Research Article

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Probabilistic Dynamic Distribution of Wireless Sensor Networks with Improved Distribution Method based on Electromagnetism-Like Algorithm

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Abstract

Performance of the Wireless Sensor Networks (WSNs) depends significantly on coverage area which is determined via the effective dynamic distribution of sensors. Making mobile sensors' dynamic distributions, which determines their positions within the network effectively, improves performances of WSNs by enabling sensors to form the coverage area more efficiently. In this paper, we initially propose the ElectroMagnetism-like (EM) algorithm as the sensor distribution strategy to increase the coverage area of network after random distribution of sensors. Forming more effective coverage area by using mobile and stationary sensors and probabilistic detection model has been aimed by developing the Optimal Sensor Detection Algorithm that is based on the proposed EM algorithm (OSDA-EM). For this purpose, it has been thought that we would attain to more realistic results, with probabilistic detection model by forming the coverage area more effectively. Additionally, performance of the developed OSDA-EM algorithm has been compared with the Particle Swarm Optimization (PSO) and Artificial Bee Colony (ABC) algorithms which was previously used in the dynamic distribution of WSNs. Simulation results have shown that the developed OSDA-EM can be preferred in dynamic distribution of WSNs that performed with probabilistic detection model.

Keywords

Electromagnetism-like algorithm; Wireless sensor networks; Optimal dynamic distribution; Probability detection model

1. Introduction

WSNs use sensors that operate independently within the coverage area in the monitoring of physical or environmental conditions [1] like temperature, humidity, light, pollution, level of noise and movements of objects in different environments [2]. Sensor networks consist of hundreds, even thousands of sensor nodes which interchange information via a wireless environment. Since sensor networks are used in most applications, the positions of sensors in an area are very important in order to form effective coverage area. Forming an effective coverage area can be possible by making the dynamic distribution of the sensors in the target area with an optimal way. For being capable of optimal distribution of sensors, firstly the initial positions of sensors in the area are determined randomly. Random placement of the initial positions of the sensors in the target area is a desired situation [3]. However, the random distribution does not always provide an effective coverage area, because the sensors might conglomerate excessively around a given Grid point or