Waste water monitoring
7. Agriculture
8. Green house monitoring
9. Air quality monitoring

V. CONCLUSION

In wireless network ,the sensor nodes have less battery supplies and less energy, It also result in replacement of sensor

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node and replacement cost and using same routing path when few nodes are not working .

Fault node recovery algorithm for wireless sensor network is combination of genetic and grade diffusion algorithm. This algorithm replace non working node and reuse the routing path reduce the replacement cost and increase the life time.

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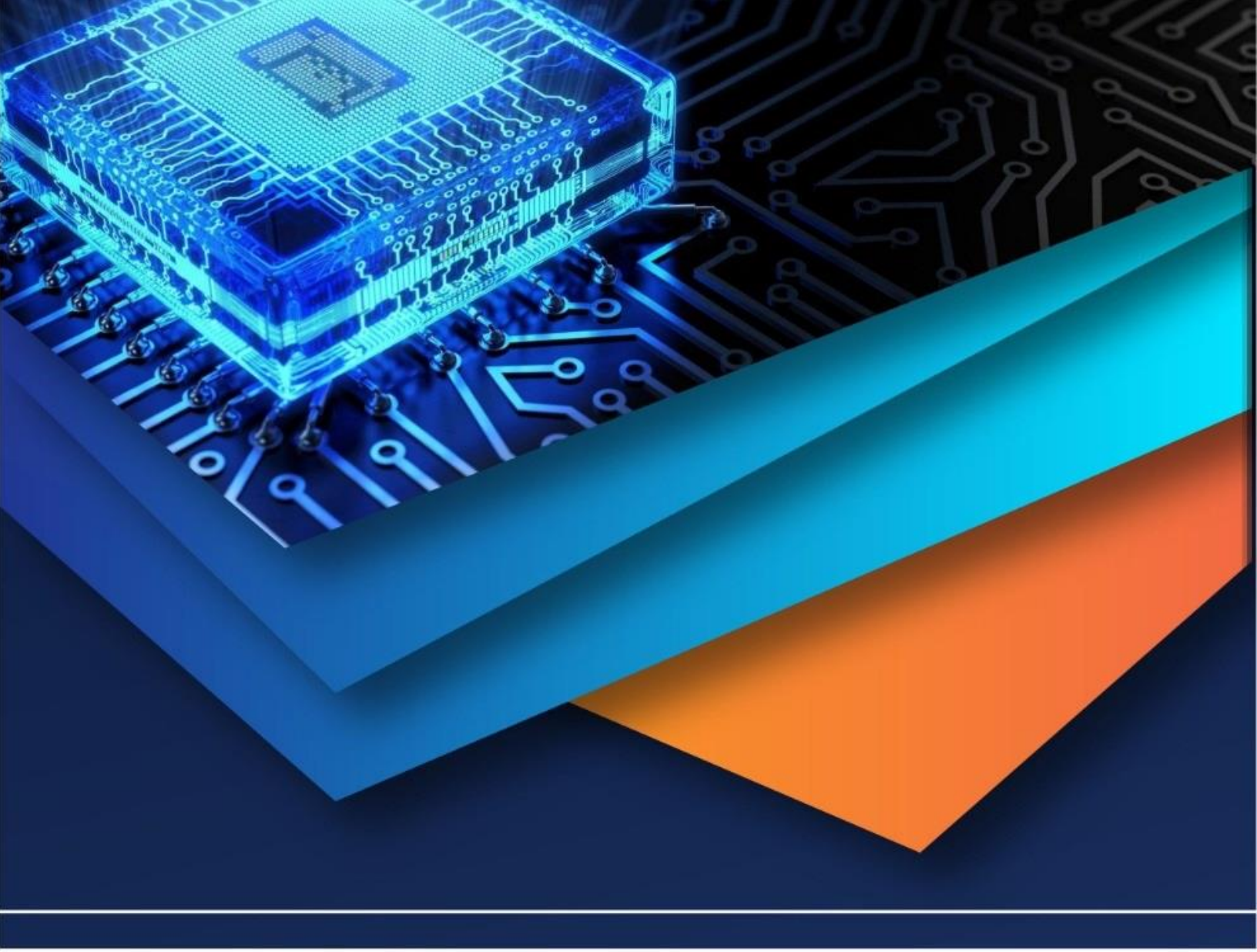

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