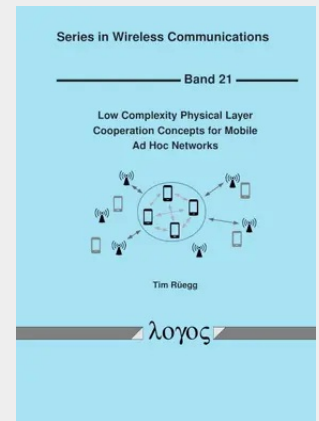


Low Complexity Physical Layer Cooperation Concepts for Mobile Ad Hoc Networks

In this thesis low complexity physical layer cooperative communication schemes are investigated to improve the spectral efficiency, the scalability and the coverage range of mobile ad hoc networks (MANETs). Specifically, we investigate cooperative broadcasting and provide an accurate coverage prediction to it, introduce leakage based beam shaping to increase the transmission range of virtual antenna arrays, while the signal in undesired directions is suppressed, and propose simple resource allocation schemes for quantize-and-forward receive cooperation. We provide theoretical analysis and numerical evaluations of these schemes and investigate their performance, respectively the performance of combinations thereof, in two different scenarios: military MANETs and urban traffic hotspots with ultra high user density. In addition to the cooperative communication schemes, we investigate the relation between the applied transmit power and the resulting interference power at unintended users in leakage based precoding, a promising multi-user MIMO precoding approach. Based on these investigations, we propose a target rate precoding as well as a rate optimal precoding, and provide a quasi closed-form solution for both.



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