

**Clustering the wireless Ad Hoc networks: A distributed learning automata approach**

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In Ad Hoc networks, the performance is significantly degraded as the size of the network grows. The network clustering by which the nodes are hierarchically organized on the basis of the proximity relieves this performance degradation. Finding the weakly connected dominating set (WCDS) is a promising approach for clustering the wireless Ad Hoc networks. Finding the minimum WCDS in the unit disk graph is an NP-Hard problem, and a host of approximation algorithms has been proposed. In this article, we first proposed a centralized approximation algorithm called DLA-CC based on distributed learning automata (DLA) for finding a near optimal solution to the minimum WCDS problem. Then, we propose a DLA-based clustering algorithm called DLA-DC for clustering the wireless Ad Hoc networks. The proposed cluster formation algorithm is a distributed implementation of DLA-CC, in which the dominator nodes and their closed neighbors assume the role of the cluster-heads and cluster members, respectively. In this article, we compute the worst case running time and message complexity of the clustering algorithm for finding a near optimal cluster-head set. We argue that by a proper choice of the learning rate of the clustering algorithm, a trade-off between the running time and message complexity of algorithm with the cluster-head set size (clustering optimality) can be made. The simulation results show the superiority of the proposed algorithms over the existing methods.

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