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无线传感器网络路径覆盖问题研究

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Study on Path Coverage in Wireless Sensor Networks

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摘要 目标跟踪是无线传感器网络的重要应用之一。在目标跟踪过程中，用户通常更关心目标移动路径的覆盖情况，而不是整个网络部署区域的覆盖情况。学术界对路径1覆盖的问题做了详细的研究，但是并没有给出路径$k(k\geq1)$覆盖的分析。针对这一问题，该文首先将节点随机布设的2维传感器网络中目标移动路径的覆盖问题转化为1维线段覆盖问题，并通过理论分析给出任意直线路径满足$k(k\geq1)$覆盖的概率下限。实验表明，在k较小时，该下限可以较好的逼近仿真结果。

关键词： 无线传感网 入侵检测 路径覆盖

Abstract：Targets tracking is one of the key applications of wireless sensor networks. In this kind of applications, the sensing process on the targets' moving paths, rather than in the whole area, is often of more concern. The path 1-coverage problem has been extensively investigated, however, the path k-coverage ($k>1$) problem receives little attention. To address this issue, in this paper, the coverage problem induced on an intrusion path by a randomly deployed two-dimensional sensor network is first transformed into a one-dimensional coverage problem, and then a theoretical lower bound to the full k-coverage probability of a randomly selected straight path is derived. Experimental results show that this lower bound is very close to the simulation results, especially when k is small.

Keywords： Wireless Sensor Networks (WSN)   Intrusion detection   Path coverage

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