Implementation On Clustering Based Distributed Cut Detection Algorithm for Replacement of Nodes in Wireless Sensor Networks

K. TAMILARASI[1], DR M. HEMALATHA[2], N. DHANAPRIYA[3]
[1]*Assistant Professor, Department of Computer Science, Hindusthan College of Arts & Science, Coimbatore*
[2] *Professor, Department of Information Technology, Hindusthan College of Arts & Science, Coimbatore*
[3] *Assistant Professor, Department of Computer Science, Hindusthan College of Arts & Science, Coimbatore*

Abstract— This Paper proposes a fault node recovery algorithm to enhance the lifetime of a wireless sensor network when some of the sensor nodes shut down. This should be identified by detecting the fault nodes using DCD algorithm. The dichotomous coordinate descent (DCD) algorithm allows linear systems of equations to be solved with high computational efficiency. It is a multiplication-free and division-free technique and, therefore, it is well suited for hardware implementation .In DCD, the concept is said to drift if quite a large number of outliers are found in the current sliding window, or if quite a large number of clusters are varied in the ratio of data points. Fault nodes are identified by detecting the fault nodes using DCD algorithm. We propose an algorithm that allows (i) every node to detect when the connectivity to a specially designated node has been lost, and (ii) one or more nodes (that are connected to the special node after the cut) to detect the occurrence of the fault node. The algorithm can result in fewer replacements of sensor nodes and more reused routing paths. In our simulation, the proposed algorithm increases the number of active nodes up to 8.7 times, reduces the rate of data loss by approximately 98.8%, and reduces the rate of energy consumption by approximately 31.1%.

Index Terms— CCOS, CUT detection, DOS, network separation, Wireless sensor network.

I. INTRODUCTION

A wireless sensor network can get separated in to multiple component due to failure of single sensor node or group of sensor node. This is called a CUT. We consider a node ‘u’ is disconnected from the source, is called a Disconnected frOm Source (DOS). When a cut occurs in the sensor network that does not separate a node ‘u’ from the source node is called Connected, but a Cut Occurred Somewhere (CCOS). Due to this event there are two detection possibilities-

1. DOS event each node is used .
2. Nodes close to cut is detected with CCOS event.

In this paper, we are dealing with distributed algorithm to detect CUT, as a Distributed Cut Detection (DCD) algorithm. The DCD algorithm allows sensor node to detect DOS events and set of sensor node to detect CCOS events. DCD algorithm is distributed, asynchronous and iterative. Wireless sensor network consisting large no. of nodes in network.It has low cost low power nodes in it. There are new applications like disaster response, military surveillance , and medical care and many more[4]

II. EXISTING SYSTEM

1. E-linear cut detection: Cut detection in wireless networks has been proposed, an algorithm that can be employed by a base station to detect an e-linear cut in a network. An e- linear cut is a separation of the network across a straight line so that at least end of the nodes (n is the total number of nodes in the network) are separated from the base station. The base station detects cuts when they occur based on whether it is able to receive messages from specially placed sentinel nodes.

2. Flooding based scheme: A flooding based scheme may also be used for detecting separations. Under node to- base flooding approach, every node periodically sends a time-stamped message to the base

station. If the base station does not receive a new message from node i for a certain time interval, it can declare that i is disconnected from it. Base station floods the network with time-stamped beacon packets periodically. A node detects that it is disconnected from the base if the length of time during which it hasn't received a new packet from the base exceeds a threshold value.

3. Critical node detection: A critical node is one whose removal renders the network disconnected.
4. Single path Routing approach: At the time of sending packets it choose only a single path.
5. Unsuitable for dynamic network reconfiguration: At the time of network reconfiguration it is not suitable for creating network of increasing or decreasing no. of sensor nodes.

III. DRAWBACK OF EXISTING SYSTEM

Algorithm proposed only for detecting linear cuts in the network

In flooding based technique, routes from the nodes to the base station and back have to be recomputed when node failures occur. Detecting all the critical nodes in relatively lower communication Figure 2 overhead come at the cost of high rate of incorrect detection.

IV. PROPOSED SYSTEM

1. DCD algorithm is applicable even when the network gets separated into multiple components of arbitrary shapes, and not limited to straight line cuts.
2. DCD algorithm makesa base station to detect cuts, but also every node to detect .hence, it is disconnected from the base station.
3. CCOS which detect the algorithm is designed for networks are implemented in 2D regions, the DOS event detection part is applicable to networks deployed in arbitrary spaces.

V. DISTRIBUTED CUT DETECTION

we create an algorithm which is asynchronous and distributed: it involves communication between neighboring nodes, and is robust to temporary communication failure between node pairs. A key component of the DCD algorithm is a distributed iterative computational step through which the nodes from sensor network compute their electrical potentials.

1. CUT: It is a promising technology for monitoring large regions at high spatial andtemporal resolution. The node failure is expected to be common among the typically limited energy budget of the nodes. a set of fault nodes will reduce the number of multi-hop paths in the network. These failures will create a subset of nodes – that have not failed – to become disconnected from the rest, resulting in a "cut". Two nodes are said to be disconnected if there is no path between them.[1]

2.SOURCE NODE: The common problem of detecting cuts by the nodes of a wireless sensor network. we take a designated node in the network, which we call the *source node*. The source node may be a base station that serves as an interface between the network and its users.

3. CCOS AND DOS: When a node u is disconnected from the source, we say that a DOS (Disconnected frOm Source)event has occurred for u. When a cut occurs in the network that does not separate a node u from the source node, we say that CCOS (Connected, but a Cut Occurred Somewhere) event has occurred for u. we can detect following things (i) detection by each node of a DOS event when it occurs, and (ii) detection of CCOS events by the nodes close to a cut, and the approximate location of the cut.[1]

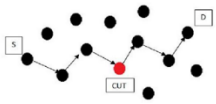
VI. DCD ALGORITHM

DCD algorithm enables base station and also every node to detect if it is disconnected from the base station.

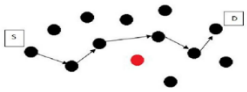
1. DOS Detection: As the name of algorithm says its Disconnected from source. To send packets we use Shortest path algorithm, it is based on energy that means at the time of sending packets from source sensors node to destination sensor node, due to throughput or any energy related issue packets are not reaching to destination. And that disturbance is from near to source sensor node. To resolve this problem we use the alternative shortest path. After repairing the cut, packets are transferred from earlier path. Diagram 1(a) shows cut occurred near to the source sensor node. Due to this it find some

another alternative path to transferred a packets to destination sensor node. Diagram1(b) shows alternative shortestpath.)

2 CCOS Detection: As the name of algorithm says its Connected but Cut Occurred From Source. At the time of sanding packets cut is occurred somewhere middle in the path. To resolve this problem it uses alternative shortest path. Cut occurred in respective node, i.e node not having sufficient energy to pass the packets forward. diagram 2(a) shows cut occurred in between the path. To resolve this, it does the same thing as done in DOS



2(a) Cut Detection



2(b)Cut Removal

VII. DRF N

Our proposed approach, called DRF N (detection and replacement of a failing node), take into consideration the network lifetime, we want that the consumed total energy for the restoration of connection would be shared by several nodes so that the consumption of individual energy would be tiny and thus extending the global network lifetime.Detection and replacement approach of a failing node for connectivity maintenance in the wireless sensors networks

If a sensor node Sn fails (because of a lack of energy on the level of its battery for example), then one of its neighbors n_i moves to replace it and ensures the functions of this failing node Sn (such as the coverage of its zone and the the connectivity maintenance with its neighbors). One of the neighbors of the node n_i goes, in its turn, to take the place left by the node n_i and will ensure its functions. The same process of replacement will continue until arriving:at a node where its zone is completely covered by its neighbors (see the first class in figure 1 where the redundant nodes are put in sleep mode); or to arrive at a node which does not have any other neighbor other than the node subject for the replacement. In this case, this node must ensure its functions and the functions of the replaced node in inter-mittency by making back and forth between its place and the place of the replaced node until its weight decreases compared to the other neighbors of the replaced node.

The idea is to imply in the replacement a node which has a potential energy higher than a node which has a low potential energy. The number of neighbors and the distance between the sensors can also be a significant criteria. The implication of several nodes permits to share the energy consumption and thus to extend the global network lifetime.

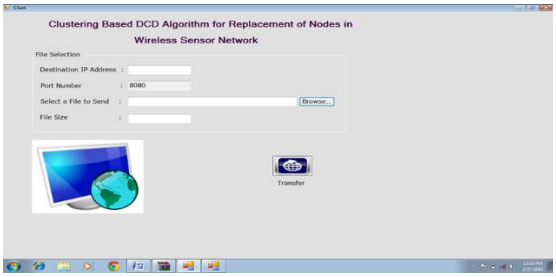


Figure 3.2 Client Page

In the case of presence of several neighbors of the failure node or the node elected substitute, what is the process to follow to elect a substitute? Several solutions can be considered

- Supposing the one which has less neighbors (less charged) to be elected. In this case, if the node is weak in terms of energy, it will be preferable to take another node with a higher potential energy;
- Supposing that we opt now to the election the one which has a higher potential energy. In this case, if the node has a great number of neigh-bors, it means that it is a very significant relay node in terms of con-nectivity. It will be then preferable to support the election of another node with a lower number of neighbors.

CONCLUSION

The wireless sensors networks are generally deployed in hard and difficultaccess environments where the breakdowns or failures of sensors nodes arepossible. These nodes failures can harm the connectivity of the entire network. In other words, the network can be partitioned where some nodes canbe disconnected from the global network. This implies a loss of connectivitybetween the parts of this network.To answer this connectivity loss, we have proposed a detection and re-placement approach of a failing node, by carrying out replacements chainfollowing a distributed algorithm. The idea is to share theconsumption of energy, necessary to the

connectivity restoration, with several sensors to minimize the early failures of the sensor nodes, and thus toprolong the lifetime of the entire network.

In this paper we define and propose DCD algorithm, it allow every node of wireless sensor network to detect Disconnected frOm Source if the event occur. And also allow subset of node that have experience of CCOS event to detect them and locate the approximate location of CUT. The algorithm is based on electrical network theory and parallel iterative solution.

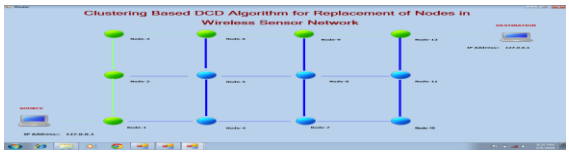


Figure 3.3 Data Transfer

As future work, we plan to develop or allow a algorithm to check a point-to-point cut detection that does not rely on nodes locations. This will enable us to employ other types of routing protocols than location based.

The performance of the system both in the presence and absence of the faults is an important task to be focused and ensured. This can be achieved by using the IOT devices in the data centers. Sensors in the data centers are the IOT devices for monitoring the environment and other sources. FDD is the basic technique to identify and diagnose the faults detected for these sensors due to some network load, external environmental conditions and the internal damage of the system. In this work, we focused on monitoring the data center conditions like ambient temperature and chiller plants. We discussed various techniques for the fault detection and recovery in these areas.

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