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Grid and Force Based Sensor Deployment Methods in Wireless Sensor Network using Particle Swarm Optimization

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ABSTRACT

Wireless Sensor Network (WSN) is emergingtechnology and has wide range of applications, such as environment monitoring, industrial automation and numerous military applications. Hence, WSN is popular among researchers. WSN has several constraints such as restricted sensing range, communication range and limited battery capacity. These limitations bring issues such as coverage, connectivity, network lifetime and scheduling & data aggregation. There are mainly three strategies for solving coverage problems namely; force, grid and computational geometry based. PSO is a multidimensional optimization method inspired from the social behavior of birds called flocking. Basic version of PSO has the drawback of sometimes getting trapped in local optima as particles learn from each other and past solutions. This issue is solved by discrete version of PSO known as Modified Discrete Binary PSO (MDBPSO) as it uses probabilistic approach. This paper discusses performance analysis of random; grid based MDBPSO (Modified Discrete Binary Particle Swarm Optimization), Force Based VFCPSO and Combination of Grid & Force Based sensor deployment algorithms based on interval and packet size. From the results of Combination of Grid & Force Based sensor deployment algorithm, it can be concluded that its performance is best for all parameters as compared to rest of the three methods when interval and packet size is varied.

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1. INTRODUCTION (10 PT)

Advancement in wireless communication have enabled the development of low-cost, multifunctional, small sensor nodes which can sense the environment, perform data processing and communicate with each other un-tethered over short distances [1]. Wireless sensor networks idea is envisioned and defined as self-deployed, error prone, long living inexpensive communication devices that are densely deployed to collect data from physical space. Sensor nodes communicate with each other to detect events depending on the application, to collect and process data, and to transmit the sensed information to the base station by hopping the data from node to node [2]. The sensor nodes are deployed either randomly or according to statistical distribution which is predefined, over a geographic region of interest (ROI).Wireless sensor network consists of various sensor nodes that are used to monitor any target area like forest fire detection by our army person and monitoring any industrial activity by industry manager [3]. A sensor node has resource constraints, like low battery power, limited signal processing, limited computation and