Wireless Networks
July 2013, Volume 19, Issue 5, pp 945-968

Deployment of a mobile wireless sensor network with *k*-coverage constraint: a cellular learning automata approach

Abstract

Deployment of a wireless sensor network is a challenging problem, especially when the environment of the network does not allow either of the random deployment or the exact placement of sensor nodes. If sensor nodes are mobile, then one approach to overcome this problem is to first deploy sensor nodes randomly in some initial region within the area of the network, and then let the sensor nodes to move around and cooperatively and gradually increase the covered section of the area. Recently, a cellular learning automata-based deployment strategy, called CLA-DS, is introduced in literature which follows this approach and is robust against inaccuracies which may occur in the measurements of sensor positions or in the movements of sensor nodes. Despite its advantages, this deployment strategy covers every point within the area of the network with only one sensor node, which is not enough for applications with *k*-coverage requirement. In this paper, we extend CLA-DS so that it can address the *k*-coverage requirement. This extension, referred to as CLA-EDS, is also able to address *k*-coverage requirement with different values of *k* in different regions of the network area. Experimental results have shown that the proposed deployment strategy, in addition to the advantages it inherits from CLA-DS, outperforms existing algorithms such as DSSA, IDCA, and DSLE in covering the network area, especially when required degree of coverage differs in different regions of the network.

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Deployment of a mobile wireless sensor network with *k*-coverage constraint: a cellular learning automata approach
Journal
Wireless Networks
Volume 19, Issue 5 , pp 945-968
Cover Date
2013-07-01
DOI
10.1007/s11276-012-0511-7
Print ISSN
1022-0038
Online ISSN
1572-8196
Publisher
Springer US
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- k-Coverage

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