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

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Abstract- *Clustering of cut detections is a fault node recovery algorithm to enhance the lifetime of a wireless sensor network when some of the sensor nodes shut down. This is 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. 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. The algorithm can result in fewer replacements of sensor nodes and more reused routing paths*

Keywords- CCOS, CUT detection, DOS, network separation, Wireless sensor network.

I. INTRODUCTION

A wireless sensor network can get separated in to multiple components 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)[6]. 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.

The DCD algorithm allows sensor node to detect DOS events and set of sensor node to detect CCOS events [7]. DCD algorithm is distributed, asynchronous and iterative. Wireless sensor network consisting large number of nodes in network. There are new applications like disaster response, military surveillance, and medical care and many more [4]

II. EXISTING SYSTEM

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 [7]. 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.

III. DRAWBACK OF EXISTING SYSTEM

1) Algorithm proposed only for detecting linear cuts in the network [3].

2) In flooding based technique, routes from the nodes to the base station and back have to be recomputed when node failures occur.

3) Detecting all the critical nodes in relatively lower communication 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 makes a 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 and temporal 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]

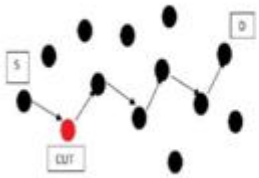
2) **SOURCE NODE:** The common problem of detecting cuts by the nodes of a wireless sensor network. We take a designated node in the network, which we call the source node. The source node may be a base station that serves as an interface between the network and its users.

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]

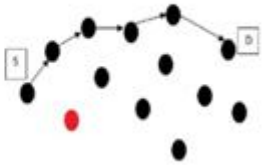
VI. DCD ALGORITHM

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 it's 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 shortest path.

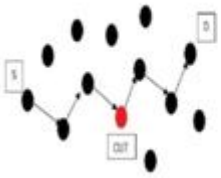


1(a)



(b)

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)

2(b)

VII. DETECTION AND REPLACEMENT OF A FAILING NODE

Our proposed approach, called DRFN (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 ni 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 ni goes, in its turn, to take the place left by the node ni and will ensure its

Functions. The same process of replacement will continue until arriving:

1. 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

2. 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-mittens 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 significant criteria. The implication of several nodes permits to share the energy consumption and thus to extend the global network lifetime.

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;

VIII. CONCLUSION

The wireless sensors networks are generally deployed in hard and difficult access environments where the breakdowns or failures of sensors nodes are possible. These nodes failures can harm the connectivity of the entire network. In other words, the network can be partitioned where some nodes can be disconnected from the global network. The idea is to share the consumption of energy, necessary to the connectivity restoration, with several sensors to minimize the early failures of the sensor nodes, and thus to prolong the lifetime of the entire network. DCD algorithm, it allows every node of wireless sensor network to detect Disconnected from Source if the event occurs. And also allow subset of node that has 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. 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.

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