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Critical Density for Coverage and Connectivity in Two-Dimensional Aligned-Orientation Directional Sensor Networks Using Continuum Percolation

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Abstract	Authors	References	Cited By

Sensing coverage is one of the fundamental design issues in wireless sensor networks. The coverage of a sensor network reflects the surveillance quality provided by them. Moreover, network connectivity is another important issue which is concerned with the ability of gathered data by sensors to reach to the sink node. Given an initially uncovered area, the problem of finding the minimum number of sensors required to cover the entire area is known as the sensor placement problem. In this paper, we propose a new model for the sensor placement problem in two-dimensional aligned-orientation directional sensor networks using continuum percolation theory. The proposed model is based on the assumption that the sensor nodes are randomly distributed in the sensing field. The results show that the proposed model can significantly reduce the number of sensors required to cover the entire area compared to the existing models.

and more directional sensors are continuously added to the sensor network, covered areas increases. At some point, the situation abruptly changes from covered areas to a single large covered area. We call this abrupt change the phase transition (SCPT). Likewise, given an originally disconnected sensor network suddenly becomes connected at some point. We call this sudden connectivity phase transition (NCPT). The nature of such phase transitions is percolation theory. In this paper, we introduce aligned-orientation directional which nodes are deployed based on Poisson point process and the orientation the same. Then, we propose an approach to compute density of nodes at critical of the SCPT and NCPT problems in such networks, for all angles of field-of-view using continuum percolation. Due to percolation theory, the critical density is densities above it SCPT and NCPT almost surely occur. In addition, we propose percolation in directional sensor networks, which provides a basis for solving problems together.

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