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REVIEW

Deployment schemes in wireless sensor network to achieve blanket coverage in large-scale open area: A review

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Abstract Wireless Sensor Network (WSN) has attracted researchers in recent years due to its wide scope of utility in a future era of automation and remote monitoring. Effective deployment of Sensor Nodes (SNs) is a major point of concern as performance and lifetime of any WSN primarily depends on it. Various models have been proposed by researchers to deploy SNs in large-scale open regions. This article aims at classification, working and comparative analysis of these models.

Contents

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1. Introduction

Sensor is a vital component of any automated system. Wireless Sensor Network (WSN) is a system consisting of a large number of Sensor Nodes (SNs) geographically distributed in the region to be monitored [1–3]. Placement of SNs in the candidate region is the major factor that determines the coverage, connectivity and life of any WSN [4–8]. The application domain of WSN includes disaster management, military surveillance, monitoring of habitat, tracking target, monitoring health of structures, agriculture, intrusion detection and health monitoring [9–17]. Most of the events cannot be sensed from distant locations as SN has limited sensing range (r_s), and this requires SN to be placed at a distance d ($d \leqslant r_s$), from probable location of occurrence of event.

Various schemes have been proposed by the researchers for the deployment of Mobile Sensor Nodes (MSNs), which claims reliable operation with optimal utilization of resources (in terms of number of MSN and time taken for deployment). WSNs are mostly deployed in hostile environments such as volcanoes, flooded regions, and deep oceans [18–20] where human intervention is not possible for post deployment maintenance, so efforts are being made to enhance its efficiency and durability. Deployment can be classified as manual or random. Among these, random deployment from the sky (using aerial vehicle/robot) [21–25] is most suited for unreachable, hazardous or large-scale open environments.

Preferably the term "open area" is used for wide regions such as forests, battlefields, disaster affected regions, and wildlife reservoir which require complete coverage. However, it may also be used to refer small regions exposed to open sky, viz. enemy camps, which require targeted coverage and are not reachable manually.

In this paper various state of art models used for deployment of SNs in large-scale open regions are studied, classified and analyzed.

Rest of the paper is organized as follows. Section 2 describes the classification of deployment schemes used for deployments in large-scale candidate regions. Point initiated relocation schemes are described in Section 3 followed by Random scattering schemes in Section 4. Section 5 describes

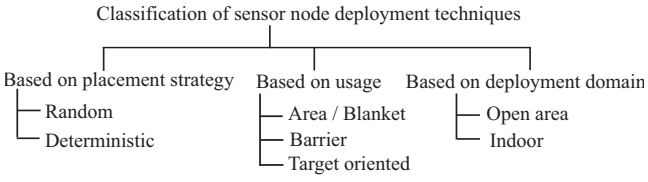

Figure 1 Classification of sensor node deployment techniques.

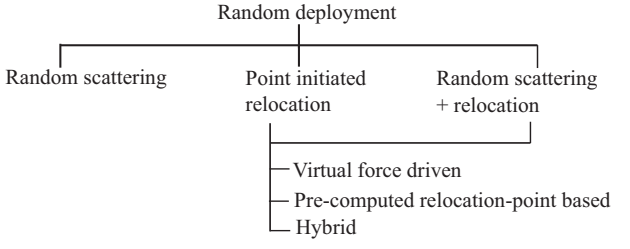

Figure 2 Classification of random deployment schemes based on initial arrangements of sensor nodes.