A Review on Coverage Recovery Mechanism Using Dynamic Sink SSOA with MOMC Rule

Ramandeep Kaur
Department of Electronics and Communication Engineering
CEC Landran, Mohali, Punjab, India

Preeti Bansal
Department of Electronics and Communication Engineering
CEC Landran, Mohali, Punjab, India

Abstract - Various sensors are deployed in a geographical area randomly without considering the location factor. After deployment, sensors are to be self organized to form a network of their own. How well the network is formed determines the life of the whole network, energy and the quality of data transmission. The SSOA (Sensor Self-Organizing Algorithm) tries to ensure that the maximum of network stays under the coverage range of the nodes. In this paper, discussion is on ISSOA (Improved Sensor Self-Organizing Algorithm) using MOMC (Minimum Overlapping Maximum Coverage) rule. Our ISSOA algorithm is activated to perform local repair by repositioning sensors around the sensing void (uncovered area). This capability of local recovery is advantageous in terms of saving the communication and moving energies. Performance of the proposed sensor deployment strategies is evaluated in terms of surveillance coverage, monitoring density, network self-healing competence, and moving energy consumption. This algorithm not only considers all sensors but also groups them to improve upon its energy and quality of service parameters.

Keywords – Self-Organization, Wireless Sensor Network, Energy

I. INTRODUCTION

A sensor network consists of a set of nodes powered by batteries and which are combined into a network to perform sensing tasks in a given environment. It may contain one or more sink nodes (base stations) to collect sensed data and relay it to a central processing and storage system. A sensor node is typically powered by a battery and can be divided into three main functional units: a sensing unit, a communication unit and a computing unit. A large number of sensor nodes can be deployed quickly in a sensing field where each node independently monitors its immediate environment (sensing range) while collaboratively participating with other nodes in the network to achieve complex information related tasks such as gathering, processing and distribution of information. Sensor networks have potential to use in many military and civilian applications including habitat monitoring environmental monitoring, health systems, target tracking and localization. However, the unique characteristics of sensor networks pose numerous challenges that have to be overcome to enable their efficient and reliable use. In particular, sensor networks are highly energy controlled because of their reliance on battery power and the difficulty and cost of battery replacement. These networks are generally composed of a large number of inexpensive and potentially unreliable individual nodes. These characteristics render the efficient collaboration between individual nodes essential to the accomplishment of the overall network task and justify the development of new algorithms to provide services such as information processing, messages routing, fault-tolerance, localization, naming and addressing. Advance of micro-electromechanical system sensing technology, and wireless communication have significantly encouraged the development of WSNs in the past decade. A WSN is widely used for habitat and environmental observation, medical application (with the purpose of improving quality of health care), agricultural assistance, and as solutions to military problems [6][7]. Several experimental tests are also implemented to investigate various aspects of WSN-related performance issues. Imagine an indoor sensing environment, as depicted in Fig. 1.To furnish the environment with monitoring capability, one possibility could be embedding a secret compartment under the roof, and deploying smart sensors inside the double-deck structure on the ceiling.

For a successful observation, providing sufficient sensing coverage is essential. Manual placement of static sensors involves effort (reaching the ceiling to perform the planned deployment) and lacks network self-healing competence (when faulty sensors occur). We consider smart sensors with mobility capability to accomplish self-deployment after an initial random placement of sensors. Furthermore, since sensing devices are prone to errors due to energy depletions or unexpected failures, faulty sensors may occur over time, leaving monitoring voids (uncovered sensing holes) [11]. With the movement ability, instead of replacing faulty sensors with new ones, those smart sensors reposition themselves to restore the sensing coverage, as illustrated in Fig. 1. According to the above descriptions, two deployment- related issues need to be addressed. First, a coverage-aware sensor deployment scheme should be developed to ensure sufficient sensing coverage. Second, in the face of sensing node failures, a sensor self-organizing mechanism needs to be devised to efficiently recover the sensing void and restore the required sensing coverage. Since local repairs generally consume less moving energy and communication overhead than a global redeployment does the sensor self-organizing mechanism should limit the network recovery/repairing locally to effectively reduce unnecessary moving energy consumption. In this work, we intend to study the energy-conserving sensor communication behaviour (though we try to reduce the moving energy by keeping sensors from moving far away when performing self-deployment).

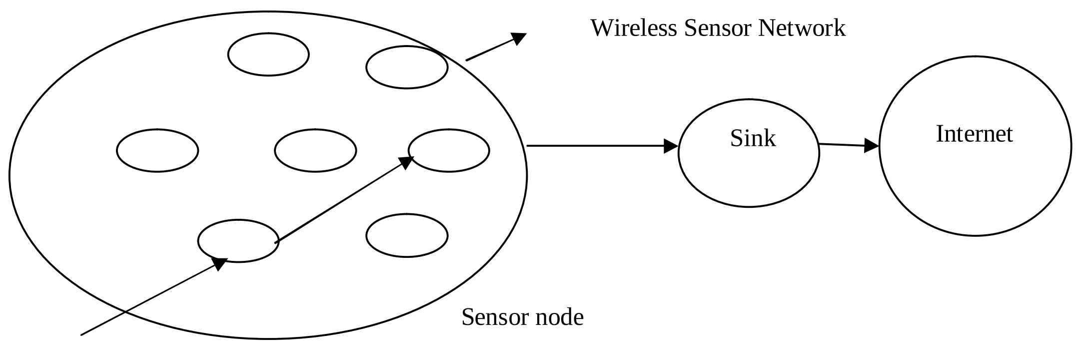

Figure 1. Wireless Sensor Network

II. LITERATURE REVIEW

Zhang et.al in [1] this paper has proposed a new energy-efficient local metric, termed as efficient advancement metric (EAM), for channel aware geographic-informed forwarding (CAGIF) algorithm, which studies the optimal selection of the relay nodes by taking into account the underlying channel conditions. The proposed metric considers not only the forward distance but also the packet successful probability under a certain channel condition, rather than purely maximizing the forward distance, to choose the most energy-efficient relay node in the geographic- informed routing protocol in a CDMA-based wireless sensor network. Rostami et.al in [2] has proposed a wireless sensor network, energy and lifetime are the most important parameters. Common sensors are not able to connect directly with the central station due to their limited ranges in asymmetrical wireless networks; therefore, they utilize super nodes. A super node has more energy, processing power and a wider range of communication. It does connectivity and transmits data to the base station, nevertheless, it is not possible for all simple nodes to connect to the super nodes directly and they transmit data through other nodes. Xu et.al in [3] this paper is based on enhance certainty information purpose of sensor node, a star deployment strategy scheme is proposed to improve connectivity probability for wireless sensor networks, they define two type deployment points, that are primary and minor deployment points, which are arranged different quantity sensor node. Vincze et.al in[4] this paper give a mathematical model that determines the locations of the sinks minimizing the sensors' average distance from the nearest sink. First they present an iterative algorithm called global that is able to find the sink locations given by the mathematical model. However, it uses global information about the network that is impractical in wide area sensor networks, thus they propose a novel iterative algorithm called lhop that carries out the sink deployment based only on the location information of the neighbouring nodes while the location of the distant nodes is being approximated. Mahfoudh et.al in [5] in this paper, they show how to extend the standardized OLSR routing protocol, in order to make it energy efficient. To take into account residual node energy, three new selection algorithms of multipoint relays, based on the minimum residual energy are evaluated, the best one is chosen. This OLSR extension selects the path minimizing the energy consumed in the end-to-end transmission of a flow packet and avoids nodes with low residual energy. They compare this extension with a two-path source routing strategy (with different links or different nodes). Li et.al in [6] this paper proposed a new approach termed as DSA, to minimize the energy consumption of maximum energy dissipation relay node, which can greatly extend the lifetime of the Two-Tiered Sensor Network. The advantage of this novel algorithm in terms of complexity and its capability in extending the lifetime of TTSN has been analyzed in detail. Dasgupta et.al in [7] this paper describes a network using congestion avoidance topology or CATopology where every wireless sensor is deterministically deployed throughout the sensing area. Muni et.al in [8] he proposed easy use of Wireless Sensor Networks has attracted applications from various fields. Day to day rise in wireless sensor network applications introduce new challenges to researchers. Yanfei et.al in [9] this paper presents an improved design of ZigBee Wireless Sensor Network. In the network the coordinator only deal with the task on the ZigBee network, the rest tasks will be processed by another processor. Modares et.al in [10] he proposed that, WSN are generally set up for gathering records from insecure environment. Nearly all security protocols for WSN believe that the opponent can achieve entirely control over a sensor node by way of direct physical access. WSN are composed of large number of tiny sensor nodes, running separately, and in various cases, with none access to renewable energy resources.

III. FINDINGS OF THE LITERATURE VIEW

The literature survey in the previous chapter infers that the recent research in the field of wireless sensor network (WSN) can be defined as a network of devices, denoted as nodes, which can sense the environment and communicate the information gathered from the monitored field (e.g., an area or volume) through wireless links. The data is forwarded, possibly via multiple hops, to a sink (sometimes denoted as controller or monitor) that can use it locally or is connected to other networks (e.g., the Internet) through a gateway. The nodes can be stationary or moving. They can be aware of their location or not. They can be homogeneous or heterogeneous [1] [3].

IV. METHODOLOGY

First of all sensor nodes are randomly deployed, then calculate the distance b/w different nodes .After finding the node with minimum distance make the cluster based on minimum distance. Then calculate the power if given solution is feasible then further calculate the SNIR and throughput based on power, if solution is not feasible then again calculate the minimum distance and next power. This process will take place until the minimum power is not gained, so that energy is increased as compared to previous **SSOA**.

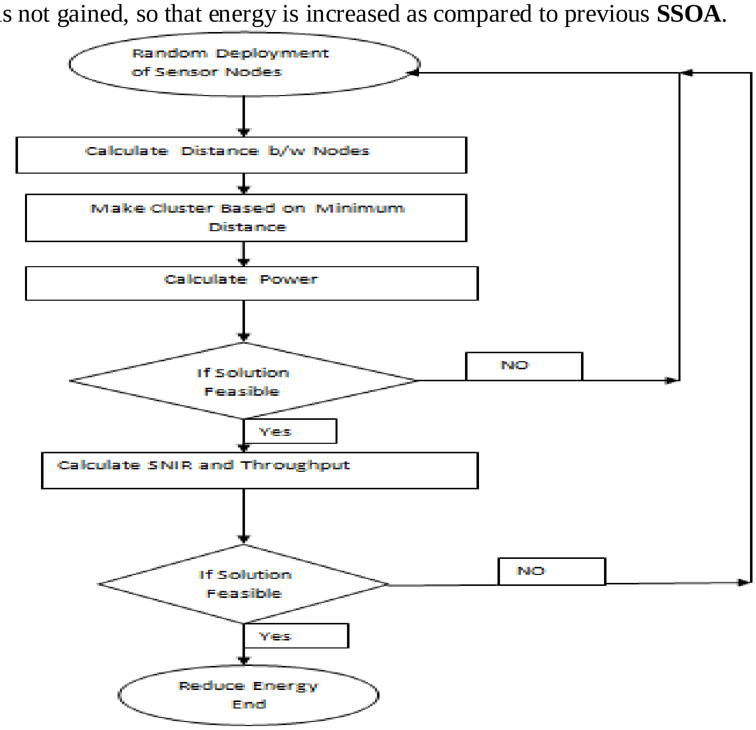

Figure.2. Algorithm for ISSOA

A. Node deployment-

Node deployment is a fundamental issue to be solved in Wireless Sensor Networks (WSNs).A proper node deployment scheme can reduce the complexity of problems in WSNs as, for example, routing, data fusion, communication ,etc. Furthermore, it can extend the lifetime of WSNs by minimizing energy consumption. In this paper, we use Random Node deployment.

B. Distance-

The distance threshold effectively defines the desired overlapping degree of two sensors. For homogeneous sensors, the distance threshold can be made as a global constant. However, for heterogeneous sensors, the value of distance threshold should be designed on per node-pair basis to obtain a similar degree of overlapping under different sensing distances. Specifically, for two sensors with small sensing ranges, the distance threshold should be made smaller than that of two sensors with large sensing distances, in order to keep reasonably similar overlapping level for the two sensor pairs (couples).

C. *Cluster*

Naturally, grouping sensor nodes into clusters has been widely adopted by the research community to satisfy the scalability objective and generally achieve high energy efficiency and prolong network lifetime in large-scale WSN environments. The corresponding hierarchical routing and data gathering protocols involve cluster-based organization of the sensor nodes in order that data fusion and aggregation are possible, thus leading to significant energy savings. In the hierarchical network structure each cluster has a leader, which is also called the cluster head (CH) and usually performs the special tasks referred above (fusion and aggregation), and several common sensor nodes (SN) as members. The cluster formation process eventually leads to a two-level hierarchy where the CH nodes form the higher level and the cluster-member nodes form the lower level. The sensor nodes periodically transmit their data to the corresponding CH nodes. The CH nodes aggregate the data (thus decreasing the total number of relayed packets) and transmit them to the base station (BS) either directly or through the intermediate communication with other CH nodes. However, because the CH nodes send all the time data to higher distances than the common (member) nodes, they naturally spend energy at higher rates. A common solution in order to balance the energy consumption among all the network nodes is to periodically re-elect new CHs (thus rotating the CH role among all the nodes over time) in each cluster. A typical example of the implied hierarchical data communication within a clustered network (assuming single hop intracluster communication and multi-hop intercluster communication) is further illustrated in Figure 3.

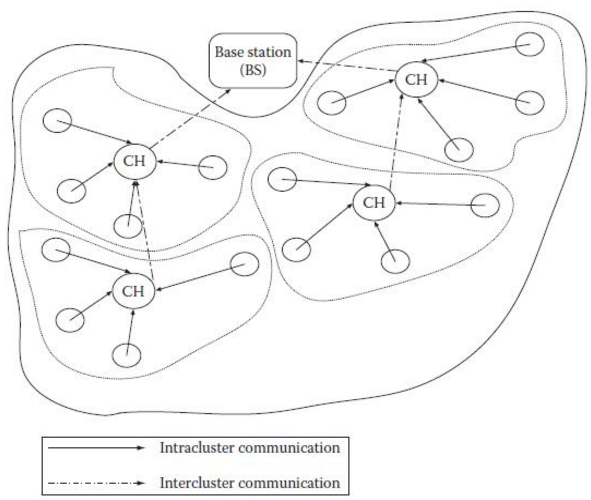

Figure.3. Data communication in clustered network

D. Power-

Energy consumption is the core issue in wireless sensor networks (WSN). To generate a node energy model that can accurately reveal the energy consumption of sensor nodes is an extremely important part of protocol development, system design and performance evaluation in WSNs. The proposed model can be used to analyze the WSNs energy consumption, to evaluate communication protocols, to de-ploy nodes and then to construct WSN applications.

E. SNIR and Throughput-

In information theory and telecommunication engineering, the signal-to-interference-plus-noise ratio (SINR) (also known as the signal-to-noise-plus-interference ratio (SNIR)) is a quantity used to give theoretical upper bounds on channel capacity (or the rate of information transfer) in wireless communication systems such as networks. Analogous to the SNR used often in wired communications systems, the SINR is defined as the power of a certain signal of interest divided by the sum of the interference power (from all the other interfering signals) and the power of some background noise. If the power of noise term is zero, then the SINR reduces to the signal to interference ratio (SIR).

V. CONCLUSION

This article has presented an Improved Sensor Self-Organizing Algorithm in WSNs (wireless sensor networks). This algorithm, termed as **ISSOA**, manages the network under the assumption that each node only has the information about its own position. The improved self-organizing way of this algorithm contributes to favourable influence performance in four respects: locating accuracy, robustness, scalability and less energy of system resources, over the global selection methods. It Require less energy and minimum throughput in comparison to **SSOA** (Sensor Self-Organizing Algorithm) improving the SSOA algorithm for better deployment considering the minimum overlapping and maximum coverage rule and dynamic sink. We have described a protocol suite that provides self-organization for a randomly deployed sensor network, with the aim of establishing energy saving and also demonstrated how the algorithm works.

REFERENCE

[1] Zhang, Lili, and Boon-Hee Soong. "A new energy-efficient local metric for channel-aware geographic-informed forwarding (CAGIF) in wireless sensor networks." Communications, 2007. ICC'07. IEEE International Conference on.

[2] Rostami, Ali Shokouhi, et al. "Novel Algorithm of Energy-Aware in Asymmetric Wireless Sensor Networks Routing for In-Point Coverage." Computational Intelligence and Communication Networks (CICN), 2010 International Conference on. IEEE, 2010.

[3] Xu, Weitao, Xiaohong Hao, and Cunlu Dang. "Connectivity probability based on star type deployment strategy for wireless sensor networks." Intelligent Control and Automation, 2008. WCICA 2008. 7th World Congress on. IEEE, 2008.

[4] Vincze, Zoltan, Rolland Vida, and Attila Vidacs. "Deploying multiple sinks in multi-hop wireless sensor networks." Pervasive Services, IEEE International Conference on. IEEE, 2007.

[5] Mahfoudh, Saoucene, and Pascale Minet. "An energy efficient routing based on OLSR in wireless ad hoc and sensor networks." Advanced Information Networking and Applications- Workshops, 2008. AINAW 2008. 22nd International Conference on. IEEE, 2008.

[6] Li, Yin, Liansheng Tan, and Na Li. "A dynamic selection algorithm for extending the lifetime of two-tiered sensor network." Future Computer and Communication (ICFCC), 2010 2nd International Conference on. Vol. 2. IEEE, 2010.

[7] Dasgupta, Ranjan, Ritwick Mukherjee, and Amitava Gupta. "Congestion avoidance topology in wireless sensor network using Karnaugh map."Applications and Innovations in Mobile Computing (aimoc), 2015. IEEE, 2015.

[8] Muni, Venkateswarlu K., Arun Kandasamy, and K. Chandrasekaran. "Energy-efficient edge-based network partitioning scheme for wireless sensor networks." Advances in Computing, Communications and Informatics (ICACCI), 2013 International Conference on. IEEE, 2013.

[9] I. M. Bomze, M. Pelillo, and V. Stix, “Approximating the maximum weight clique using replicator dynamics,” IEEE Trans. Neutral Netw., vol. 11, no. 6, pp. 1228–1241, Nov. 2000.

[10] V. Bychkovskiy, S. Megerian, D. Estrin, and M. Potkonjak, “A collaborative approach to in-place sensor calibration,” in Proc. Int. Conf. Inf. Process. Sen. Netw., pp. 301–316, 2003.

[11] K. Chakrabarty, S. S. Iyengar, H. Qi, and E. Cho, “Grid coverage for surveillance and target location in distributed sensor networks,” IEEE Trans. Comput., vol. 51, no. 12, pp. 1448–1453,Dec. 2002..