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A Review K-Coverage in Wireless Sensor Networking

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ABSTRACT—
Wireless sensor networks (WSNs) have significant potential in many application domains such as agriculture, health, environmental monitoring, battlefield surveillance, and wild fire detection. It may cause Coverage holes and inefficiencies in WSN due to sensor nodes moving, energy loss, physical damage, errors and failures. K coverage algorithm is proposed to monitor the coverage holes in target network and also repair and achieve uniform K-coverage Simulation Results by applying K coverage algorithm. The use of this algorithm to the WSN performs effectively for achieving uniform k coverage area and increase the lifetime of network**.**
Keywords— use at least four keywords

INTRODUCTION

With advance in technology, sensor networks composed of small and cost effective sensing devices equipped with wireless sensors for environment monitoring have become feasible. The key advantage of using these small devices to monitor the environment is that it does not require infrastructure such as electric mains for power supply and wired lines for Internet connections to collect data, nor need human interaction while deploying. These sensor nodes can monitor the environment by collecting information from their surroundings, and work cooperatively to send the data to a base station, or sink, for analysis.

Clustering in WSN [6]: The process of grouping the sensor nodes in a densely deployed large-scale sensor network is known as clustering. There are some issues involved with the process of clustering in a wireless sensor network. First issue is, how many clusters should be formed that could optimize some performance parameter. Second could be how many nodes should be taken in to a single cluster. Third important issue is the selection procedure of cluster-head in a cluster. Another issue is that user can put some more powerful nodes, in terms of energy, in the network which can act as a cluster-head and other simple node work as cluster-member only. As sensor nodes are generally battery-powered devices, the critical aspects to face concern how to reduce the energy consumption of nodes, so that the network lifetime can be extended to reasonable times. It break down the energy consumption for the components of a typical sensor node, and discuss the main directions to energy conservation in WSNs[5]. Then, it presented a systematic and comprehensive taxonomy of the energy conservation schemes, which are subsequently discussed in depth. Special attention has been devoted to promising solutions which have not yet obtained a wide attention in the literature, such as techniques for energy efficient data acquisition.

COVERAGE TECHNIQUES IN WSN

A wireless sensor network consists of collection of nodes organized into a cooperative network which monitor physical or environmental conditions. Each node consists of processing capability may contain multiple types of memory, have a power source e.g., batteries and solar cells. The nodes communicate wirelessly and often self-organize after being deployed in an ad hoc fashion. In wireless sensor network each node supports a multi-hop routing algorithm and forwards data packets to sink node.

DESIGN CRITERIONS FOR COVERAGE TECHNIQUES

In wireless sensor networks, because energy depletion, harsh environmental conditions, and malicious attacks may result in node failures or become inoperative at any time, it is desirable to have higher degrees of coverage. The goal is to have each location in the physical space of interest within the sensing range of at least one sensor. Depended on different objectives and application requirements, there are different factors analyzed in designing coverage schemes. Generally, there are many different criterions (factors) can affect the coverage performance of WSN and that have dominating effect.

Deployment strategy: Deterministic versus Random Grid based deployment is deterministic deployment strategy [2]. Grid based deployment strategies used to determine sensors positions. Grid based is the sampling method in which coverage is estimated as ratio of grid points covered to total number of grid points in the ROI. The cost of this method is determined by number of grid points, name and amount of sensors deployed. The accuracy of the estimation is determined by the size of each grid, the smaller the size the more accurate the estimation is. There are three types of grids commonly used in networking.

- Triangular Lattice
- Square Grid
- Hexagonal Grid

Triangular lattice is the best among the three kinds of grids as it has the smallest overlapping area hence this grid requires the least number of sensors. Triangular Lattice is shown in figure 1(a). Square grid is shown in figure 1(b). Square grid provides fairly good performance for any parameters. Hexagonal grid is the worst among all since it has the biggest overlapping area, shown in figure 1(c).

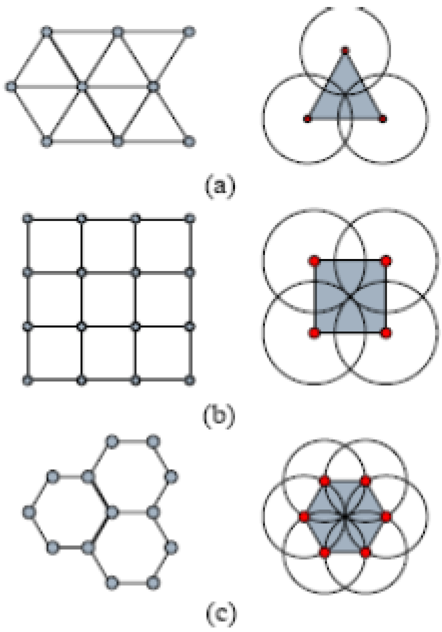

Figure 2.1: Types of grids (a) Triangular lattice (b) Square grid (c) Hexagonal grid

Random deployment strategy is where sensor nodes are distributed within the field stochastically and independently e.g.,air-dropped, scattered from an aircraft or launched via artillery, is required exclusively.

Sensing model

There are two models in the sensing model:

1. Boolean sensing model
2. Probabilistic sensing model.

In Boolean Sensing Model where each sensor has a fixed sensing area and a sensor can only sense the environment or detect events within its sensing area. The Boolean sensing model assumes that sensor readings have no associated uncertainty. In reality, sensor detection is imprecise. In Probabilistic Sensing Model, the detection probability of object or event and the sensor's sensitivity decreases as the distance increases.

Sensing area: A sensor can detect an object or phenomena which are inside its sensing range deterministically or probably depended on its sensing model. Generally, the sensors are assumed to have the same range. A sensor's sensing range is not always perfect disk it could be an elliptic shape or other shapes with the sensing strength could varies with distance from the sensor. For example, the sensing area is considered to be isotropic.

Sensor Scheduling for k-Coverage in Wireless Sensor Networks

The Sensor Scheduling for k-Coverage (SSC) problem which requires to efficiently schedule the sensors, such that the monitored region can be k-covered throughout the whole network lifetime with the purpose of maximizing network lifetime. The SSC problem is NP-hard and they propose a heuristic algorithm for it. In addition, we develop a guideline for users to better design a sensor deployment plan to save energy by employing density. In this they consider a sensor network which monitors a two dimensional region and no two sensors are located at the same location. Every point in the region needs to be continuously monitored (covered) by at least k sensors. The network lifetime is defined as the total duration during which the whole region is k-covered. They assume the number of the deployed sensors is more than the required number of sensors that can provide k-coverage for the monitored region. To extend the network lifetime, instead of making all the sensors to be active throughout the whole network lifetime, a subset of the sensors can be turned on to provide k coverage at any time, while the rest sensors are in sleep mode.

Expected k-Coverage in Wireless Sensor Networks: In this paper they concerned with wireless sensor networks where n sensors are independently and uniformly distributed at random in a ¯nite plane. Events that are within a fixed distance from some sensor are assumed to be detectable and the sensor is said to cover that point and formulated an exact mathematical expression for the expected area that can be covered by at least k out of n sensors. Results are important in predicting the degree of coverage a sensor network may provide and in determining related parameters (sensory range, number of sensors, etc.) for a desired level of coverage. We demonstrate the utility of our results by presenting a node scheduling scheme that conserves energy while retaining network coverage.

The coverage performance of stationary sensor network can be determined by the initial network configuration, and it remains unchanged over time after deployment. Contrarily, by mobile sensors mounted on mobile platform (such as mobile robot), mobile sensor network can improve or maintain coverage performance by sensor mobility. It is extremely valuable in situations where deployment mechanisms fail or coverage maintenance. The coverage of mobile network depends not only on the initial configurations, but also on the mobility behavior of the sensors.

COVERAGE TECHNIQUES:

Extensive research efforts have been made to develop energy efficient schemes integrating coverage and connectivity for Wireless Sensor Network. Depended on the coverage objectives and applications, they can be roughly classified into three categories: Area Coverage, Point Coverage, and Path Coverage.[4]

Area coverage

In Area Coverage the main objective of the wireless sensor network is to cover (monitor) Region of Interest. Each point of the region need to be monitored because complete coverage is desired for valid data otherwise coverage holes exits.

Point coverage

In Point Coverage the objective is to cover a set of point (target) with known location that need to be monitored. The point coverage scheme focuses on determining sensor nodes exact positions. Generally point coverage is special case of area coverage. In area coverage some points remain undetected due to some problem ,in such case point coverage is implemented. In some applications, when the network is sufficiently dense, area coverage can be approximated by guaranteeing point coverage. In this case, all the points of wireless devices could be used to represent the whole area, and the working sensors are supposed to cover all the sensors and monitor the target.

Path coverage

Path coverage is one of the monitoring examples, where WSNs are deployed to sense a specific path and report possible efforts made by intruders to cross it. In a manual network deployment, the desired level of the path coverage can be achieved by proper placement of the sensors over the area. When it is not possible to deploy the network manually, random deployment is used, for example, dropping sensors from an aircraft. Due to the randomness of the sensors location, network coverage expresses a stochastic behavior and the desired (full) path coverage is not guaranteed.

CONCLUSION

In this paper we present wireless sensor network is consist a large number of sensor nodes and these nodes are resource constraint. That's why lifetime of the network is limited so the various approaches or protocol has been proposed for increasing the lifetime of the wireless sensor network. In this paper we discuss the data aggregation are one of the important Techniques for enhancing the life time of the network. And security issues is data integrity with the help of integrity we reduce the compromised sensor source nodes or aggregator nodes from significantly altering the final aggregation value.

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