To detect and localize coverage holes in sensor networks they used the algebraic topological methods to define coverage hole, and develop provably correct algorithm to detect a hole and partition the network into smaller subnetworks and checking for holes in each. By repeating this process leads to localize the coverage holes. In simulation observed that all the nodes in these subnetworks are always at most one hope away from the shortest cycles bounding a coverage hole [15].

The presence of coverage holes in WSN is a major issue. Yao Sun, Chengdong Wu, Yunzhou Zhang, Nan Hu [16] present an algorithm based on centroid calculation to locate the position of the coverage holes and uses a graphical method to detect coverage holes, and discusses the research on route planning for Unmanned Aerial Vehicle (UAV). UAV is used to place the redeployment nodes.

Chia-Pang Chen, Cheng-Long Chaung, Tzu-Shiang Lin, Chia-Yen Lee, Joe-Air Jiang et al. [17] proposed an novel hybrid genetic algorithm (HGADSC). It comprise of genetic operations and fitness-improving local search strategy. Both these strategy divide all wireless sensor node into a number of disjoint set covers (DSCs). The HGADSC is used to solve the NP-complete problem. It guaranteed the longer network lifetime by switching disjoint set covers. The result shows that the network lifetime can be effectively improve by the proposed method. The network lifetime ranging from 0.54% to 36.1% under different simulation scenarios by using this method.

Move on wireless communication and Micro Electro Mechanical Systems (MEMS) have enabled the growth of low-cost, low-power, multi-functional, tiny sensor nodes which can sense the environment, perform data processing and communicate with each other untethered over short distances. Amitabha Ghosh, Sajal K. Das [18] used the one of the important criteria for being able to deploy an efficient sensor network is to find optimal node deployment strategies and efficient topology control techniques. Nodes can either be placed manually at predetermined locations or dropped from an aircraft. However, since the nodes are randomly scattered in most practical situation it is difficult to find a random deployment strategy that minimizes all the desirable metrics simultaneously, such as, sufficient coverage and connectivity, low-computation and communication overhead.

WSN is the collection of the independent and distributed sensor. It has an additional functionality or capacity of mobility. Mobility adds additional functionality to the wireless sensor network by providing self deployment and relocation of sensors. Many approaches have been used for this by considering different issues. Main issue of deployment is Coverage and Connectivity. When deploy mobile sensor other issues are also come like sensor relocation, energy efficient movements of sensors, obstacle adaptability, lifetime of network, fault tolerance etc. So, Mayur C. Akewar, Nileshsingh V.Thakur [19] defined the different types of deployment techniques and algorithms with different ways of deployment. The approaches are virtual force based, movement assisted, computational geometry and pattern based approach.

The given approach should self-deploy the sensor into a connected ad-hoc network that has the maximum coverage. Non-uniform random distribution and exhausted energy of sensor nodes may lead to coverage holes problem in wireless sensor networks. So, to solve this problem of coverage holes in wireless sensor networks Wang Qing-Sheng, Gaohao [20] a geometry-based distributed coverage holes discovery algorithm. This algorithm is forming a triangle by sensor node and its two neighbor nodes, calculating circumradius and circumcenter of the triangle. This two neighbor nodes also judging existence of coverage holes under the guidance of relevant knowledge of geometric graphics. For the experimental or practical purpose MATLAB platform is used. The result shows that this algorithm is better than others algorithms and give better or high accuracy than the others algorithms.

The basic problem in Wireless Sensor Networks (WSNs) is the coverage problem. The coverage problem in WSNs causes the security environments is supervised by the existing sensors in the networks suitably. The coverage in WSNs is so important that it is one of the quality of service (QoS) parameters. If the sensors do not suitably cover the physical environments they will not be enough efficient n supervision and controlling. The other reasons which had increased the importance of the coverage problem are the topologic changes of the network. The changes are done by the damage or deletion of some of the sensors and in some cases the network must not lose its coverage. SO, Isa Maleki, Seyyed Reza Khaze, Marjan Mahmoodi Tabrizi, Ali Bagherinia [21] used the hybrid Particle Swarm Optimization (PSO) and Differential Evolution (DE) algorithms. These are the Meta-Heuristic algorithms and have analyzed the area coverage problem in WSNs. Also a PSO algorithm is implemented to compare the efficiency of the hybrid model in the same situation. The results of the experiments show that the hybrid algorithm has made more increase in the lifetime of the network and more optimized use of the energy of the sensors by optimizing the coverage of the sensors in comparison to PSO.

Coverage is a major problem for wireless sensor networks (WSN) to examine a region of interest (ROI) and to provide a good quality of service. In many applications, full coverage is required, which means every point inside the region must be covered by at least one sensor node. The occurrence of hole is unavoidable in ROI due to the inner nature of WSN, random deployment, environmental factors, and external attacks. For ensuring successful coverage in WSNs the following key elements are critical: 1) Determining the boundary of the RoI, 2) Detecting Coverage holes, and 3) Determining the best target locations to relocate nodes to repair the holes. For maintaining the coverage quality of the given WSN, K.Kavitha, T.Thamarai Manalan, M.Suresh Kumar [22] proposed a low complexity distributed and localized algorithm (HEAL) to detect and heal the holes. This algorithm allows a local healing where only the nodes located at a proper distance from the hole will be involved in the healing process. For practical work

NS2 tool is used. Performance results through ns 2 simulator shows that HEAL can handle holes of various forms and sizes and provides a cost-effective and an accurate solution for hole detection and healing. They also improve the Distributed Virtual Forces Algorithm (DVFA) to deal with obstacles. Performance results show that DVFA provides an efficient deployment even if obstacles present in the monitoring area.

4. Contribution

In section 3rd work done by various researchers in the field of coverage hole detection and remove redundancy is studied. A modified hole detection and healing method is proposed that could remove the redundant nodes and moving the nodes that removes holes by using distributed virtual force based approach in WSNs. This proposed method could remove the drawback of existing algorithms. Virtual force based deployment is a strategies that is used in solving coverage problem in WSN. It is a distributed, robust and scalable deployment strategy. It is depend or rely on the sensors mobility, using virtual repulsive and attractive forces. In this strategy, to achieved the full coverage the sensors nodes are force to move away or towards each other. Unlike the existing algorithm, proposed strategy does the simulation of the movement first and at the end of the process only one time physical movement of nodes is done.

5. Conclusions

In this paper, a critical problem in Wireless Sensor Network that are detection of holes and redundancy remove in network is focused. Redundancy that waste lot of energy and more power consumption that makes network more expansive. The work done by the various authors are described in details. A related work to hole detection and remove redundancy in WSN is given or provided. To remove these drawbacks to make network more efficient and powerful, a modified hole detection and healing method is proposed that could remove the redundant nodes and moving the nodes that removes holes by using distributed virtual force based approach. Thus providing energy efficient and cost efficient hole detection and healing method with virtual force based strategy.

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