Title: Connectivity Discovery in Wireless Sensor Networks
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Abstract

Connectivity discovery is useful in practical deployment of wireless sensor network. In order to understand the behavior and performance bottleneck, knowledge of the network connectivity is crucial. Obtaining connectivity for dense wireless sensor network is expensive due to large number of neighbors and shared access of limited wireless bandwidth. In this paper, we consider the problem of efficiently obtaining network connectivity. We propose a connectivity discovery algorithm that consists of three components. First, it uses a hop vector distance based scheme to generate a set of candidate neighbors for each node. Next, an approach based on a combination of normal and counting Bloom filters is then used to refine the candidate set to obtain more exact connectivity. We provide analytical formula for the efficiency of these two kinds of Bloom filters and show how they should be applied depending on the network and neighbor size. Finally, for nodes with sufficiently small number of unconfirmed neighbors, brute-force searches can be performed. The proposed algorithm is very efficient but at the cost of not obtaining all the neighbors with a very small probability. For node densities between 5 and 30, communication cost reduction varies from 65% to 85% comparing to optimal compression result of m(log T logm), where m is the number of neighbors detected and T is the total number of nodes in the network.