COVERAGE HOLE AVOIDANCE USING FAULT NODE RECOVERY IN MOBILE SENSOR NETWORK

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Abstract -*Study the coverage and energy utilization control in mobile heterogeneous wireless sensor networks (WSNs). By term heterogeneous, we mean that sensors in the network have various sensing radius, which is an inherent property of many functional WSNs. Two sensor deployment schemes are considered-uniform and Poisson schemes. The main focus of this work is directed towards distributed coordination algorithms for coverage in a mobile sensor network. The sensors are assumed to have non identical sensing ranges, and it is desired to move them in such a way that the total sensing coverage increases as much as possible. To this end, the field is partitioned using the multiplicatively weighted Voronoi cells, and then different geometric methods are developed to find new locations for the sensors such that the coverage is improved. The proposed algorithms are iterative, and use the existing local information to place the sensors accurately, aiming to decrease the size of the coverage holes in the system. Our scheme propose defective node recovery and replacement algorithm for WSN based on the grade diffusion algorithm combined with genetic algorithm. The FNR algorithm requires replacing smaller number of sensor nodes and reuses the most routing paths, rising the WSN lifetime and reducing the replacement rate. In the model, the proposed algorithm increases the number of active nodes reduces the rate of energy utilization.*

Key Words: Heterogeneous Network, Voroni Cells, Fault Node Recovery Cells ,Coordination Algorithm.

1. INTRODUCTION

Wireless Sensor Network (WSN) is a collection of spatially deployed wireless sensors by which to monitor various changes of environmental conditions (e.g., forest fire, air pollutant concentration, and object moving) in a collaborative manner without relying on any underlying infrastructure support. Recently, a number of research efforts have been made to develop sensor hardware and network architectures in order to effectively deploy WSNs for a variety of applications. Due to a wide diversity of WSN application requirements, however, a general-purpose WSN design cannot fulfill the needs of all applications. Many network parameters such as sensing range, transmission range, and node density have to be carefully considered at the network design stage, according to specific applications. To achieve this, it is critical to capture the impacts of network parameters on network performance with respect to application specifications.

Wireless sensor network consists of a large number of distributed nodes with sensing, data processing, and communication capabilities. Those nodes are self-organized into a multi-hop wireless network and collaborate to accomplish a common task. As sensor nodes are usually battery-powered, and they should be able to operate without attendance for a relatively long period of time, energy efficiency is of critical importance in design of wireless sensor network.

1.1 Related Work

Faults may be due to a variety of factors, including hardware failure, software bugs, operator (user) error, and network problems. Data delivery in sensor networks is inherently faulty and unpredictable links may fail when permanently (or) temporarily blocked by an external object (or) environmental condition.

Packets may be corrupted due to the erroneous nature of communication. Fault is occurred during the routing process in wireless sensor network because of some problem, the major problem that affect the design and performance of a WSN are as follows:

Hardware and Operating System for WSN

- Synchronization
- Localization
- Deployment
- Data Dissemination

•Data Aggregation

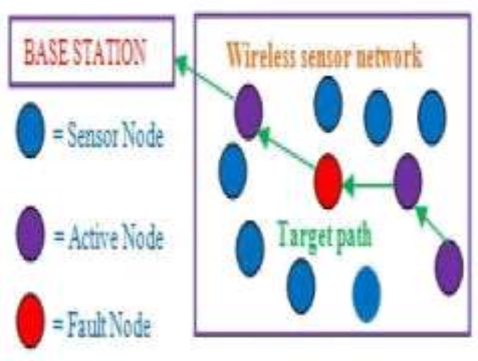


Fig 1: Fault Occurred in WSN Network

In a wireless sensor network (WSN), sensor nodes are provided with batteries that can operate for only a short period of time, which results in short network lifespan. The short lifespan disables the application of WSNs for long term tasks such as road condition maintenance for bridges and tunnels, border surveillance, and so on.

2. EXISTING SYSTEM

The MW-Voronoi diagram is used in this work to develop sensor deployment algorithms. Every sensor has a circular sensing area whose size is not the same for all sensors. Consider each sensor as a weighted node whose weight is equal to its sensing radius, and draw the MW-Voronoi diagram.

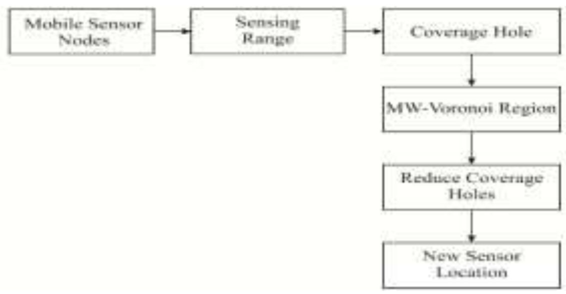
It is a straightforward results that if a sensor cannot detect a phenomenon in its region, there is no other sensor that can detect it either. This implies that to find the coverage holes in the sensing field, it would sufficient to compare the MW-Voronoi region of every node with its local coverage area.

Disadvantages:

- To enhance the life time of a wireless sensor network when some of the sensor nodes stop their working.
- It consumes more energy and decrease the network life time.
- the coverage hole problem may occur

3. PROPOSED SYSTEM

Farthest Point Boundary Strategy (FPB) is proposed. In this algorithm, each sensor moves toward the farthest point in its MW-Voronoi region such that any existing coverage hole in its region can be covered. This point is denoted by X i,far for the i -th region. In fact, once a sensor detects a coverage hole, it calculates the farthest point and moves toward it continuously until X is covered



The following definition is used to calculate the farthest point in each MW-Voronoi region.

Due to Fault node also, the coverage hole problem may occur. To avoid this fault node recovery algorithm is established. It uses genetic algorithm to find out fault nodes. Table is maintained for every node, having its energy level, location and payload. If energy level drops to threshold, then corresponding region is covered neighbouring nodes using voronoi cell algorithm. If it does not node will be replaced.

Advantages:

- It tends tomove the sensors in proper directions such that the network configuration becomes closer to an ideal configuration.
- Reducing the rate of data loss and rate of energy consumption
- Increase the network life time.

MODULES

1. Sensor Deployment

2. Hole Identification

3. Hole Healing

4. Healing a Hole with Obstacle

3.1 SENSOR DEPLOYMENT

Constructing Project design in NS2 should takes place. Wireless Sensor Nodes are deployed over a region where some phenomenon is to be monitored. Each node in the Wireless Sensor Network maintains the details of neighbour node.

3.2 HOLE IDENTIFICATION

In this module we assess the existence of a hole, which is done by identifying stuck nodes which are border of hole. Stuck nodes & Border Nodes are similar to this Algorithm. That is why we need to carry out the network boundary-node identification to avoid that the hole discovery process be launched by those nodes.

3.3 HOLE HEALING

After determining the Stuck nodes & Boundary nodes, the nodes in the local area of the holes involved in the healing process. Nodes that receive forces from the holecenter, move towards it.

3.4 HEALING A HOLE WITH OBSTACLE

In this module, we add the Distributed Virtual Force Algorithm to deploy mobile wireless sensors in an area containing obstacles in order to ensure coverage and connectivity. And also the DVFA algorithm should cover the boundary of the network. Here we have the figure 1 to explain the system which we are going to propose. In this figure we have the number of nodes from that we need to send the message from one node to another one, in between that some obstacles are present so that it have to penetrate through the obstacle and then move to the sink node.

4. FAULT NODE RECOVERY ALGORITHM

Fault node recovery algorithm is combination of grade diffusion algorithm with genetic algorithm fig shows the flow chart of FNR .

In wireless network ,the sensor nodes have less battery supplies and less energy, It also result in replacement of sensor 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. 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 based on the Grade Diffusion (GD) algorithm combined with the GA.

5. THE BASIC WIRELESS MODEL IN NS

The wireless model essentially consists of the Mobile Node at the core, with additional supporting features that allows simulations of multi-hop ad-hoc networks, wireless LANs etc. The Mobile Node object is a split object. The C++ class Mobile Node is derived from parent class Node. A Mobile Node thus is the basic Node object with added functionalities of a wireless and mobile node like ability to move within a given topology, ability to receive and transmit signals to and from a wireless channel etc. A major difference between them, though, is that a MobileNode is not connected by means of Links to other nodes or mobile nodes. In this section we shall describe the internals of Mobile Node, its routing mechanisms, the routing protocols dsdv, aodv, tora and dsr, creation of network stack allowing channel access in Mobile Node, brief description of each stack component, trace support and movement/traffic scenario generation for wireless simulations.

6. IMPLEMENTATION TOOLS

6.1 THE NETWORK SIMULATOR 2.33 (NS2)

Network Simulator (NS2) is a discrete event driven simulator developed at UC Berkeley. It is part of the VINT project. The goal of NS2 is to support networking research and education. It is suitable for designing new protocols, comparing different protocols and traffic evaluations. NS2 is developed as a collaborative environment. It is distributed freely and open source. A large amount of institutes and people in development and research use, maintain and develop NS2. This increases the confidence in it.

6.2 MOBILE NETWORKINGG IN NS2.33

This section describes the wireless model that was originally ported as CMU's Monarch group's mobility extension to NS2. The first section covers the original mobility model ported from CMU/Monarch group. In this section, we cover the internals of a mobile node, routing mechanisms and network components that are used to construct the network stack for a mobile node. The components that are covered briefly are Channel, Network interface, Radio propagation model, MAC protocols, Interface Queue, Link layer and Address resolution protocol model (ARP). CMU trace support and Generation of node movement and traffic scenario files are also covered in this section. The original CMU model allows simulation of pure wireless LANs or multihop ad-hoc networks. Further extensions were made to this model to allow combined simulation of wired and wireless networks. MobileIP was also extended to the wireless model.

7. CONCLUSIONS

Efficient sensor coordination algorithms are developed in this work to increase sensing coverage in a network of mobile sensors with non-identical sensing ranges. The sensing field is first partitioned using the multiplicatively weighted Voronoi (MW-Voronoi) diagram, and three distributed deployment algorithms are subsequently developed. Under the proposed algorithms, the sensors move iteratively in such a way that coverage holes are reduced in size.

The algorithms tend to move the sensors in proper directions such that the network configuration (in terms of the distance of sensors from the vertices of the MW-Voronoi regions) becomes closer to an ideal configuration. To avoid complex non-convex optimization problems, novel geometric methods are used to find the new sensor locations in the MW-Voronoi regions. The proposed algorithms are compared with other techniques with different number of sensors. Our system proposes a faulty node recovery and replacement algorithm for WSN based on the grade diffusion algorithm combined with genetic algorithm. The FNR algorithm requires replacing fewer sensor nodes and reuses the most routing paths, increasing the WSN lifetime and reducing the replacement cost. In the simulation, the proposed algorithm increases the number of active nodes reduces the rate of energy consumption.

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