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Distributed Cut Detection in Wireless Sensor Network

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ABSTRACT- A wireless sensor network (WSN) is a deployment of a large number of small, inexpensive, self-powered devices that can sense , compute, and communicate with other devices for the purpose of gathering local information about a physical environment. We propose a distributed algorithm to detect "CUT" in Wireless sensor networks, that mean the failure of any single node or set of node that separates the network in to two or more components. Algorithm is iterative and asynchronous i.e every node is communicate only those node that are in the rang. Simulation result show that this algorithm leads to very good detection performance compared to existing techniques.

KEYWORDS-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. Detection by each node of DOS event .
2. Detection of CCOS event by the node which are close to cut.

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 having 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.

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III. DRAWBACK OF EXISTING SYSTEM

1. Algorithm proposed only for detecting linear cuts in the network
2. In flooding based technique, routes from the nodes to the base station and back have to be recomputed when node failures occur.
3. Critical node detection uses 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 enables not just a base station to detect cuts, but also every node to detect if it is disconnected from the base station.
3. CCOS event detection part of the algorithm is designed for networks deployed in 2D regions, the DOS event detection part is applicable to networks deployed in arbitrary spaces.

V. DISTRIBUTED CUT DETECTION

The algorithm we propose 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: Wireless sensor networks (WSNs) are a promising technology for monitoring large regions at high spatial and temporal resolution. In fact, node failure is expected to be quite common due to the typically limited energy budget of the nodes. Failure of a set of nodes will reduce the number of multi-hop paths in the network. Such failures can cause 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: We consider the problem of detecting cuts by the nodes of a wireless sensor network. We assume that there is a specially 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. Since a cut may or may not separate a node from the source node, we distinguish between two distinct outcomes of a cut for a particular node.[1]

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. By cut detection we mean (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

- Comes with provable characterization on the DOS detection accuracy
- CCOS events detection can be identified
- 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.

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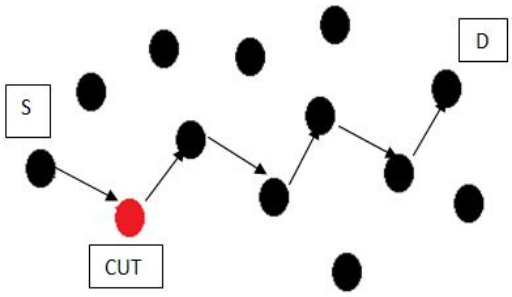
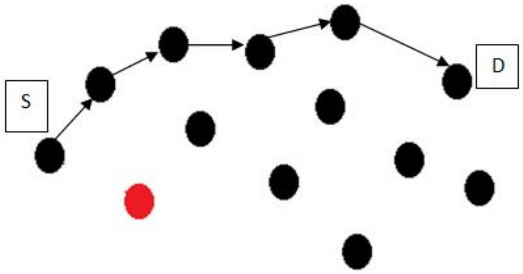
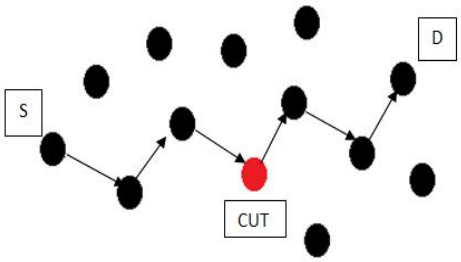


1(a)

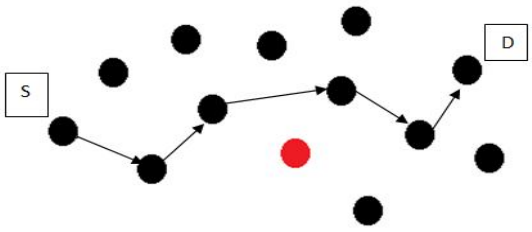


1(b)

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. NS2:

*NS2 Goals

• Network Simulator support networking research and education: It also used to design Protocol, traffic studies, etc. It also used for comparing the Protocol. New architecture designs are also supported to network simulator.

• Network simulator provide collaborative environment: NS2 is Freely distributed, open source. It Increase confidence in result, it directly shows simulation of networks.

*Two Languages: C++, OTcl

• OTcl: short for MIT Object Tcl, an extension to Tcl/Tk for object-oriented programming.

• It also used to build the network structure and topology which is just the surface of your simulation. Easily to configure your network parameters. It's Not enough for research schemes and protocol architecture adaption.

*Two Languages (Con't)

• C++: Most important and kernel part of the NS2. To implement the kernel of the architecture of the protocol designs. Also From the point of view of packet flow view it is most important, the processes run on a single node To change or "comment out" the existing protocols running in NS2.

• There are two most important requirements of the simulator

– Detailed simulation of Protocol: Run-time speed;

– Varying parameters or configuration: easy to use.

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C++ is fast to run but slower to code and change. OTcl is easy to code but runs slowly.
*Protocols/Models supported by NS2
• Wired Networking
There are different Routing mechanisms in NS2, e.g. Unicast, Multicast, and Hierarchical Routing, etc. Also there are mainly two transportation protocols e.g. TCP, UDP. Other protocols are used depends on specification. Also it uses transfer protocol on the basis of simulation requirement e,g web, ftp, telnet etc. It having different quality of services for wireless networking IntServ and Diffserv. It also having Ad hoc routing and mobile IP
*NS2 Components
• NS2: the simulator itself, now version: ns-2
• NAM: Network animator. Visualized trace tool(not really).
Nam editor: GUI interface to generate ns scripts
• Pre-processing: Traffic and topology generators
• Post-processing: Simple trace analysis, often in Awk, Perl(mostly), or Tcl

VIII. CONCLUSION

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.

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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