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A Review on Deployment schemes in Wireless Sensor Network

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Abstract

Present years have noticed the arrival of (WSNs) i.e. wireless sensor networks as a latest information-collecting prototype, in which enormous number of sensors distribute over examination field and pull out data of interests by evaluating real-world phenomena from the physical location. One of the foremost issues in the field of wireless sensor networks (WSN) is Localization. To route data from source to destination is the challenging tasks in wireless sensor network. From the sensor network area Sensors assemble data and surpass the assembled data to the base station. Lots of deployment techniques are here by which one can improve both localization accuracy and localization success rates. The WSN operation is categorized as dynamic, static and energy aware node assignment. Different deployment algorithms of static, dynamic and energy aware protocols are studied in this paper.

Keywords: WSN, Localization of WSN Nodes, Design challenges of WSN, Schemes of Node Deployment

INTRODUCTION

1.1 Introduction to WSN:

Implementation of Wireless Sensor Networks (WSNs) is relatively suitable to a variety of fields. Its implementation is simply build on smaller nodes, radio transceiver, and battery. The wireless sensor networks complete its operation in independent mode to get accurate values in the spatial field. In the network, Wireless

Sensor Networks (WSNs) are a rather new application which gives high quality monitoring with comparatively economical equipment for vast geographical areas [1]. WSNs are made up of set of tiny sensor nodes, by which adjacent environment can efficiently monitor. In both academic and industrial fields in current years WSNs have attracted relative more attention because of its widespread potential utilizations in battlefield supervision, environmental monitoring, weather forecasting, healthcare and calamity recognition etc [2].

1.2 Localization of WSN Nodes:

Localization is a process to compute the locations of wireless devices in a network WSN Composed of a large number of inexpensive nodes that are densely deployed in a region of interests to measure certain phenomenon. None-line-of sight (NLOS) condition is the dominant factors that affect localization, which occurs when the direct path from the unknown node to the anchor nodes is restricted by some obstacles. Anchor nodes are those nodes whose location is supposed to be known. There is a broad range of methods for improvement of the NLOS impact on localization accuracy. The location estimates from different groups are joint by using remaining weighting. The hypothesis testing is employed in [3] to detect the LOS and NLOS conditions and then an extended Kalman filter is used as a nonlinear estimation. Obtaining information about the position of sensors in wireless networks (WSNs) is necessary since it is the required for a number of tasks and these are target tracking, geographical routing protocols, environmental monitoring, etc. To lessen NLOS errors the constrained optimization techniques are used [3].

1.3 Design challenges of WSN:

In WSNs, to extend the lifetime of the whole network is the focal design challenges while taking in to account the cost, energy consumption and reliability. Network lifetime can be maximize by considering lots of factors that are architecture of network and protocols, data collection, sensor node lifetimes, channel characteristics and energy consumption model. One approach to maximize the network lifetime can be maximize through an energy-efficient reliable routing algorithm which is for data communications within WSNs, and this algorithm can provide the best results by combining the total energy usage, communication reliability and cost [4].

1.4 Schemes of Node Deployment:

The sensor nodes are fixed in the particular area in static node deployment, due to which the working performance reduces. But in case of dynamic node deployment the performance is increased because of sensor nodes are mobile. In energy aware node deployments every sensor node is equipped with the power and is used for the first gather and then transferred the data. For the transmission of data what amount of energy is consumed by a node is also define in this scheme.

A. Primary objective o/the node deployment

Sensors should be deployed in such a manner so that they bring into line to the overall design objectives. Hence, those deployment strategies are in the literature which give stress on increasing the coverage area, optimizing the energy consumption, and also achieving the sturdy network connection, gives attention on extending the lifetime of the network and/or increasing data fidelity.

B. Static Node Deployment

This scheme selects the best location by taking in to account the optimization energy and the position of nodes does not change in the entire lifetime of WSN. And after the placement of sensors, there is no further movement in the network. And Static sensors cannot be changed when their location change.

C. Static Node deployment Algorithms

Artificial Bee Colony algorithm (ABC) algorithm and Bio-geography Based Optimization algorithm (BBO) are algorithms for static node deployment. For dynamic node deployment these algorithms can also be applied. ABC and BBO algorithm applied for static deployment are explained below.

1) Artificial Bee Colony Algorithm

For the study of both static and dynamic node deployment problem in WSN ABC algorithm is one the latest one approach. This algorithm was implemented by taking into consideration the foraging actions of honeybee swanns . it gives good result (99.34% for 10,000 iterations) [II] when coverage rate of ABC algorithm is compared with other dynamic deployments algorithm. The network coverage rate or the total area of coverage of sensors resembles to the fitness value (nectar) of the solution.

2) Bio-geography Based Optimization algorithm (BBO).

When node deployment has begun, because of the randomness of the nodes an effective or good coverage rate of the nodes cannot be reached. BBO algorithm combines both static and dynamic sensor nodes. The BBO algorithm is influenced by the movement of species between islands (or habitats) so that more compatible islands can be searched.

D. Dynamic Node Deployment Algorithms

Deployment algorithm has attracted scholars' wide attention. To find the positions of the sensor nodes is significant part of deployment, which is also depends on the area coverage. The decision of deployment is taken in the start of network setup and it does not change with the dynamic changes during the operation of network that’s why In dynamic node deployment type, the sensor nodes are first to be found in the randomly selected areas. The different dynamic node deployment algorithms are given below:

1) Virtual Force based algorithm (VFA)

It is one of the popular approaches for node deployment. In this algorithm as key perceptions the obstacles, sensor nodes and the coverage areas are predictable so as to enable attractive or repulsive force within the nodes can be formed. In VFA three assumptions are made first, a single node within its communication range should be able to attain relative position of other nodes. Second, only according to the calculated results of the algorithm all the left behind nodes will move effectively. And third, all the nodes are related with Omni-directional sensors, which means that for every node, the sensing range is equal for all nodes and the areas they sensed are circles with node at its midpoint, so that results are in communication range.

E. Energy aware node placement in WSN.

Energy consumption and exploitation of WSN technology is the key issue for the node deployment in these days. Lifetimes of WSN are affected with some factors like MAC design with energy efficient, topology management and error control strategies.

1) Bio-geography Based Optimization algorithm (BBO).

For sink nodes in WSN SEAD protocol is used and is called as a distributed self-organizing protocol. In spite of directly connected to WSN sink node is also called as relay node and is an external network. They control the sensor nodes and called as moving nodes. Both in constructing and maintaining the Dissemination-tress (D-tree) SEAD protocol saves the power.

F. Neural networks:

By mimicking the organization and processing systems of biological nerves The NN processes information. It connects a huge number of neurons: and each one is having bias, and two functions one is transfer function and second is the activation function. The inter-neuron connection is called the weight. NN is Used in a lot of daily practices such as the back-propagation neural (BPN) network have been widely

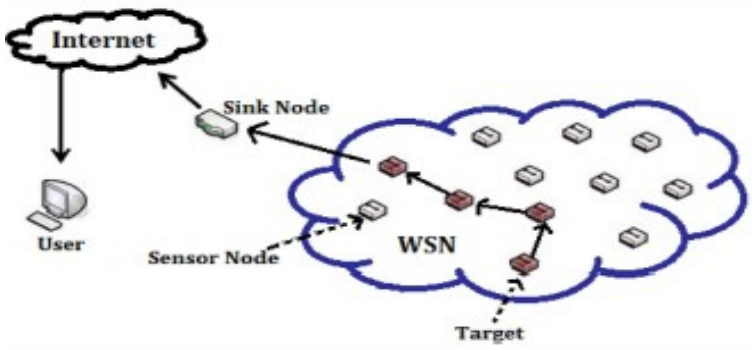

Fig. I. Sink node in WSN

Given below some of the NN-based localization schemes.

Dana scheme: It is a centralized training localization approach which is offline. The inputs of the network model is made up of the coordinates and probable distances of RSSI of the three anchor nodes, and the output is the coordinate. It tends to produce accumulated errors and less localization success rates in sparse topologies by concerning only the estimated distances of RSSI.

BP scheme: to train a network model, BP used the estimated distances of HCs like the DV-hop. It is a centralized, online training localization approach which. HCs between the unknown nodes are the inputs of the network model and all available anchor nodes, and the coordinate is the output. It may yield large localization errors and fail to identify an unknown node correctly because this scheme uses only the estimated distances of HCs.

VNBP scheme: by randomly generating virtual nodes at sinks to increase the number of anchor nodes VNBP aims to get better performance as compared to previous localization schemes. And the virtual nodes produced with coordinates but with no communication ability [6].

LITERATURE SURVEY

V. Karthik in 2012 [1] Data collection is the process of gathering and measuring information on selected variables in an recognized systematic fashion, which then enables one to answer relevant questions and evaluate outcomes. Parent node acknowledges each packet successfully. Particularly in the tree based topology Energy utilization by parent node increases due to continuously forwarding of sensed data from their respective child nodes. Once the power in the parent nodes was completely exhausted, from the sink node some of the child nodes get isolated. The estimated data collection technique involves deployment of multiple mobile robots whose responsibility is to collect the data from the nodes whose energy level is less than the threshold value. By using time and location based strategies Navigation of mobile robots to collect the data from partitioned nodes are achieved. In estimated hybrid scheduling, the navigation of mobile robots programmed by both the combination of time and location based strategies with a range of region scheduling. In network scenario, due to its extra responsibilities the mobile robot gets more burdens to visit all divided nodes. So the entire scenario is divided in to dissimilar regions and the deployment of frequent mobile robots is relayed on the requirements. WSN is enhanced doubly using multiple mobile robots As a outcome, the efficiency of sensed data collected by the base station or sink node from partitioned., the outcome from various aspects show that projected multiple mobile robots can develop the appearance of collecting the sensed data in huge-scale sensing fields and also it improves the life span of the sensor nodes which is shown by Through simulation under the environment of NS-2 simulator.

M. Vijayalakshmi et al. in 2013 [2] (WSN) wireless Sensor Network is an emerging technology. WSNs made up of enormous number of small sensor nodes those having limited onboard energy supply and deployed densely in a given section for

information harvesting reasons, the power consumption in WSN becomes as a chief issue nowadays because of the sensor devices has limited memory and power capacity. So that, a scheme is given to lessen the power consumption in WSN is introduced. It is clustering based. It uses temporal correlation amid the sensor data, gives a possibility for reducing the energy consumption of continuous sensor data collection. Thus it can maximizes network life and achieve stability. To control prediction, analyze the performance tradeoff between reducing communication cost and prediction cost, and design algorithms an adaptive scheme is used and it is used to take the advantage of adaptive method to permit/disable forecast operations. Over the preceding dual-prediction scheme Localized prediction method is performed which is used to decrease communication and computation cost by minimizing the power utilization. A realistic algorithm intended for data aggregation will use faster and more capable cluster-to-cluster propagation.

Nasser Aghaie et. al.in 2016 [3] in the field of wireless sensor networks (WSN) Localization is one of the major issues. A signal which is used to establish the distance between nodes cannot pass during a straight path in the non-line of sight (NLOS) environments because of the obstacles between the anchor nodes and other nodes. Due to This problem localization error increases. A new localization method based AOA measurement for the NLOS environments is presented by author. This method based on the identification of NLOS nodes and then eliminating them from the localization process. Identification of the NLOS nodes is based on the statistical model of the measurement error and NLOS error and apply the NP theorem and find out a threshold value to the AOA which identify the NLOS nodes. The results show that in localization in the NLOS conditions it has good performance.

Amir Ehsani Zonouz et al. in 2016 [4] to monitor physical or environmental conditions Wireless sensor networks contains spatially distributed sensor nodes. These sensor nodes are normally battery-powered sensor nodes (BPSNs) and it does not meet design goals of long network lifetime and high reliability. Energy-harvesting sensor nodes (EHSNs) convert different types of power to electrical energy and it is an substitute of sensor nodes with a long lifetime but with a high cost. Conflicting design goals of long lifetime and reasonably low cost can be pact with the Combining BPSNs and EHSNs. A new contribution is made in this paper by modeling a heterogeneous WSN consisting of both BPSNs and EHSNs and signifying a wide-ranging cost function-based routing approach that integrates end to-end path reliability, cost and power consumption for providing acceptable quality of service to applications running on hybrid WSNs. the optimal deployment of EHSNs with a reliability importance-analysis-based method to improve the end-to-end path reliability within hybrid WSNs contribution made in this work.

Renuka .R. Patil et al. in 2015 [5] (WSN)s Wireless Sensor Networks, contains lots of sensor nodes, and are used in the application areas name as, vehicle tracking, agriculture, military, forest surveillance, healthcare, environment and earthquake inspection etc., The sensor nodes can do smaller computation, have little memory, very little battery power and having very less communication strength. To monitor the environmental system on the basis of applications of WSN These sensor nodes are to

be deployed in a particular location. An optimization and application requirement supports .The complexity of deployment of a wireless sensor networks. Extended work of paper "Analogy of Dynamic and Static Node Deployment Algorithms in WSN" is given in this paper. The comparison of algorithms and protocols is done considering parameters like energy consumption; coverage of nodes, average distance between the nodes etc., and decides the better performance deployment algorithm. This paper gives the knowledge about the best of static, dynamic and energy aware deployment schemes.

Po-Jen Chuang et al. in 2014 [6] Wireless sensor networks regularly find out the location of an unknown node by calculating the distance between the unknown node and its neighboring anchors. In this paper to enhance both localization accuracy and localization success rates, the authors introduce a new neural network-based node localization scheme. This scheme make the trained network model completely related to the topology via online training and correlated topology-trained data and therefore achieve inter-node distance estimation and also more efficient application of the neural networks. It also, to improve the distance estimation accuracy as well as localization accuracy at no additional cost adopt both received signal strength indication and hop counts to estimate the inter-node distances. Experimental evaluation results prove that, the new scheme constantly produces higher localization success rates and smaller localization errors than other policies at reasonable cost.

Annie Uthra Rajan et al. in 2015 [7] In industries, environment monitoring and health care monitoring systems wireless sensor networks have become an growing technology . In addition, sensor node in terms of memory, bandwidth and energy become a resource-constrained device. These constraints because of retransmission put in force congestion in the network, gives large number of packet drops, low throughput and noteworthy wastage of power. A new approach for predicting congestion using probabilistic method, and managing congestion using new rate control methods is projected. The probabilistic method used for the prediction of overcrowding in a node is developed using facts traffic and buffer occupancy. To improve throughput and to lessen packet drops the rate control method uses rate allocation schemes, namely, (RR) rate reduction, rate regulation (RRG) and split protocol (SP). An energy-efficient routing which finds the finest forwarding node for data transmission is given in this paper. On comparison of Simulation results with decentralized predictive congestion control (DPCC) show that the selected method indeed minimizes congestion and energy consumption, and improves the performance.

Rajesh M et al. in 2015 [8] Disaster management is one of the most critical applications that can be performed by a (WSN) Wireless Sensor Network. For the successful relay of information optimized sensor nodes deployment is required. This paper suggested the deployment of sensor nodes by multiple autonomous mobile robots in an unexplored huge disaster prone territory. The use of multiple robots provides significant advantages over human-assisted placement like safety, precise positioning and flexibility. For precise location of an event, localization of the sensor nodes is very important which is attained by using Received Signal Strength (RSS)

from anchor nodes and the sensor nodes which act as secure node after being positioned. Placement of node by robots helps in achieving the location information of all the nodes that build up the network. Communication and coordination between the multiple robots over the sensor nodes is used to attain accurate localization, faster exploration and network creation. In this study, energy efficient utilization of the sensor node is attained when it acts as an anchor node as it only responds when it receives the node discover command with a property of Zigbee protocol from the robot placing the sensor nodes. Simulation of the projected method is carried out by using Firebird V robots and Zigbee protocol is used for communication and coordination between the robots.

Shilpa Mahajan et al. in 2015 [9] to route data efficiently from source to destination is One of the difficult tasks in wireless sensor network. Sensors takes data from the sensor network area and pass this data to the base station. In the literature Three techniques have been given: namely, direct, hierarchal and hybrid to fulfill this data transmission task. When data sends on a single lane several times it results in depletion of energy and hence crash of those nodes. Thus, error tolerance method for finding multiple disjoint routes for data transmission is required. In this method, the system can change from an inaccessible path with broken links to existing candidate paths. A new graph theory scheme for optimal path selection based on quality of service parameters is projected. A fault tolerant mechanism is also adopted to prolong the life span of the network. And the results show that the planned approach maximizes network lifetime and path stability improves.

Shreya Mishra et al. in 2015 [10] (DSNs)Directional Sensor Network being a subdivision of WSN has attracted researchers a lot due to its wide deployment in visual monitoring applications as the continuous technical advancements have enabled us making use of low-cost camera sensors. Except because of the inherent random deployment of these camera sensors, the effective area coverage is reduced. Therefore, the effective area coverage of the network must be improved; which can be achieved either by enabling mobility among the nodes or by exploiting motility of the nodes. In this work, a clustering-based scheme has been proposed which re-orient the (FoV) Field-of-View of the nodes to adjust them accordingly with an objective of improving the total area coverage. The performance of the proposed scheme is evaluated alongside a renowned scheme Face-Away using two metrics viz. Object-Detection Capability and Effective Coverage Area; and, the results have proved the supremacy of proposed scheme over the Face Away.

Vijay S. Rao et al .in 2015 [11] Reasonable energy consumption for Wireless Sensor Networks (WSNs) is being considered as a best solution for long lasting deployments in various WSN applications. Because amount of energy harvested varies spatially and temporally so that the sensor nodes often do not have sufficient power to handle application like network and house-keeping tasks. Moreover the ambient source cannot be implicit to be necessarily available all the time. It is desirable that the nodes take up higher loads whenever more energy is harvested energy. When the energy is not sufficient the nodes should switch to highly energy capable schemes. Hence requirement of harvesting-aware scheduling of tasks arise. Harvesting-aware

scheduling challenges are (a) to find out the amount of power to be exhausted in a time slot, and (b) to consume this energy for carrying out of tasks maximally. For task execution, to increase energy utilization author first divides application level tasks into subtasks, some of which can be executed at the same time as. A dynamic optimization model, which is based on (MDP) Markov Decision Process that takes into account priorities and deadlines of the activities, and stored and harvested power to derive an optimal scheduling policy is suggested in this paper. Because of the complexity of the MDP cannot be tracked in real time, that's why a greedy scheduling policy had been proposed in this paper.

Tiago Semprebomy et al. in 2015 [12] precluding maintenance or human intervention are controlled by Many Wireless Sensor Network (WSN) applications in unreliable or inaccessible environments. Making the network flexible to failure and environmental changes, redundant deployment techniques are normally considered in this scenario. Furthermore, while active nodes execute monitoring services, sleep-scheduling strategies can also be applied, enabling redundant nodes to turn off their radios. In This paper the behavior of the (m,k)-Gur Game approach is studied. To make (m,k)-Gur Game is to provide an uniform network coverage for monitoring applications, with autonomic nodes performing a self-regulated option between sending message to a base station or sleep until the next period is the main motive. The scheme was implemented using the OMNeT++ simulator tool under the MiXiM framework and Preliminary results gives that the (m,k)Gur Game performs very well over the conventional GurGame approach in terms of following factors like QoS provision and network coverage.

Sr. No	Year	Tech. used	Outcome
1	2013	By region based approach and angular based algorithm multiple mobile robots used for separate partition is done.	Effectiveness of sensed data composed by the base station in Partitioned/islanded WSN is enhanced doubly using multiple mobile robots.
2	2013	To decrease the energy utilization in WSNs and to prolong the network lifetime.	Proposed framework even though the object arrived from any random location and moves randomly this algorithm achieves energy efficiency.
3	2016	A novel NLOS recognition method has been projected and analyzed through model.	Estimation error of the projected method are very close to the best case and the projected method when compared with existing methods gives less localization Error.

4	2016	A comprehensive CF-based routing technique for hybrid WSNs with a combination of EHSNs and BPSNs	The average end-to-end path reliability can increase considerably when compared to random location selection for the same number of EHSNs.
5	2015	Node deployment various schemes .	Analysis shows that ABC algorithm implemented on both static and dynamic node deployment, parameters such as number of nodes, coverage rate, standard deviation, energy consumption and computation time this algorithm provides better performance.
6	2014	Localization scheme which is NN-based. It involves both RSSI and HCs to estimate the inter-node distances and by doing so at no additional cost lifts up the distance evaluation accuracy as well as localization accuracy	New node localization scheme can produce better localization success rates as well as smaller localization errors than existing AI-based schemes at reasonable cost.
7	2015	Using energy-efficient routing, a congestion calculation method and congestion control methods	Per-node throughput increases and energy minimizes in the network.
8	2015	Using Zigbee protocol an algorithm for the optimum deployment of sensor nodes is implemented and these deployed sensor nodes are further used for relay of information.	The proposed scheme provides accurate localization with an average error of .15m, provides faster exploration with multiple robots and lowest redundant deployment.
9	2015	An adaptive EBFS-based method	The results clearly show the improved network reliability and energy using EBFS when compared with IBFS.
10	2015	Cluster Based algorithm.	The result of CBCE algorithm proves superiority in terms of - efficiency is validated in terms of effective area coverage and number of deployed object on the initial deployment of the nodes and also checked alongside very prominent scheme.

CONCLUSION

One of the main issues in WSNs is Localization. In NLOS which means the non-line of sight which is a type of environments a signal which is used to determine the distance between nodes, because of the obstacles between the anchor nodes and other nodes, cannot pass through a straight path. And localization error is increases because of this difficulty. Localization method based AOA measurement has excellent performance in localization in the NLOS conditions. A new neural network-based node localization scheme is used to increase the localization accuracy and localization success rates. At reasonable cost, this scheme as compared to other schemes produces higher localization success rates and smaller localization errors. For enhancing the effective area coverage of the deployed nodes by exploiting nodes motility A Cluster Based algorithm is used. The analysis results gives that ABC algorithm for parameters such as number of nodes, coverage rate, standard deviation, energy consumption and computation time which is implemented for both static and dynamic node deployment gives a better performance. An optimal policy for scheduling generates by Markov Decision Process model.

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