

Price-Based Resource Allocation for Wireless Ad Hoc Networks with Multi-Rate Capability and Energy Constraints

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Abstract

Wireless ad hoc networks have attracted a lot of attentions recently. Resource allocation in such networks needs to address both fairness and overall network performance. Pricing is a prospective direction to regulate behaviors of individual nodes while providing incentives for cooperation. In this work, we develop some pricing strategies for resource allocation by taking account of factors like multiple transmission rates and energy consumption of nodes, which have not been well studied in former works. Multirate transmission capability is commonly seen in most wireless products nowadays, while energy is one of the most important resources in portable devices. We propose a clique-based model which allows us to achieve optimal resource utilization and fairness among network flows when multi-rate transmission is considered. We also show how to extend the model to dynamically adjust prices based on energy consumptions of flows. In particular, our model takes into account energy consumptions in the transmitters' side, the receivers' side, and those that are non-transmitters and non-receivers but are interfered by these activities. So our model can more accurately reflect the real

energy constraint in a wireless network. Simulation results are presented to show the convergence and other properties of these strategies.

Keyword : ad hoc network, nonlinear programming, pricing, resource allocation, wireless communication