基于概率的三维无线传感器网络K-覆盖控制方法

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摘 要：

针对无线传感器网络在三维空间监测中存在的固有的不确定性与系统应具有较强的容错能力、鲁棒性之间的矛盾，提出了一种基于概率的三维无线传感器网络K-覆盖控制方法。对三维待监测区域以网格建模，用迭代的贪婪启发式方法确定传感器节点在网格中的位置，每一步迭代完成一个节点的放置，直到节点总数达到预设的上界或每个网格点以概率T达到K-覆盖为止。仿真结果表明，相对于传统的随机和均匀配置方法，本方法能使用较少的节点满足相同的覆盖度和监测精度的要求，或使用相同的节点达到更高的覆盖度。并对整个待监测区域中有优先覆盖要求（覆盖度优先和监测精度优先）的局部区域的情况进行了分析。

关键词：无线传感器网络；三维覆盖；覆盖控制；K-覆盖

Probability-based K-coverage control approach for three-dimensional wireless sensor networks

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Abstract:

For the contradiction between the inherent uncertainty and strong fault-tolerance ability and robustness required in the system during the three-dimensional monitoring with wireless sensor networks, a probability-based K- coverage control approach for three-dimensional wireless sensor network, PKCCA, is proposed in this paper. Divide the three-dimensional monitoring region into a grid, use a greedy heuristic to determine the best placement of one sensor at a time until a preset upper limit on the number of sensors is reached, or K-coverage with probability T of the grid points is achieved. Comparing with the traditional random and uniform deployment, the simulation results indicate PKCCA uses less sensors to achieve the same coverage degree and detection precision or same sensors to reach higher coverage degree. The case of preferential coverage (preferential coverage degree and preferential monitoring precision) for sub-regions is also analyzed and simulated.

Keywords: wireless sensor networks; three-dimensional coverage; coverage control; K-coverage

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