Identifying Cuts by Linear Search Method

Mani Sharma, Sunil.J. Wagh, Archana Sar

Abstract: Tracking cuts and their position in wireless sensor network is the main issue of focus now-a -days. This research paper describes cut detection by linear search method in a dynamic table. We are working on the values of node's related factors. In this method, scanning will be performed on each sensor node on the basis of certain factors and cut will be detected. We hope that our method will be efficiently takes less time in tracking cut and will help in the process of connectivity restoration.

Index Terms*: *Tracking cuts, wireless sensor network, linear search, scanning

I. INTRODUCTION

Wireless Sensor Network (WSN) is created by controlling basis node and little sensor nodes [13]. Basis node works as a crossing position among users and network. Every sensor has a feature to judge the atmosphere and converse the facts collected from the investigated position through the wireless bond. They contain slight mass plus utilize less voltage. This is most important cause of using sensor nodes by big organizations. WSN have appeared with innovation in the area of wireless interactions plus digital electronics. The atmosphere where sensors are kept causes node malfunction which generates cut in network. As a consequence, sensors in such detachments unable carry their analysis which may suppose application unsuccessful.

Multiple cut recognition algorithms have planned for tracking cuts. But no such procedure has been generated that can tracks the cuts correctly. The most important reason for their unsuccessfulness is that existing procedures are very complicated or even unfeasible to apply to WSN since they use a huge quantity of power which may not be given via WSN or use a lot of moment [6]. In this research, we are describing the troubles suffered by sensor network due to node failure which has not acknowledged satisfactory consideration. This problem must be solved to improve operational reliability of network. Cut vertex is vital in WSN for the motives specified below:

- Cut vertex malfunction detaches the WSN addicted to numerous attached sections, facts delivery from individual attached section to a further are discontinued.
- Optimization policies relying on cut vertices can assist in falling conversation price.

Cut is described as the detachment of nodes which consequences in distribution of network into numerous linked sections. Network Cut is Network partitioning or network disconnection. According to graph hypothesis, cut vertex is the node in network whose breakdown distributes network. Cut consequences in lessening in numerous of many expected routes. Two nodes are called to be detached condition when no route is placed among them.

Network Cut results in:

- Facts loss since it prevents the facts from reaching to its target.
- Fall in number of links among the nodes. These consequences in loss of attachment among the nodes which is very terrible for sensor network. Thus, it results in collapse of complete sensor network.
- Expenditure of power of valuable nodes in case of no news of node malfunctions during facts transmission.
- Failure of operational effectiveness of the network.
- Failure of operational consistency of sensor network.
- Cut Recognition is the procedure of tracking the occurrence of detached sensors. Thus, cut recognition stands for:

i. **Recognizing DOS incident through all node.**
If a node x is detached from basis node, in that case we say that DOS incident has a take place for node x.

ii. **Recognizing CCOS incident through nodes that are neighbor of malfunctioned nodes**.
If a node x is attached to the basis node, in case of gets detached from node y, then we state that CCOS incident has take place for node x

iii. **Fairly accurate place of cut.**
Through fairly accurate place, we denote that the section otherwise gap wherever energetic nodes exists on the border of cut plus linked to the basis node [2].

Therefore, cut recognition is significant for sensing malfunctioned nodes to sustain its continuous working so that WSN can provide error free job to the companies, organizations and users. A scheme must be discover to recognize the inactive nodes in network. Re-establishment of network' associability is the essential matter in WSN.

II. LITERATURE SURVEY

The article named "Detecting cuts in sensor networks," projected an idea to notice e- cuts [1]. Their procedure was straightforward plus little operating cost. Deficiency of fake positivity or negativity was the key aspect of their procedure. Hence, superior range cuts can be recognized. They assumed a network S of n sensors in 2-D regions. They focused to recognize an e-cut which is a straight line cut that distributes the WSN to two regions one region contains portion of e-defective nodes plus other plane contains energetic nodes counting basis node where 0<e<1. They assumed that the basis node should placed inside the secure surface of region. They preferred a tiny node subset. It performs like sentinels. During usual time, conversation takes place among the sentinels and basis node. In case of some stoppage in conversation from sentinel, this denotes that sentinel's cut off.

They proved that a 0(1/e) sentinels are required to notice e-cut condition- e<1. They discovered two procedures one procedure is decisive for creating least sentinel set and second procedure is randomized for calculating 0(1/e) sized sentinel set. Their procedure is centralized, as the complete process is operated at basis node. They reduced conversation rate by taking small set of sentinel nodes. The main point to reminder is that the range of sentinel set depends simply on the factor e, not on n, the range of network. Therefore their structure was largely scalable. Drawbacks of their procedure are given below:

- Except linear, other shaped cuts haven't noticed.
- Universal topology facts required
- Subject of sound or intrinsic instability of sole sensor node didn't considered.

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- Can't use dissimilar sets of sentinels as they increases conversation rate.
- Suffer time delay due to centralized nature as entire work done by basis node.
- Lack of fault tolerant to numerous individual node malfunctioned in procedure.

The article named "Cut detection in wireless sensor networks" projected a dispersed procedure Distributed Cut Detection (DCD)[2]. Disconnected frOm Source (DOS) incident has take place for a sensor in that case it gets detached from basis node. Connected, but Cut Occurred Somewhere (CCOS) incident for a sensor happened in case cut occurs it is attached with basis node but detached from some other sensor. In this procedure, all sensors notice DOS actions plus a subset of sensors to notice CCOS actions. All nodes require to contacts with simply those nodes that are surrounded by their conversation boundaries. It computes the fairly accurate place of defect in structure of a directory of energetic sensors that are present at the cut border. It is strong to provisional stoppage of conversation among couples of sensors. A key part of this procedure is an cyclic calculating stage. By the assist of this stage, node calculates its energy voltages. The union calculating velocity is autonomous of system range plus organization. DCD overcomes the limitation of straight cut recognition as all nodes recognizes cut. Hence, it reduces time delay as entire work distributed among all nodes. It also recognizes high classes of cuts. It is not bounded to straight cuts. It works effectively even in cases of larger net ranges. It is based on opinion of electrical net hypothesis plus similar cyclic answer of linear equations. It is strong to impermanent conversation breakdown among sensor couples. Drawbacks of their procedure are given below:

- Isolated cut recognition in case of node malfunction occurred in intolerable condition.
- Recognizing node disjointing plus rejoining to basis node in mobile network was not performed.

The article named "Destination-based cut detection in wireless sensor networks" concerned on dilemma of end node based cut recognition [3]. Cuts are recognized referring end node and discovered an immediate resolution called Point-to-Point Cut Detection protocol (P2PCD). Cut is reactively recognized as compared to proactive solutions. Thus it is more power capable. It allows the basis node to recognize defect with reference to any end sensor. Here, basis node decides accessibility of end node. Cut Border is presented though group of straight sectors. Cut presentation permits the records on present cuts to be spread to net with little operating cost. Basis node, utilizing records, decides whether target is accessible or not. Another practical resolution RE-CDM discovered which highly light weighted protocol is. It capably recognizes the occurrence of cuts among basis node plus little place of destinations. All node confirms attachment to many descend nodes by this resolution. It defeats the drawback of P2PCD as it doesn't require sensors to be localized plus no need for facts storage. Thus, it reduces the price overhead faced by P2PCD. They confirmed that together solutions progresses power use by broad model.

Drawbacks of their procedure are given below:

- P2P-CD relies on node's location. Thus, path searching is operated upon location, additional routing types aren't used.
- RECDM is not more useful for power reduction as it recognizes cut with reference to little group of targets
- RECDM is little power capable than P2PCD.

The article named as "An Efficient Algorithm for Cut Vertex Detection in Wireless Sensor Network" projected a dispersed procedure Cut Vertex Detection (CVD) [4]. It contains three stages: tree building, Tree Coding, Cut Finding. In tree building, a spanning tree T(s) is created from a graph G (v, e) from a provided WSN. In tree coding, T(s) created from the tree generating is utilized. All nodes of T(s) have given an interval code. Cut Finding recognizes the cut nodes through edge coloring phenomenon. CVD is a dispersed procedure. It uses a coded spanning tree to minimize conversation price plus assumes an original situation for recognizing the malfunctioned nodes in equivalent to minimize moment wait. Hypothetical study confirms that CVD is accurate. It involves 0(dn) conversation price plus has 0(dn) moment wait, where n is number of sensor nodes plus d is the utmost degree of sensor node. CVD proves its large effectiveness operation on actual sensor net. Though optimization procedures, it defeats DFS plus CAM in case of conversation price plus moment wait.

Drawback of their procedure is that CVD just recognizes the cut points. It doesn't give network recovery.

The article named, "Distributed Relay Node Positioning for Connectivity Restoration in Partitioned Wireless Sensor Network" projected a scattered relay node locating [5] to bring back network attachment via Game theory. Firstly, placing relay nodes at definite positions in a defective place moreover they reposition themselves guarantee network reconnectivity from cut. An expected Nash balance is given to all detachment. On the foundation of expected balance, pdf is defined for all detachment. Relay nodes improve that detachment earliest whose pdf is maximum. This progression carry on awaiting entire detachments have improved plus equal balance has arrived. Tests have revealed the superiority of game theoretic approach with respect to force based approach under all conditions considered. The results have proved scalability of game theoretic approach. They consider two matrices: number of relay nodes to be deployed and movement cost which needs to be lessen.

Drawbacks of their procedure are given below:

- Network attachment can't restore in case of stationary feature of nodes.
- There is a substitution among use of extra relays with the movement price.

The article named "Artificial Routing Protocol for Cut Detection of Cut Vertices" discovered a simulated routing procedure [6] to notice cuts by Ms. Rini Mathew and Mrs. Annadevi. E. This procedure uses dynamic source routing to discover vertex node. Threshold power is set up if it exceeds the present power point, on that instant itself the malfunctioned node itself informs its closest fellow sensors that it is leaving to expire away based on its power intensity. Thus, in this scheme, fellow node receive note via malfunctioned node about its malfunction. The fellow node notifies the basis node plus target node regarding this incident of node malfunction. After that basis node begins by taking swap pathway to transmit facts to its target. The complete procedure gives details in three sections.

Every section contains of numerous associated phases given with a title. Every title is followed with explanation. They used NS2 simulator to bring away simulation. They followed two schemes for cut recognition. In first scheme, malfunctioned node was recognized through eliminating every node plus examining the network's status whether it was attached or not. If it was detached, then that sensor node was said to be malfunctioned node. This scheme has taken a large moment plus power. Therefore they used second scheme based on routing table examining. This scheme was much successful plus a little changed to track malfunctioned node. At the moment of node malfunctioning, it helps in notifying basis plus target in order to reproduce the new route via basis node. This minimizes packet loss to least extend. This scheme works in short duration plus operates in low iterations.

Drawback of their procedure is that It can just be functional to the stationary nodes.

The article named "Introduction to Graph Theory (Second Edition)" discovered Distributed Depth First Search (DDFS) [7] which is a changed version of DFS procedure. This procedure makes the DFS tree in a dispersed mode, based on sequential examination of the complete network topology. This procedure operates through passing a note from the descend vertex s with 0(dn) conversation price plus 0(dn) moment wait where n is number of sensor nodes plus d is the utmost degree of sensor node. The note performs a depth- first search visit of graph plus here is an appropriate categorization of edges into the tree edges, back edges and cross edges. A counter is incremented all moment while note visits a vertex. Each vertex p receives an indicator x(p). x(p) is counter of initial visit note. Every leaf vertex u, sends least indicator x(v) to its parent w. From all the indicators got from its offspring, parent w keeps the least indicator. W is a malfunctioned node in case receiving least indicator to W from its children is minor than x(w). This indicator is called y(w). min(y(p)) is sent via w to its parent. This procedure continues plus after that all vertex can nearby recognize whether it is a malfunction node.

Drawbacks of their procedure are given below:

- Huge Time delay, thus it possibly will be unworkable for a huge range sensor network.
- High receptive to vertex malfunctioning. Thus, its strength is fairly small.

The article named "Optimizing Overlay Topology by Reducing Cut Vertices" discovered CAM procedure. Network was assumed as a one directional graph. Recognition, Calculation plus neutralization are the stages included in this procedure [8]. In recognition stage, it utilizes the narrow flood format among TTL threshold. All neighbors have a TTL which denotes the instance of end of note. All applicants send a constituent probe message to every fellow. While node gets message, it changes narrow facts plus plans whether to pass message otherwise to go back a coming message. The applicant is a malfunctioned node while graph of CAM has many sections. In calculation stage, CAM graph was build together with the associations. If a node takes delivery of two coming contacts of dissimilar sections, after that a link is appended to graph plus a node was determined as the malfunctioned node of the graph. In neutralization stage, recognized malfunctioned node was prepared as non-malfunctioned node. Detached parts are prepared attached therefore sinking malfunctioned nodes. CAM gets 0(dnn) conversation prices, which is excessively huge for power-controlled sensor network.

Drawbacks of their procedure are given below:

- High message price.
- High moment wait.

III. PROPOSED SYSTEM

In our procedure, malfunctioned node is recognized by checking entered values to the conditions. In our research process, cut is recognized via three factors:

- Initial Energy Level
- Activation State
- Contact Level

We suppose that basis node is energetic since it converse among other nodes and collect information about every action of nodes. So, entered value though user must be high to satisfy conditions. We are taking small range of node to construct WSN.

- Initialization Process:

Enter the values of NodeId, Qlength, Contact and Initial Energy in textboxes. Add button is clicked to insert the row filled with user's entered values in dynamic range table. After that, a condition arrives such that there is requirement of adding more rows in table or not. In case, if more rows needed to place large content, add button is again pressed otherwise no add button is pressed. The procedure of initialization process carried on until user's demand of placing content doesn't satisfy. If user's desire satisfied, then initialization phase gets completed.

- Cut Recognition by Energy Level:

This phenomenon begins by pressing detect cut button. Then NodeId and their corresponding Qlength will be appear. Then minimum energy level will be displayed in frame. Cut recognition begins by checking the values of energy level. Values are compared with the assumed value. Assumed values have taken by us for the aim of comparing values. If entered values are less than assumed value, then location and node accessed by its index and NodeId. Low energy value node will be confirmed as defective. In case if no node has low energy then all nodes are energetic, no cut has occurred in WSN plus procedure will be finished otherwise location, NodeId will be displayed. Total number of malfunctioned node also displayed.

- Cut Recognition by Activation State:

This procedure begins with assigning state values to each node. After that NodeId and their corresponding states have displayed in table. Comparison of values performed with the assumed value to find minimum state value. Those nodes which have minimum state values will be confirmed as malfunctioned nodes. If all nodes have high state values, then no node is defective, no cut has occurred otherwise cut has occurred, NodeId and location accessed and displayed. Number of inactive nodes displayed.

- Cut Recognition by Contact Level:

This procedure begins by scanning the level of contact among all nodes including Basis node. If a node has low contact level value, it will be can't able to converse with other nodes and basis node. Thus, it can't operate in sharing resources process and other essential activities.

Hence, low contact level node will be confirmed as defective. Lowest contact value will be appeared in frame. Defective nodes will be displayed by accessing their NODEID. Number of defective nodes also displayed.

In case, if contact values are higher than the assumed value, then there will be no cut shown by this procedure. At the last, sum of malfunctioned nodes are displayed by adding number of cuts obtained by energy level, contact level plus activation state.

1. Implementation

This research process describes cut detection by linear search method in a dynamic table. In this scheme, searching will be carried out on each node in WSN.

Malfunctioned node will be detected on the basis of certain aspects.

Step-1: Before searching cut, Node Initialization which is first stage of our procedure will be carried out. In our research work, we are performing coding in swing API. We created the frame and insert components in that frame. The data will be first entered in the textboxes. After clicking on the Add button, an event will be occur which involves execution of code by Add button object which adds the row in table and the data which is being entered by user will be displayed. The overall dynamic entered data will be visible in the table appeared in the frame.

In tabular representation:

- Rows correspond to the number of nodes.
- Columns correspond to the number of factors that are related to each sensor node.
- In this investigate document, Node's related factors have taken from research paper [6].

- We are taking four factors:
- NodeID: NodeID has used for unique identification of each node.
- QLength: QLength describes the distance of each sensor node from Base Station.
- Contact: Contact factor describes whether each node is able to converse with base station or not. If contact factor is more than one then node will be able to converse with basis node also with other nodes.
- Initial Energy: Initial Energy describes the quantity of power required by each sensor node to transfer data packets from source to destination.
- The information described above will be visible through table in the frame.

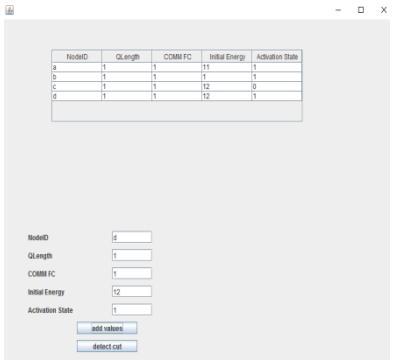

Fig. 1: Frame showing Node Initialization process

Step-2: Cut detection by linear search method involves the scanning of each sensor node. This process will be performed on the dynamic table. By clicking of detect cut button, the code related to the detect cut button object will be executed. We are taking three factors in our research process, on the basis of that, cuts will be identified:

1. Initial EnergyLevel
2. Activation State
3. Contact Level

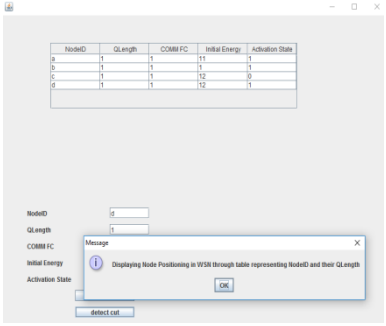

Fig 2 Dialog Box informing about process of Node Positioning

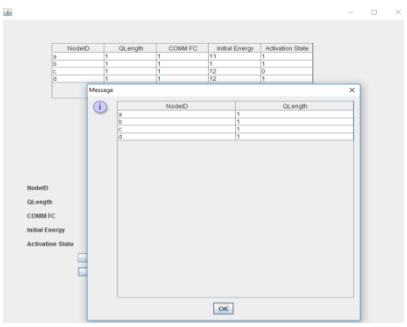

Fig.3 Dialog box showing Node Positioning process

Step-2.1 Cut detection by Initial Energy level is mainly inspired and based on DCD algorithm. In this process, we have used file transfer operation in which data packets are allowed to be transfer through each senor node in WSN. Those nodes which have the higher energy will transfer packet to other node otherwise file transmission will be blocked in WSN. As a result, a warning message will be displayed by dialog box that notices the existence of cut.

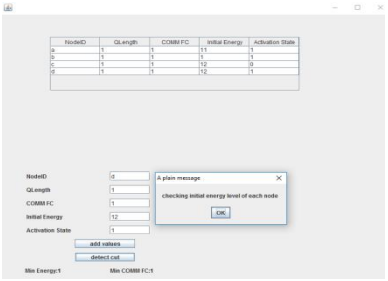

Fig.4 Dialog box informing about initial energy level scanning

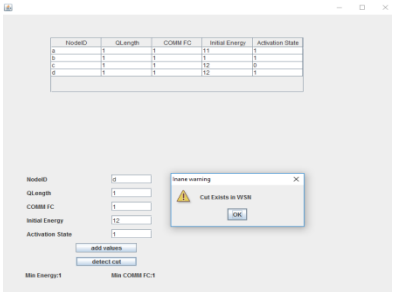

Fig.5 Dialog box showing warning message in frame

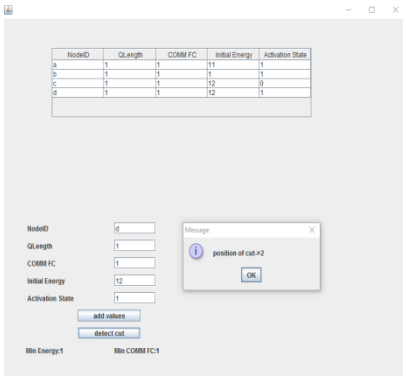

Fig.6 Dialog box showing cut position in frame

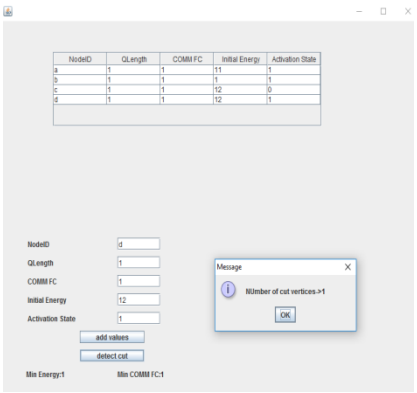

Fig 7 Dialog box showing number of cut vertices in frame

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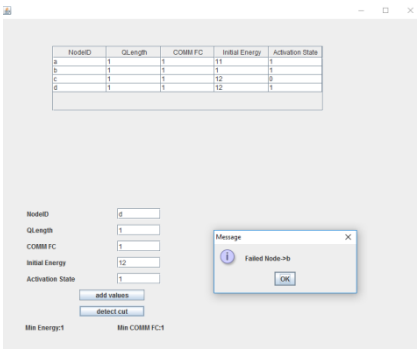

Fig.8 Dialog box showing cut vertex in frame

In Linear search method, we are taking the fourth column named Initial energy level for scanning. In our scanning process, each node will be examined by certain conditions. If the energy level of each node will be negative, zero, or low value that is less then desired level, then the node will be confirmed as the failed vertex of WSN. The smallest value of energy level will be computed and displayed in the frame. The position of cut, number of cut vertices by this checking process and failed vertex by accessing NodeId will be show in dialog box.

Step-2.2 Cut detection by contact level involves the comparing values of contact level of each node with fix active values in WSN. Minimum contact value will be displayed in frame.

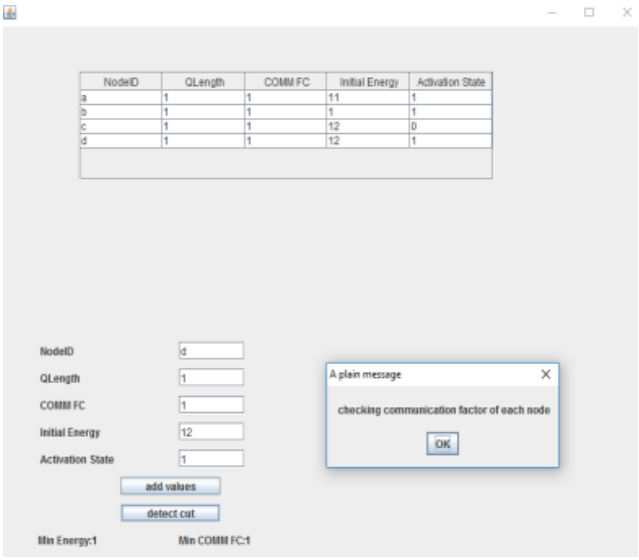

Fig 9 Dialog box informing about contact level scanning

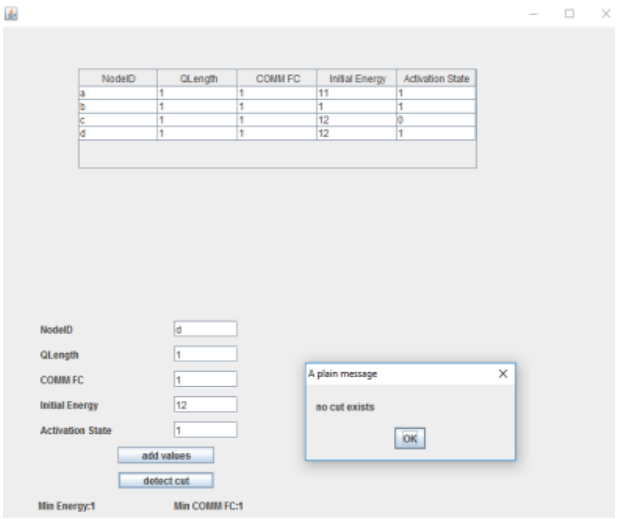

Fig 10 Dialog box showing no cut occurred message in frame

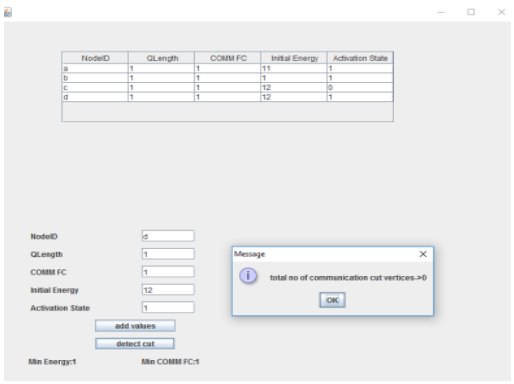

Fig.11 Dialog box showing number of contact cut vertices

In case of comparison, we are taking positive integer values greater than zero as active values. Scanning will be based on the values of contact level of each node. If contact level of node is less than and equal to zero, node will be declared as defective, location of failed nodes will be displayed otherwise this scanning process will display no cut occurred though dialog box.

Step-2.3 Cut detection by activation state involves the checking of activation state of each node in WSN. After detecting cuts by checking energy level, a scanning of activation state of each node begins.

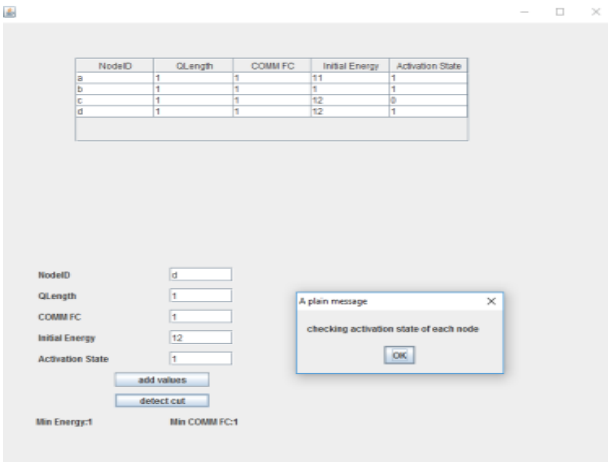

Fig 12 Dialog box informing about activation states scanning

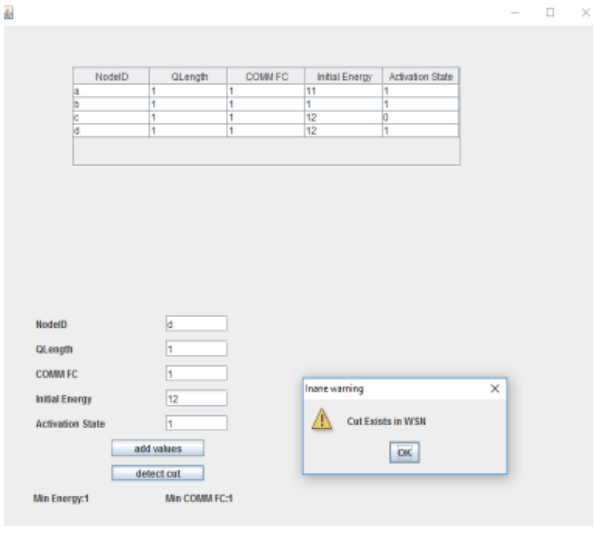

Fig 13 Dialog box showing warning message in frame

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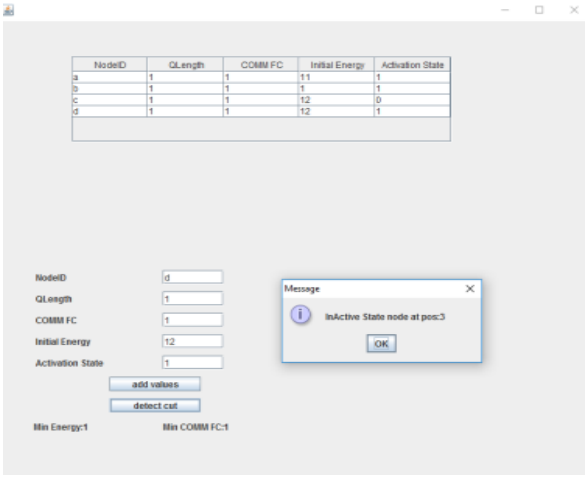

Fig 14 Dialog box showing position of inactive nodes

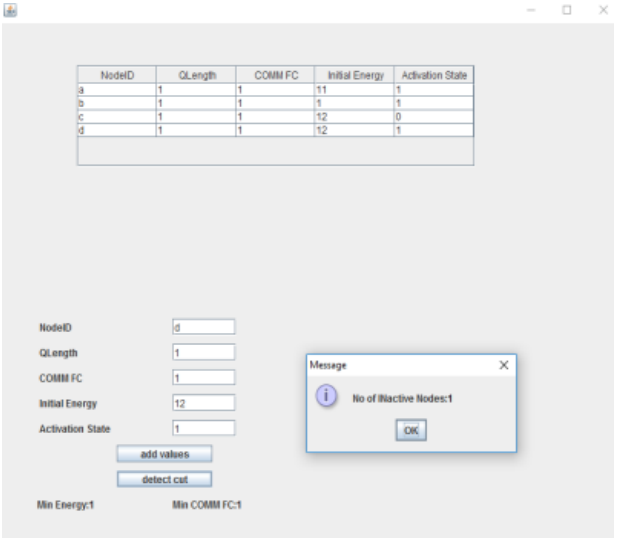

Fig 15 Dialog box showing number of inactive vertices

Checking will be done on the basis of value of activation state. If activation state of node is low, then the node will be declared as the disconnected node. The position of cut, number of cut vertices by this checking process and failed vertex by accessing NodeId will be display in dialog box.

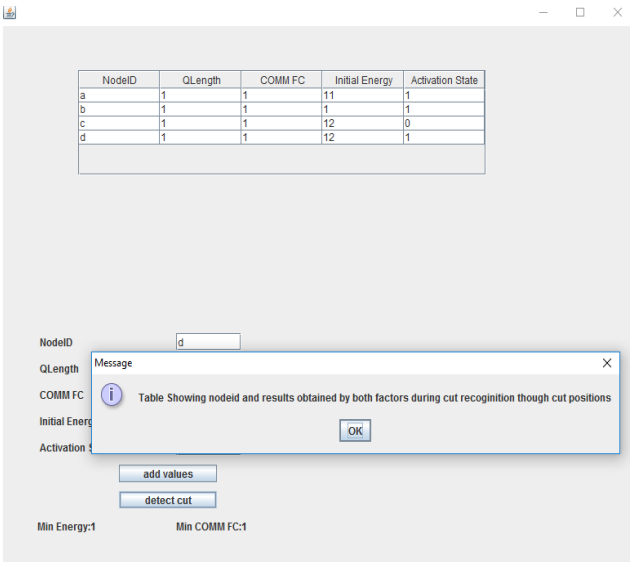

Fig 16 Dialog box showing record display process

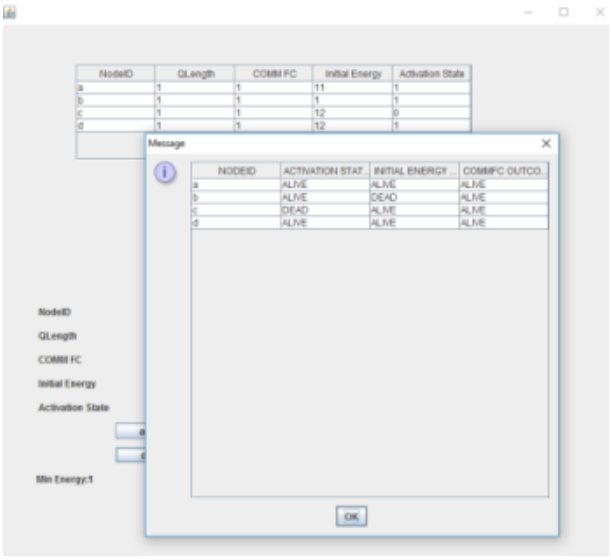

Fig 17 Dialog box showing cut recognition records

When scanning process will be over, a dialog box will be appears showing the total number of failed vertices in WSN.

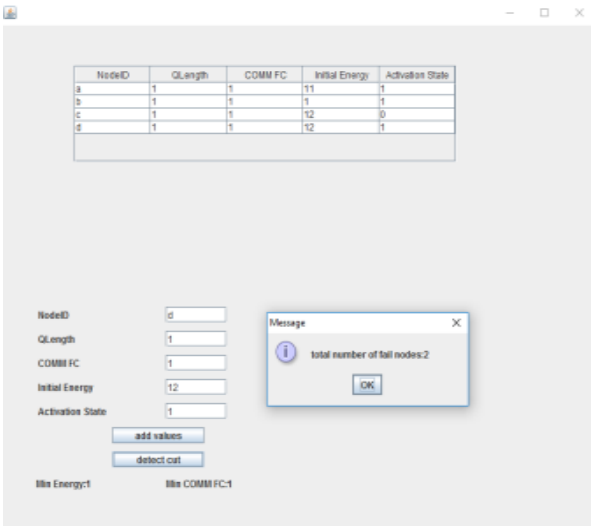

Fig 18 Dialog box showing number of failed vertices

Total number of failed vertex are computed by summing up of failed vertices computed in initial energy level checking process to the failed vertices computed in activation state plus contact level checking process.

IV. CONCLUSION

In this task report, we concentrated on the issue of cuts in remote sensor organize which brings about loss of network among hubs. Information transmission isn't conceivable because of essence of cut vertices in a system as there are odds of information misfortune in sensor arrange. Thus, we reasoned that Cuts in remote sensor arrange are a major issue and should have been identified and evacuated at the earliest opportunity. In the event that discovery of cuts won't be taken in time, at that point remote sensor system will be apportioned into different disjoint sets. We have exhibited our approach in this examination venture. In initial step of our approach,

little size of sensor arranges has been taken to check its precision. We have performed record exchange operation so cut region and cut vertices can be effectively distinguished. Our approach is exceptionally improved. Henceforth, it lessens time postpone factor which are endured by the majority of the strategies. It defeats the restrictions of existing systems as it incorporates a procedure through which base station gets message about hub disappointment in sensor organize. The status of every hub has been checked by the estimation of beginning vitality level and enactment condition of every hub. The base estimation of beginning vitality level and initiation state will be show in the casing. Those hubs which have low vitality and low initiation state will be announced as fizzled vertices.

V. FUTURE ENHANCEMENT

- *Noticing basis node plus target node regarding node malfunctioning.*
- *Compare our approach with additional existing approaches.*

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