

无线传感器网络中基于刚性的移动锚节点路径规划

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Rigidity Guided Trajectory Design of Mobile Anchor in Wireless Sensor Networks

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摘要

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摘要 在移动锚节点辅助定位中, 锚节点通常沿着预设轨迹扫描或采用随机方式移动, 当节点分布不均匀、待定位区域形状复杂时, 存在锚节点冗余移动、位置冗余广播及定位性能难以确保等问题。该文提出了利用网络拓扑信息进行移动路径规划的新思路, 首先利用刚性理论将网络划分为多个唯一可定位的单元, 之后寻找一条遍历各单元的最短路径作为锚节点的移动轨迹, 锚节点沿着该轨迹移动、依次定位各单元。大规模仿真结果表明, 该策略可以有效避免锚节点的冗余移动和位置广播, 灵巧适应各种布设情形, 与经典的扫描式路径相比, 大大降低了路径长度和位置数目。

关键词: 无线传感器网络 网络定位 移动锚节点 刚性理论 路径规划

Abstract: In most mobile-assisted localization schemes, mobile anchors usually follow predefined scan trajectories or move randomly. When sensors are deployed non-uniformly in various terrains with complex shapes, random and predefined trajectories lead to wasted efforts in localization and uncertain localization performance. In this paper, by utilizing deployment topology information, a novel scheme of trajectory design for mobile anchor is proposed. Based on rigidity theory, the original network is first partitioned into localization units. The shortest path traversing all units is chosen as the trajectory of mobile anchor. Anchor moves along this path and localizes units in turn. Large scale simulations show that the new scheme avoids unnecessary movements and position broadcast efficiently and accommodates all kinds of deployment scenarios smartly. Compared with classic scan based trajectory, anchor travels at much shorter path and broadcasts much fewer positions.

Keywords: Wireless sensor network Network localization Mobile anchor Rigidity theory Trajectory design

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