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Fault Node Recovery algorithm for wireless Sensor Network

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ABSTRACT: The Wireless sensor network every sensor node having a tendency to fail , due to computation power, hardware Fail, software Fail, environmental condition and energy depletion. Fault tolerance is a critical issue in a wireless sensor network. The using the proposed algorithm enhances the lifetime of wireless sensor network when some sensor node is shut down. The Effective Fault Node Recovery Algorithm is the combination of generic algorithm are used for node replacement techniques and grade diffusion algorithm are used for create a routing path of sensor node. The algorithm can result in fewer replacements of sensor nodes and more reused most routing paths. This algorithm also increases the number of active nodes up to 8.7 times, reduces the rate of data loss up to 98.8 % and reduced energy consumption up to 31.1 %.

Keywords: Wireless Sensor Networks, Genetic Algorithm, Grade Diffusion Algorithm, Fault Node Recovery

I. INTRODUCTION

The wireless sensor network is nothing but collection of Sensor Node organized in a Cooperative Network. Each Sensor Node has Capability to process the data, Sense the Data and the transfer there Live Data to Base Station or Data Collection Centre. In Wireless Sensor Network, each Sensor Node has limited Computational Power to process and transfer live Data to Base Station[1]. Sensor In Wireless Sensor Network every Sensor node having a tendency to shut down ,due to computation power, Hardware Fail, Software Fail, environ- mental Condition and energy depletion Fault tolerance is one of the critical issues in WSNs. The existing fault tolerance mechanisms either consume significant extra energy to detect and recover from the failures or need to use additional hardware and software resources.

The aim of the System is to provide Energy efficient and cost effective communication in Wireless Sensor Networks. The proposed algorithm enhances the lifetime of a sensor nodes when a sensor node is shut down and it depends on Grade diffusion algorithm combined with the genetic algorithm. The algorithm can result are in the replacements of sensor nodes and more reused routing paths. This Algorithm also increases the number of active nodes, reduce the rate of data loss and reduced energy consumption.

The aim of the System is to provide Energy efficient and cost effective communication in Wireless Sensor Networks. The Purpose an efficient algorithms which will enhance the lifetime of WSN. To Introduced an effective node Replacement tech.

To identify the Reliable Routing path Based on the maximum number of Reusability. To provide an alternate for the inoperative sensor Node or the node with depleted the battery. This Algorithm also increases the number of active nodes, reduce the rate of data loss and reduced energy consumption.

In Existing methods, the algorithm study of a wireless sensor network, genetic algorithm and grade diffusion algorithm. The WSN may fail due to a variety of causes, including the following: the routing path might experience a break; the WSN sensing area might experience a leak; the batteries of some sensor nodes might be depleted, requiring more relay nodes; or the nodes wear out after the WSN has been in use a long period of time. The outside nodes transfer event data to the sink node via the inside nodes (the sensor nodes near the sink node) in a WSN illustrate the accommodation measures for non-working nodes. The inside nodes thus have the largest data transmission loading, consuming energy at a faster rate. If all the inside nodes deplete their energy or otherwise cease to function, the event data can no longer be sent to the sink node, and the WSN will no longer function [4].

Directed Diffusion algorithm is presented by c. Intanagonwiwat in 2003. In DD algorithm is a reduced a transmission count of data and energy consumption. The DD algorithm is a Query Driven transmission protocol in which the sensor nodes send the data back to the sink node only when it fits the queries. The Main Disadvantages of DD algorithm is energy consumption is high and no reuse the routing path .that wise this algorithm is not popular.

But existing system has disadvantages
1) It is a query-driven transmission protocol.
2) Energy consumption is high.
3) No reuse of routing paths.
4) Data loss Rate is High.
5) The sensor nodes send the data back to the sink node only when it fits the queries.

This paper proposes a fault node recovery (FNR) algorithm to enhance the lifetime of a wireless sensor network (WSN) when some of the sensor nodes shut down, either because they no longer have battery energy or they have reached their operational threshold. Using the FNR algorithm can result in fewer replacements of sensor nodes and more reused rout- ing paths. Thus, the algorithm not only enhances the WSN lifetime but also reduces the cost of replacing the sensor nodes.
The algorithm proposed in this paper is based on the GD algorithm, with the goal of replacing fewer sensor nodes that are inoperative or have depleted batteries, and of reusing the maximum number of routing paths. These optimizations will ultimately en- hence the WSN lifetime and reduce sensor node replacement cost.
Advantages of Proposed System
1) The Purpose an efficient algorithms which will enhance the lifetime of WSN.
2) To Introduced an effective node Replacement tech.
3) To identify the Reliable Routing path Based on the maximum number of Reusability.
4) To provide an alternate for the inoperative sensor Node or the node with depleted the battery.
This Algorithm also increases the number of active nodes, reduce the rate of data loss and reduced energy consumption.

II. METHODOLOGY

Design the Wireless Sensor Network .Applies the Grade Diffusion Algorithm on WSN. Calculate the Bandwidth of Wireless Sensor Network. Applies the genetic Algorithm on WSN. Finally Node Replace Using Fault Node Recovery Algorithm. Finally Compaire the this three Algorithm to each other through a graph.

III. S/W ENGINEERING APPROACH

Basic Theme of waterfall model is that we Know all requirements in detail at start in communication and then go for next phases with no change is allowed later. According to that the very first gather all requirements because at current stage the system that are going to develop contains modules which are interdependent on each other so, for that its must to know all the requirements at the start of project so the first step that is requirement gathering is completed.
Then next project planning is important step in that daily project planning is done and project work is going on according to that plan so that it will complete on time. A next step that is designing, modelling, coding will complete according to plan which is created. Proposed systems is divided into small modules so that its easy to implement and understand and also as small modules are there its easy to arrange tasks to each project member. so that its become easy to manage. As all requirements are well understood its easy to work on project.

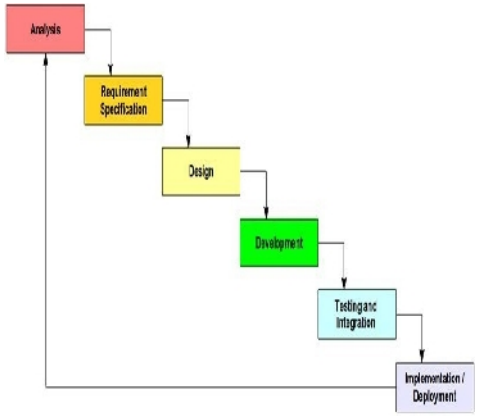

Fig. 1. Software Engineering Approach.

There exist various software development approaches, aptly defined and designed, which are employed during the development process of a software. These approaches are also referred to as Software Development Process Models. Each process model follows a particular life cycle in order to ensure success in the process of software development. The same waterfall model is utilised in this project. Waterfall approach was first a Process Model to be introduced and followed widely in software engineering to ensure success of the project. In the waterfall approach, the whole process of software development is divided into separate phases. These phases in waterfall model are:

1) Requirement specification phase
2) Software design
3) Implementation
4) Testing and maintenance

All these phases are cascaded to each other so that the second phase is started as and when a defined set of goals are achieved for first phase and it is signed off, and hence the name waterfall model. All the methods and processes undertaken in the waterfall model are more visible.

IV. SOFTWARE REQUIREMENT SPECIFICATION

The wireless sensor network is nothing but collection of Sensor Node organized in a Cooperative Network . Each Sensor Node has Capability to process the data, Sense the Data and the transfer there Live Data to Base Station or Data Collection Centre. In Wireless Sensor Network, each Sensor Node has limited Computational Power to process and transfer live Data to Base Station. Sensor In Wireless Sensor Network every Sensor node having a tendency to shut down ,due to computation power, Hardware Fail, Software Fail, environ- mental Condition and energy depletion Fault tolerance is one of the critical issues in WSNs. The existing fault tolerance mechanisms either consume significant extra energy to detect and recover from the failures or need to use additional hardware and software resources.
The aim of the System is to provide Energy efficient and cost effective communication in Wireless Sensor Networks. The proposed algorithm enhances the lifetime of a sensor nodes when a sensor node is shut down and it depends on Grade diffusion algorithm combined with the genetic algorithm. The algorithm can result are in the replacements of sensor nodes and more reused routing paths. This Algorithm also increases the number of active nodes, reduce the rate of data loss and reduced energy consumption.

A. Intended Audience and Reading Suggestions

The intended audience includes the agency project management team. They are responsible for the project from the time it receives agency approval until it is turned over to the operating organization. This team generally consists of a project manager, a lead project engineer, immediate staff, and personnel from other organizations who provide project sup- port [procurement, finance, and contracts].

B. Purpose

The purpose of this algorithm is to provide Energy efficient and cost effective communication in Wireless Sensor Networks. The algorithm can result are in the replacements of sensor nodes and more reused routing paths. This Algorithm also increases the number of active nodes, reduce the rate of data loss and reduced energy consumption.
Product Features
Performance of the WSN is increase.
The increase the Lifetime of Sensor Node.
Loading of Sensor node is decrease.

C. Project Scope

The our aim is to provide Energy efficient and cost effective communication in Wireless Sensor Networks. This Algorithm also increases the number of active nodes, reduce the rate of data loss and reduced energy consumption. This is the Feature of Project. The Purpose an efficient algorithms which will enhance the lifetime of WSN .To Introduced an effective node Replacement tech. To identify the Reliable Routing path Based on the maximum number of Reusability. To provide an alternate for the inoperative sensor Node or the node with depleted the battery. This Algorithm also increases the number of active nodes, reduce the rate of data loss and reduced energy consumption. The Proposed algorithm is increase the number of Active Node. The Reuse the most Routing Path. Energy Consumption is Reduced. Data loss Rate is Reduced.

V. SYSTEM FEATURES

A. Intrusion Detection

Proposed System will be capable of detecting the active intrusions of three types of attacks. It can identify multiple attacks by multiple node at the same time.

B. Intrusion countermeasure

When an intrusion occurs, the proposed system calls the countermeasure modules to nullify the attacks that are going on. Also it can prevent attacks from occurring.

C. Multiple Performance Metrics

Many existing routing protocols use minimum hop-count as a performance metric to select the routing path. This has been demonstrated to be ineffective in many situations.

D. Scalability

Setting up or maintaining a routing path in a very large wireless network may take a long time. Thus, it is critical to have a scalable routing protocol in WMNs.

E. Robustness

To avoid service disruption, WMNs must be robust to link failures or congestion. Routing protocols also need to perform load balancing.

F. Efficient Routing

Considering the minimal mobility and no constraints on power consumption in mesh routers, the routing protocol in mesh routers is expected to be much simpler than ad hoc network routing protocols. With the mesh infrastructure provided by mesh routers, the routing pro- tocol for mesh clients can also be made simple. Existing routing protocols for ad hoc networks have already considered some of these features.

G. High Performance Metrics

The impact of performance metrics on a routing protocol is studied where link quality source routing (LQSR) selects a routing path according to link quality metrics. Three performance metrics, i.e., expected transmission count (ETX), per-hop RTT, and per-hop packet pair, are implemented separately. The performance of the routing protocol with these three performance metrics is compared with the method using the minimum hop-count. For stationary nodes in WMNs, ETX achieves the best performance, while the minimum hop- count method outperforms the three link quality metrics when nodes are mobile. This result illustrates that the link quality metrics are used still not enough for WMNs when mobility is concerned.

H. Network Monitoring

Many functions are performed in a network management protocol. The statistics in the management information base (MIB) of mesh nodes, especially mesh routers, need to be reported to one or several servers in order to continuously monitor network performance. In addition, data processing algorithms in the performance monitoring software on the server analyze these statistical data and determine potential abnormalities. Based on the statistical information collected from the MIB, data processing algorithms can also accomplish many other functions such as network topology monitoring. Several research issues exist in network monitoring. To reduce overhead, efficient transmission of network monitoring information in a mesh network topology is expected. In addition, in order to accurately detect abnormal operation and quickly derive a multi-hop mesh network topology of WMNs, new data processing algorithms need to be developed.

VI. SYSTEM ARCHITECTURE

The Aim of Fault Node Recovery System Recover the Node Using Genetic Algorithm and Grade Diffusion Algorithm. Firstly, WSN Deployment. Grade Diffusion algorithm is Applies on Wireless Sensor Network and its Forward the data. Calculate the Bandwidth of Sensor Node if it is larger than Zero then call the Pro- posed Algorithm.

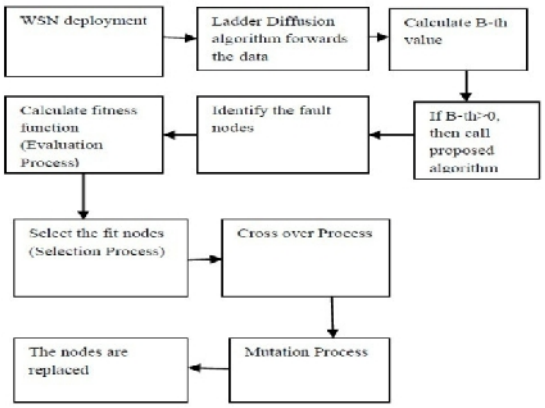

Fig. 2. System Architecture.

Applies the FNR Algorithms on the WSN With the help of Genetic Algorithm and Grade Diffusion Algorithm. Modules are as follows

1. GD Algorithm

Input: Wireless Sensor Network.
Output: Routing Table, Grade Value, Neighbor Node, Payload Value.

2. Bandwidth

Input: Sensor Node.
Output: if B-th Value of Wireless Sensor Network is larger than Zero then call the FNR system .

3. GA

Input: Wireless Sensor Network.
Output: Replace the Sensor Node.

4. FNR Algorithm

Input: Faulty Node.
Output: Faulty Node is Replace by Active Node.

5. Graph

Result
Input: Fault Node Recovery System.

Output: The Compare with above three algorithm to each other**.**

VII. CONCLUSION

In real wireless sensor networks, the sensor nodes use battery power supplies and thus have limited energy resources. In addition to the routing, it is important to research the optimization of sensor node replacement, reducing the replacement cost, and reusing the most routing paths when some sensor nodes are nonfunctional.

The various simulations demonstrate that the round trip time, Number of Hops. Power Consumption in mw, Energy Consumption in MJ, Number of Alive Nodes, and Number of Dead Nodes the proposed approach performs better than the Grade diffusion algorithm. In this paper the Fault node recovery algorithm we promoted takes less time to deliver the packets hence the energy consumption is less and power consumption is also less and the dead nodes are less and alive nodes are more. The rate of packet loss is reduced to 97 percentage and the energy consumption is reduced to 70- 80 Percentage. Thus it enhances the life time of the network. As it reuses the routing paths the replacement cost is also reduced.

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