PRE-DEPLOYMENT SCENARIO TO PREVENT DISTRIBUTED COVERAGE HOLE OCCURANCE IN WIRELESS SENSOR NETWORKS

VANITHA.N
M.E (CSE)
Jay Sriram Group of Institution
vanithaayshu@gmail.com

Mrs.MALLIKA.P
Assistant Professor
Jay Sriram Group of Institution
mallikajaycse@gmail.com

DR. RAJALAKSHMI
HOD (CSE)
Jay Sriram Group of Institution
mrajislm@gmail.com

ABSTRACT
A wireless sensor network can get separated into multiple connected components due to the failure of some of its nodes, which is called a “hole.” The unreachability problem (i.e., the so-called hole problem) that exists in the existing routing algorithms has been studied for the wireless sensor networks. Some of the current research work cannot fully resolve the cut problem, while there are some other schemes that can guarantee the delivery of packets with the excessive consumption of control overheads. In this project, a Coverage Hole Dynamic Interference Avoidance (CHDIA) protocol is proposed to solve the hole problem with increased routing efficiency by exploiting the boundary finding technique for the Hole Repair Algorithms (HORA).

KEYWORDS
Wireless Sensor Network, Coverage hole, Coverage overlapping, Multi-hop delivery, Zone Based Structure.

I. INTRODUCTION
In wireless sensor networks (WSNs), sensors are deployed randomly over a monitoring region with higher degree of density of nodes. Hence due to random deployment strategy, certain areas of the monitoring region may have coverage holes and serious coverage overlapping, which significantly degrade the network performance. One of the fundamental services provided by a WSN is the monitoring of a specified region of interest, where the main duty is sensing the environment and communicating the information to the sink. WSNs cannot work efficiently if serious coverage overlapping due to redundant nodes is present. Hence, designing an optimal node deployment strategy to static nodes is another issue of density control in WSNs, which can satisfy various demands of coverage and connectivity. To simplify the coverage hole recovery problem, most papers assume that the coverage holes have been detected accurately. The concept of density control is still workable for mobile sensors which are used to minimize the overlapping area and to eliminate the coverage holes or maintain the coverage and connectivity according to the density of nodes. Unfortunately, some coverage holes cannot be fully eliminated if no more redundant nodes can be moved. However, big coverage holes can be formed in the network, if numbers of deployed nodes are insufficient.

Due to random deployment of nodes, uniform distribution of density of the nodes cannot be guaranteed. Besides, maintenance of the network coverage and connectivity is highly essential because a small un-monitored area can spoil the whole purpose of the network, if it goes undetected. From the survey of current literature, though different coverage and connectivity maintenance algorithms are found, to the best of our knowledge, none of the work proposes how to prevent hole occurrences.
II. **HORA: The Hole Repair Algorithms**

The coverage HOLE Repair Algorithms are developed taking density of the network. Based on our assumptions, the nodes are deployed randomly and the network is fully connected. Due to random deployment, it could be possible that more number of nodes may overlap with each other in some parts of the network, whereas few number of nodes may overlap in other parts of the network. In such a deployment scenario, the node density of the network can be non-uniform as density of the nodes in large overlapping area must be higher than the density of the nodes in the sparse region. Besides, it could be possible that coverage hole is generating due to predictable or unpredictable death of the nodes. Hence, our goal is to repair the coverage holes by moving few sensors from the large overlapping area to the hole region so that uniform density of the nodes can be maintained in the whole network. In our algorithms, a mobile node is selected based on its highest coverage degree (Kh) value and the new location of the mobile node is calculated without compromising the coverage and connectivity of the network. In order to maintain an average uniform coverage degree of the network and to repair the coverage holes at the same time, following points are strictly considered.

- Existing connectivity of a mobile node with its one-hop neighbors is not disturbed.
- Existing coverage of a mobile node is not lost.
- Kh value of a node in the region, to which another node from the large overlapping region moves, does not change due to such mobility.

Fig.1. The definition of CT, HCT, NCT node, and COR as well as selection of mobile node for Kh ≥4.

The detail procedure of the proposed HOLE Repair Algorithm described as follows.

**A. Selection of Mobile Node**

After deployment of the nodes, each node checks its status as a CT, HCT or NCT node. Let coverage holes H1 and H2 be generated in the network due to death of the nodes and as per our assumption, location of the hole is known. Hence, any node can be a candidate node, which may be a CT, HCT or NCT based on its Kh value. It is to be noted here that Kh value of a CT or HCT node ≥ 4 and that of an NCT < 4.

Fig.2. Selection of mobile node for Kh<4.

**B. Determination of Mobile Region**

The region to which a mobile node should be moved so that its existing connectivity and coverage is not disturbed is called mobile region (R). In order not to disturb the existing coverage and connectivity, each candidate node that wants to move to repair the hole, selects its nearest one-hop candidate node as an assistant node.

**C. Calculation of New Location**

After selecting the mobile sensor and deciding the mobile node has to find out its new location of mobility. The new location can be calculated by using nonlinear programming, taking minimization of coverage overlapping as the objective function and conditions of mobility as the constraints. Let, (Xn, Yn) be the new position of the mobile node, which is to be calculated.
Then, mobility of the node to that new position must satisfy the following conditions.

i. Existing connectivity with at least one of the one-hop neighbors of the mobile node is not lost.

ii. Existing coverage of the mobile node is not lost.

iii. Kh-value of one-hop neighbors of the mobile node is not increased.

PROPOSED WORK

Through HORA routing, recover the network from hole problem but recovering steps utilize the more energy in terms of mobility, location services and traffic. Obviously, for HORA routing, requires proper operation of geographic routing, the location information of the destination contained in packets must be accurate enough so that nodes can route them to their destinations using the destination ID and location information. However, more accurate location information requires more bits, hence larger overhead and energy consumption.

Our enhancement work focus on analysis the reasons of hole occurrences and provide solution to reduce the reasons i.e concentrate on node placement and proper utilization of node activity thus reduce energy consumption and overhead. So we propose a zone based routing protocols for varying zone size called Coverage Hole Dynamic Interference Avoidance (CHDIA) protocol. We consider a network then divide it into zones. Each zone has a zone head which is used for routing. Zone head are used for routing data to the destination i.e. to the base station. Data are transmitted with the help of zone head. Other member nodes are not used for routing. They only transmit data to their zone head within the zone.

These zones are formed under voronoi structure with boundary edges and marking best interference point between zones thus placement of nodes as per interference points Then among the nodes in a zone elect the zone head which has best coverage or signal strength. This kind of network formation which reduces holes creation. Every zone has a zone head which is used for routing data to the destination. One node is considered as zone head and all other is simple node. These nodes sends data to their zone head and then zone head send the data to the base station

A. Coverage Hole Dynamic Interference Avoidance (CHDIA) protocol

- CHDIA uses a virtual-zone-based structure to implement scalable and efficient group membership management.

- A network wide zone-based bidirectional tree is constructed to achieve more efficient membership management and multi hop delivery.

- The position information is used to guide the zone structure building, multi hop tree construction, and multi hop packet forwarding, which efficiently reduces the overhead for route searching and tree structure maintenance.

- Making use of the position information to design a scalable virtual-zone-based scheme for efficient membership management, which allows a node to join and leave a group quickly.

- Our CHDIA routing framework avoids the coverage hole due to the use of estimated destination position with reference to a zone and applied for sending control and data packets between two entities so that transmissions are more robust in the dynamic environment Supporting efficient location search of the multi hop.

- Group members, by combining the location service with the membership management to avoid the need and overhead of using a separate location server

- An important concept zone depth, which is efficient in guiding the tree branch building and tree structure maintenance, especially in the presence of node mobility.

- Nodes self-organizing into zones, zone-based bidirectional-tree-based distribution paths can be built quickly for efficient multi hop packet forwarding.

III. CHDIA PROTOCOL IMPLEMENTATION
In zone based wireless sensor networks we divide the network into small zones. The proposed protocol CHDIA is virtual based zone structure. Making use of the position information, a scalable virtual zone-based scheme for efficient membership management is formed, which allows a node to join and leave a group quickly. The zones are configured by using the transmission range. The zone structure is formed virtually and the location of the nodes in zones is calculated based on the position of the node and the reference origin using boundary interference coordinates. So the construction of zone structure does not depend on the shape of the network region, and very simple to locate and maintain a zone. A zone head is selected in a zone only when the zone has zone members in it to avoid unnecessary management overhead. The zone member that first constructs the tree is designated as the zone head or the primary root of the tree. As per request, zone head forwards the packet to the base station.

IV. PERFORMANCE EVALUATION

First, we need to specify the necessary input parameters in the Config.in file as said above. For our simulation procedure, we have been specific about certain parameters as mentioned below to enable hassle free simulation

Terrain range – (1000,1000)
Number of nodes – 30 (This is a scalable simulator. Hence number of nodes can be increased at will.)

These parameters were adhered to for the whole process of experimentation with the new protocol.

The performance of the proposed algorithm is evaluated via glomosim simulator. Performance metrics are utilized in the simulations for performance comparison:

- **Packet arrival rate.** The ratio of the number of received data packets to the number of total data packets sent by the source.
- **Average end-to-end delay.** The average time elapsed for delivering a data packet within a successful transmission.
- **Communication overhead.** The average number of transmitted control bytes per second, including both the data packet header and the control packets.
- **Energy consumption.** The energy consumption for the entire network, including transmission energy consumption for both the data and control packets.

V. CONCLUSION

In this work, we propose Coverage Hole Dynamic Interference Avoidance (CHDIA) protocol to avoid the major reasons for hole creating in networks by using zone routing and also to reduce the control overhead and energy consumption, thus increases the node lifetime. The performance of the proposed algorithm is evaluated via glomosim simulator.

REFERENCES

1. Prasan Kumar Sahoo, Wei-Chang Liao,”HORA:A Distributed Coverage Hole Repair Algorithm for Wireless Sensor Networks,”Member IEEE.
5. Mihaela Cardei, DING-ZHUDU,”Improving Wireless Sensor Network Lifetime Through Power Aware Organization,” Florida Atlantic University, USA and University of Minesta, USA.