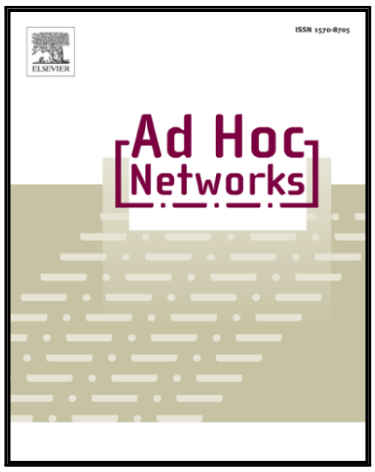

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Analytical Modeling of Self-pruning and an Improved Probabilistic Broadcast for Wireless Multihop Networks

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Abstract

The *first wave* of broadcasting algorithms exploit neighbor knowledge to reduce redundant retransmissions in mobile ad hoc wireless networks (MANETs). Self-pruning is one of such broadcast algorithm that received much attention from the research community. In self-pruning, only a subset of nodes forward the message based on certain forwarding rule. Moreover, it belongs to one of the reliable broadcasting algorithm category where a broadcast message is guaranteed (at least algorithmically) to reach all the nodes in the network. Despite its exclusive feature, so far the evaluation of self-pruning is mainly based on experiments and lacks detailed theoretical analysis. In this paper, we develop an analytical model for self-pruning to determine expected number of forwarding nodes required to complete a broadcast in the network. The derived expression is a function of various network parameters (such as, network density and distance between nodes) and radio transceiver parameters (such as transmission range). Moreover, the developed mathematical expression provides us a better understanding of the highly complex packet forwarding pattern of self-pruning and a valuable insight to design a new broadcasting heuristic. After careful analysis, we propose a new heuristic dubbed as *dynamic probabilistic broadcast* where the rebroadcast probability of each node is dynamically determined from a developed mathematical expression. Extensive simula-

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