

April 2014

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RAJAT BHARDWAJ

Department: Computer Science And Technology , Lovely Professional University, Phagwara, Punjab, India,
rajatbhardwaj.x@gmail.com

HITESH SHARMA

Department: Computer Science And Technology , Lovely Professional University, Phagwara, Punjab, India,
hitesh.15778@lpu.co.in

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Recommended Citation

BHARDWAJ, RAJAT and SHARMA, HITESH (2014) "HOLES IN WIRELESS SENSOR NETWORKS,"
International Journal of Computer Science and Informatics: Vol. 3 : Iss. 4 , Article 8.
Available at: <https://www.interscience.in/ijcsi/vol3/iss4/8>

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HOLES IN WIRELESS SENSOR NETWORKS

RAJAT BHARDWAJ & HITESH SHARMA

Department: Computer Science And Technology , Lovely Professional University, Phagwara, Punjab, India
Email:rajatbhardwaj.x@gmail.com, hitesh.15778@lpu.co.in

Abstract- Nowadays the science and technology has enriched man's life. In today's world everything depends upon the technology. One of such technology is sensor technology. Now in every field sensor technology is used. The Wireless Sensor Network has reduced the work of groups of people to one individual person. Wireless sensor network makes the work easy to monitor in the hazardous environments like wild forests, war fields, etc. During that, many of the problems occur. One of such problems is the Hole Formation in Wireless Sensor Networks. The holes are formed in the Wireless Sensor Networks when a group of sensor nodes are enabled to sense the area around it. Here we will discuss what Network Holes are, the different types of holes in the networks and the reasons for hole formation.

Keywords: *Wireless Sensor Networks, Holes.*

I. INTRODUCTION

Wireless Sensor Network is formed from the tiny sensors. When the sensors are grouped together they form a network called sensor network. The sensors are arranged according to the topologies to form appropriate network. Wireless sensor network communicate with the radio frequency waves. The sensors have to perform two different tasks in the network. The first task is that they have to sense the data from the corresponding neighbors and send it to the other neighbor. The second one is communicate with the neighboring nodes. The communication between the different sensor nodes is done with the help of routing. Today Wireless sensor network is used in every field of applications like battle field, traffic control, in colleges, entry gates, etc.

The wireless sensor network has reduced the installation cost. The sensor network can be installed in any region such as mountains, forests, battle fields etc. If the area is such that the person cannot approach the area then the sensor networks are installed through planes. A sensor network helps to detect the enemy in the battle field, fire in the forests, measurement of the water level of the dams and many more. In today's daily life the sensor networks are used in the electronic gates to detect the metals, in wash rooms-on water taps etc. In this paper, main spotlight is on the hole detection in the sensor networks and different types of hole and how the holes are formed in the wireless sensor networks.

There are different algorithms proposed by the different researchers for finding the hole in the network. There are different types of hole in the network-coverage hole, routing hole, jamming hole, and black/sink hole.

II. NETWORK HOLE

Network hole means when the group of nodes stops sensing the data and communicating with the other nodes. Now let us describe an example of network hole. In figure (a) Suppose you have to build a network in the dense forest. During your installation, some of the nodes fall in the water and some are damaged by the fire then it results in the network hole formation. Holes are also formed when the sensor nodes are damaged by the environmental disasters.

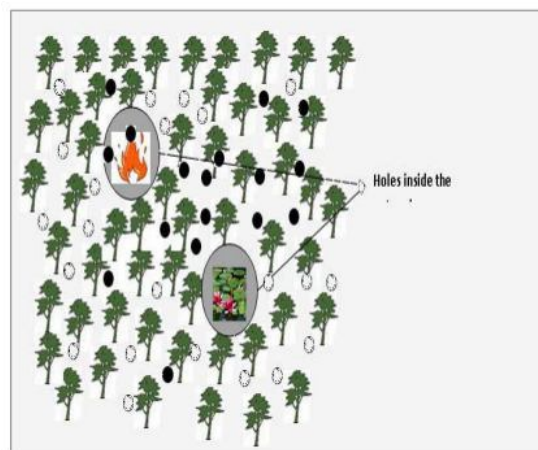


Figure (a) [2]

III. TYPE OF HOLES

There are different types of holes. [1]

1. Coverage holes
2. Routing holes
3. Jamming holes
4. Black holes

Coverage holes: - The coverage holes are formed when the design of the network fails. They are formed when the sensor nodes are arranged unsystematically in the area. Coveragehole can

appear into existence due to poor installment, or nodes whose power are weak. So they are formed by the power depletion, topology failure and by presence of obstacles. Routing holes: - The routing holes are formed when one of the nodes is damaged and it disables that route. Then we have to reconstruct the new route to outcome from the routing holes. It s caused by the power depletion and environmental disasters. Jamming holes: - The jamming holes are formed when any high frequency signal comes in contact with the wireless network and network breaks the signal and connects with the new signal. They are also formed when the jammers are installed in the nearby areas. They are caused by the presence of obstacles. Black holes: - The black holes are formed when the data sent by one node is not received by the other node and the sender is not aware that the data is received or not by the receiver. The data is discarded in between the traffic only.

IV. REASONS FOR HOLE FORMATION

There are many reasons for hole formation in the wireless sensor networks. Holes are formed when the sensor nodes do not participate in the working of the network. Hole is formed when the node is dead or it is destroyed by any environmental disaster. Some of the common reasons for the hole formation are given below:

- a) Power depletion
- b) Environmental disasters
- c) Topology failure
- d) Presence of obstacles
- e) New node set up

A) Power depletion: - We know that the power is the main source of the WSN. Power is used for sensing the data and for communicating with the nodes. It causes formation of holes in network. To avoid this, we have to use proper power battery and good sensor nodes which consume less power. The types of holes that are formed by power depletion are coverage holes and routing holes.

B) Environmental disasters: - Environmental disasters play a vital role in formation of the holes in network. If a WSN is installed in the dense forest from the help of plane then the storm, volcano, earthquake and many other disasters cause the formation of holes. The routing hole is formed from it.

C) Topology failure: - Topology plays another important role while designing the network. It should be chosen properly for designing of the network. It basically leads to the formation of the coverage hole. So the topology

failure also leads to the formation of holes in the network.

D) Presence of obstacles: - It is another reason for the formation of holes. The presence of pond in the forest while installing the network and the nodes are not sensitive to operate in water. Presence of fire in the forests and animals like apes, monkeys etc. or by the presence of the jammers also. The jamming holes are formed from it.

E) New node set up: - If one of the node is dead or stops working due to some reason then a new node is to be installed in place of that node. For that a new route is to be defined. This results in the formation of the hole in network. The routing hole is caused by it.

V. FUTURE WORK

The coverage hole detection in wireless sensor networks. The design of algorithm for efficient method to find the coverage holes in wireless sensor networks.

VI. CONCLUSION

Today the wireless sensor network technology is used in every area. This has reduced the work load of the people. In the upcoming years this will be used in vast areas. It is very easy to install and maintain and at a low cost. Now for detection of the holes in the networks the following algorithm has been proposed [4].

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