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A Literature Review in Wireless Sensor Hole Detection Along with Node Scheduling Algorithm

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Abstract— A sensor network consist of low battery power, low cost, limited storage, tiny sensing devices. The one of the significant challenge in wireless sensor network is how well the network is monitored while maximizing network's lifetime. Since sensing and transmitting data consume sensors' energy, so to preserve energy an optimal sensor node scheduling scheme is required where only an optimal number of sensors are activate and other node are eligible to shut down to save their energy which can be used to prolong lifetime of sensor network. In this paper we introduced a node scheduling scheme which is based on optimal Coverage Preserving Scheme (OCoPS) that first check the redundant sensor and then decide to turn itself off. Further, in wireless sensor network there may exist some regions where sensors are not able to sense data or communicate which are called hole regions. Since hole region may jeopardize sensing, communicating or connectivity of sensor network, therefore identification of hole regions is also prime concern. In this paper, we first detect the hole regions in sensor network and then deploying sensors at appropriate location for covering that region. Our hole detection approach is based on *Boundary Critical Points*. The simulation results demonstrate that the proposed algorithm can lead to a high coverage ratio while keeping long network's life.

Keywords- *WirelessSensor, Scheduling Sensor, Hole Detection, Wireless Network*

I. INTRODUCTION

A Wireless Sensor Network (WSN) is a group of spatially distributed, autonomous, specialized transducers called sensors. These networks are used to monitor physical or environmental conditions such as temperature, humidity, wind direction and speed, illumination intensity, sound, pressure etc. Sensors are equipped with a transducer, microcomputer, transceiver and power source our proposed scheme helps to find an approach for mainly two question. [1]. First question is how to detect hole regions? Second one is what node scheduling scheme have been proposes to achieve high coverage ratio while preserving energy efficiency for prolonging network lifetime. To ease of understanding we are also using some assumptions. [2].

II. USE OF WIRELESS SENSORS

A. Area Monitoring

Area monitoring is a common application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. A military example is the use of sensors detect enemy intrusion

*B. H*ealth care monitoring

The medical applications can be of two types: wearable and implanted. Wearable devices are used on the body surface of a human or just at close proximity of the user. The implantable medical devices are those that are inserted inside human body. Body-area networks can collect information about an individual's health, fitness, and energy expenditure.

C. Forest Fire Detection

A network of Sensor Nodes can be installed in a forest to detect when a fire has started. The nodes can be equipped with sensors to measure temperature, humidity and gases which are produced by fire in the trees or vegetation. The early detection is crucial for a successful action of the firefighters; thanks to Wireless Sensor Networks, the fire brigade will be able to know when a fire is started and how it is spreading.

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III. TECHNIQUES

Hole and boundary detection: The different techniques required in the red discovery alongside its limit is considered and the limitations of every strategy is moreover broke down.

Hole Region: Hole region is define by the area that is not covered by any sensor node. Coverage holes can be classified into open hole and close hole. Open hole is enclosed by boundary lines and boundary of monitoring area whereas close hole is enclosed by boundary line that form a close loop.

Boundary Critical Points (BCP: The intersection points of sensor s_i with its neighbors that cannot be covered by other k sensors is known as Boundary Critical Points where k is the coverage degree.

Equations

- Sensors are randomly deployed in network region.
- All sensors are uniform with sensing range R_S
- Network uses disk coverage model.
- Every sensor has its unique ID and no two sensors are located at same position.
- We use static sensor network and every sensor know it's coordinate.
- A point p is covered by sensor if Euclidean distance between p and is within the sensing range of s. i.e.

$$d(p,\ i) < Rs \quad [4]$$

IV. PROPOSED ALGORITHM

In this section we describe hole region detection algorithm which is based on boundary critical points and then we set up sensor at appropriate location. This work leads to high coverage ratio in sensing network. After then, to preserve energy of sensors and to extend network's lifetime we propose a node scheduling method in which we first check sensors' redundancy and then use an activity scheduling approach and it is based on coverage preserving node scheduling algorithm. Given a set of sensors and a monitoring target area A. variable K_1 indicates number of neighbor nodes of sensor s_1 and K_2 indicates number of neighbors of sensor s_2.

A. Figures

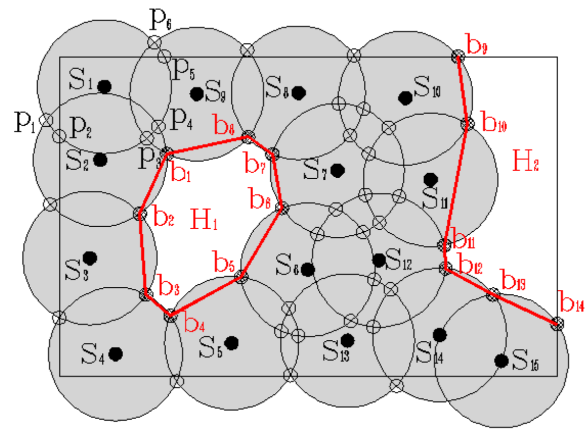

Figure 1. Example of Intersection Points, (Boundary Critical Point and Coverage Hole)

V. RELATED WORK

B. Kun, T. Kun, G. Naijie, L.D.Wan and L. Xiaohu [1] introduced a conveyed plan taking into account correspondence topology diagram. In this plan the issue of identifying topological openings in sensor systems with no confinement data in any node. To distinguish the gaps in the system, every node just needs to trade data with its 1-jump and 2-bounce neighbors. In this the node chooses in the event that it is on the limit of a gap. This is finished by contrasting its degree and the normal level of its 2-bounce neighbor.

Limitation: The fundamental Limitation of this [1] technique is that not every one of the nodes can recognize its limit.

Funke [2] proposed a heuristic based method for distinguishing openings in light of correspondence topology chart. The opening identification calculation depends on the topology of the correspondence diagram, that is, the main data accessible is which nodes can speak with each other.

Limitation: This methodology is not limited as it requires the calculation of separation fields over the entire system.

Funke and Klein [3] proposed direct time calculation for opening identification. This strategy required correspondence diagram that takes after the unit circle diagram model. The creators had demonstrated that by utilizing an exceptionally straightforward direct time calculation that finds the limit of the openings in the sensor system. [3] Also expresses that there is sufficient geometry data covered up in the availability structure to recognize topological components. At the point when contrasting and the past technique, the calculation has most pessimistic scenario.

Limitation: This strategy works for just high node thickness. In the event that the thickness of the Node in the system diminishes the calculation breaks.

Zhiping Kang [4] at Detection and Recovery of Coverage Holes in Wireless Sensor Networks explained an algorithm based on boundary critical points, and can be run on a single node with verifying boundary critical points from neighbors. The hole patching algorithm is implemented with the concept of perpendicular bisector and our detection algorithm. The patching sensor nodes are deployed on hole boundary bisectors. Simulation demonstrates that our algorithm can detect and recover coverage hole, and guarantee full coverage in hostile environments with an effective manner.

Limitation: It doesn't have a scheduling parameter on the basis of which power consumption can be reduced.

Fekete et al.[5] portrayed the co-ordinate free system to recognize the limit of the opening in WSNs. The presumption made here is that the nodes are consistently circulated in non-opening zones. The techniques utilized as a part of this strategy depend on various common presumptions that are available in thickly appropriated sets of nodes, and make utilization of a mix of stochastic, topology, and geometry.

Limitation: The Limitation of this system [5] is that it requires a high node thickness.

Tooth et al. introduced bound opening calculation [6] utilizing right-hand principle to recognize hubs on the limit of geometric gaps.

Limitation: The Limitation of this strategy is that it has high message unpredictability.

Shirsat and Bhargava[7] proposed this calculation expecting the relative geographic data of 2-bounce neighbors. The gap limit discovery calculation takes best approach in recognition process.

Limitation: The defect in this paper [6] is that the calculation requires synchronization among hubs.

Wang et al. proposed limit calculation to discover the data of the connectives [12]. For the opening identification handle the creator had utilized uncommon structure of the most brief way tree.

Limitation: The creator did not make an investigation on its many-sided quality. This calculation depends on tedious system flooding.

A. Kroller, P.Fekete, D. Pfisterer, and S.Fischer utilized deterministic technique for limit acknowledgment furthermore utilized topology extraction procedure for bigger system of sensors. The creators had managed the self-association considering its topology furthermore geometric pressing contentions to discover the Boundary hubs furthermore the structure of the sensor system.

Limitations: Though, creators [13] had made suspicions, they have considered complex structures like bloom structure which is the limitation of this paper.

G. Wang, G. Cao and T.F.L. La Porta depicted three unique sorts of arrangement conventions [7]. These conventions use voronoi graphs to migrate the hubs without a moment's delay the openings are being recognized.

Limitation: The principle limitation of this strategy is that, this procedure can't be utilized for vast gaps. Furthermore this technique requires worldwide calculation.

C.Y. Chang and co-creators [8] proposed three calculations for keeping up transitory scope in WSNs. Creators proposed methodologies for opening development for the expansive gap. This is done in a manner that either the force utilization of the sensor or the vitality utilization of the hub is adjusted or lessened separately.

Limitation: The limitation of this proposed calculation [8] is that there is a prerequisite of synchronization among the hubs in the system.

C.Y. Lin and co creators proposed following system and robot repair calculation. By utilizing this procedure [9] the scope issue is fathomed utilizing a moving robot. The robot"s footmark is deserted on the sensors amid the following components. This aides the sensors to discover better courses for sending repairing solicitations to the robot. The mending calculation builds up an effective way for correspondence.

Limitation: The principle Limitation of this procedure [9] is that the creators make a presumption that the WSN has been conveyed utilizing robot arrangement systems.

A. Nadeem, S.K. Salil and J.Sanjay proposed a businesslike methodology [10] to range scope in crossover remote sensor systems. This paper proposed MAPC-Mobile-Assisted Probabilistic scope. The MAPC kept up the scope by moving the sensor hubs to vital positions in the revealed range.

Limitation: Using this procedure [10] just the sink can include in the activating of the opening identification and recuperating and the source can't include in activating procedure.

X. Li et al. proposed a randomized transporter based sensor migration [11] where the robots grabs inactive sensors and replaces them in the openings. This is done in an irregular way and consequently called as randomized migration.

Limitation: This migration strategy [11] expect that the limit of the remote sensor system is known in before which is the primary Limitation of this paper.

Z. Yong et al. proposed a virtual power calculation (VFA) [14] as a sensor arrangement system to enhance the scope after an beginning arbitrary arrangement of sensors. The VFA endeavors to enhance the scope zone of the sensors.

Limitation: The inconvenience of this proposed calculation [14] is that it is an incorporated methodology.

S.Yangy et al. proposed check based development helped sensor sending strategy for remote sensor systems [15]. In this paper the district of interest is separated into numerous little framework cells. What's more, the quantity of hubs in the matrix cell is the heap of the lattice cell. Limitation: This method produces a huge message overhead in a denser system since the quantity of rounds of output is being expanded. Furthermore, at the last phase of bunching procedure, if two adjacent groups are unfilled the checking procedure will be wrong.

Limitation: the real Limitation of the output based technique [15].

X. Li et al. proposed two entirely restricted arrangement calculations, Greedy Advance (GA), and Greedy-Rotation-Greedy (GRG) for sensor arrangement issue [16]. These two calculations drive sensors to move along the TT (triangle tessellation) chart to encompass POI (purpose of interest).

Limitation: This paper [16] considers just point scope issue and it doesn't consider the area of interest which is a detriment.

G. Wang, G. Cao, P. Berman and T. La Porta had proposed two offering convention for sensor arrangement [17] in remote sensor system. Here, static sensors distinguish scope openings locally by utilizing Voronoi charts and offer versatile sensors to move. Furthermore, these portable sensors acknowledge most noteworthy offers and mend the greater openings.

Limitation: This technique requires worldwide calculation which implies that every one of the hubs in the system needs to run the calculation [17].

VI. CONCLUSION AND FUTURE WORK

In WSAN, sometimes nodes exhibit failure due to several factors [78]: due to calibration error, malfunctioning hardware, hostile environment, low battery and link failure. If the node is a critical node and the failure permanent in nature, then critical node failure contributes towards network partitioning. In time critical applications like military applications, precision agriculture, medical application etc. Partition in the network, disrupts the communication leading to data loss, which may lead to a disaster, to an extent of losing a human life. Therefore network connectivity has challenged many researchers to devote novel methods to restore the connectivity, coverage and lifetime with better QoS. This paper presents a review on various methods contributed by several authors and discusses the merits and demerits. The methods are classified as proactive, reactive and hybrid approaches. The paper concludes that though many researchers have contributed towards connectivity issue, not many of them have taken care to retain the performance objectives like coverage, lifetime, and path length.

REFERENCES

[1] B. Kun, T. Kun, G. Naijie, L.D. Wan, and L. Xiaohu, 2006, “Topological Hole Detection in Sensor Networks with Cooperative Neighbors,” Proc. Int‟l Conf. Systems and Networks Comm. (ICSN ‟06), p. 31, 20.

[2] F. Stefan, 2005, “Topological Hole Detection in Wireless Sensor Networks and its Applications,” Proc. Joint Workshop on Foundations of Mobile Computing, p. 44-53.

[3] F. Stefan and K. Christian, 2006, “Hole Detection or: How Much Geometry Hides In Connectivity?” Proc. 22nd Ann. Symp. Computational Geometry (SCG ‟06), pp. 377-385.

[4] S.P. Fekete, A. Kr€oller, D. Pfisterer, S. Fischer, and C. Buschmann,2004,“Neighborhood-BasedTopology Recognition in Sensor Networks,” Proc. Int‟l Workshop on Algorithmic Aspects of Wireless Sensor Networks, pp. 123-136.

[5] Q. Fang, J. Gao, and L.J. Guibas, 2006, “Locating and Bypassing Holes in Sensor Networks,” Mobile Networks and Applications, vol. 11, no. 2, pp. 187-200.International Journal of Engineering Research and General Science Volume 3, Issue 1, January-February, 2015 ISSN 2091-2730 1094 www.ijergs.org

[6] A. Shirsat and B. Bhargava, 2011, “Local Geometric Algorithm for Hole Boundary Detection in Sensor Networks,” Security and Comm. Networks, vol. 4, no. 9, pp. 1003-1012.

[7] G. Wang, G. Cao, and T.F.L. La Porta, June 2006, “Movement-Assisted Sensor Deployment,” IEEE Trans. Mobile Computing, vol. 5, no. 6, pp. 640-652.

[8] C.Y. Chang, L.L. Hung, S.W. Chang, and Y.C. Chen, 2012, “Decentralized and Energy-Balanced Algorithms for Maintaining Temporal Full-Coverage in Mobile WSNs,” J. Wireless Comm. and Mobile Computing, vol. 12, no. 5, pp. 445-462.

[9] C.Y. Chang, C.Y. Lin, G.J. Yu, and C.H. Kuo, 2013, “An energy-Efficient Hole-Healing Mechanism for Wireless Sensor Networks with Obstacles,” Wireless Comm. and Mobile Computing, vol. 13, no. 4, pp. 377-392.

[10] A. Nadeem, S.K. Salil, and J. Sanjay, 2011, "A Pragmatic Approach to Area Coverage in Hybrid Wireless Sensor Networks," Wireless Comm. and Mobile Computing, vol. 11, no. 1, pp. 23-45.
[11] X. Li, G. Fletcher, A. Nayak, and I. Stojmenovic, 2012, "Randomized Carrier-Based Sensor Relocation in Wireless Sensor and Robot Networks," Proc. Ad Hoc Networks, DOI:10.1016/j.adhoc .06.007.
[12] Y. Wang, J. Gao, and S.B. Mitchell, 2006, "Boundary Recognition in Sensor Networks by Topological Methods," Mobi Com „06, pp. 122-133.
[13] A. Kroller, P. Fekete, D. Pfisterer, and S. Fischer, 2006, "Deterministic Boundary Recognition and Topology Extraction for Large Sensor Networks," Proc. 17th Ann. ACM-SIAM Symp. Discrete Algorithm (SODA „06), pp. 1000-1009.
[14] Z. Yong and W. Li, June 2009, "A Sensor Deployment Algorithm for Mobile Wireless Sensor Networks," Proc. 21st Ann. Int"l Conf. Chinese Control and Decision Conf. (CCDC "09), pp. 4642-4647, 17-19.
[15] S. Yangy, M. Liz, and J. Wu, Aug 2007, "Scan-Based Movement-Assisted Sensor Deployment Methods in Wireless Sensor Networks," IEEE Trans. Parallel and Distributed Systems, vol. 18, no. 8, pp. 1108-1121.
[16] X. Li, H. Frey, N. Santoro, and I. Stojmenovic, Nov 2011, "Strictly Localized Sensor Self-Deployment for Optimal Focused Coverage," IEEE Trans. Mobile Computing, vol. 10, no. 11, pp. 1520-1533.
[17] G. Wang, G. Cao, P. Berman, and T. La Porta, May 2007, "Bidding Protocols for Deploying Mobile Sensors," IEEE Trans. Mobile Computing, vol. 6, no. 5, pp. 563-576.

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