

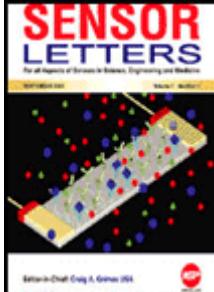


N A Cellular Learning Automata Based Clustering Algorithm for Wireless Sensor Networks

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Source: *Sensor Letters*, Volume 6, Number 5, October 2008 , pp. 723-735(13)

Publisher: American Scientific Publishers



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Abstract:

In the first part of this paper, we propose a generalization of cellular learning automata (CLA) called irregular cellular learning automata (ICLA) which removes the restriction of rectangular grid structure in traditional CLA. In the second part of the paper, based on the proposed model a new clustering algorithm for sensor networks is designed. The proposed clustering algorithm is fully distributed and the nodes in the network don't need to be fully synchronized with each other. The proposed clustering algorithm consists of two phases; initial clustering and reclustering. Unlike existing methods in which the reclustering phase is performed periodically on the entire network, reclustering phase in the proposed method is performed locally whenever it is needed. This results in a reduction in the consumed energy for reclustering phase and also allows reclustering phase to be performed as the network operates. The proposed clustering method in comparison to existing methods produces a clustering in which each cluster has higher number of nodes and higher residual energy for the cluster head. Local reclustering, higher residual energy in cluster heads and higher number of nodes in each cluster results in a network with longer lifetime. To evaluate the performance of the proposed algorithm several experiments have been conducted. The results of experiments have shown that the proposed clustering algorithm outperforms existing clustering methods in terms of quality of clustering measured by the total number of clusters, the number of sparse clusters and the remaining energy level of the cluster heads. Experiments have also shown that the proposed clustering algorithm in comparison to other existing methods prolongs the network lifetime.

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LEARNING AUTOMATA; CELLULAR LEARNING AUTOMATA

Document Type: Research article

DOI: 10.1166/sl.2008.m146

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