

Combined Distributed Power Control, Antenna Array and Equalizer Adaptation for Indoor Radio

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Abstract

We present the coupled adaptation problem for a radio transceiver which includes adaptive power control, an adaptive transmitter and receiver antenna arrays, and an adaptive equalizer. The motivation for this work is the design of an experimental high-speed highly adaptive transceiver for indoor communications, although the problem of coupled adaptation has much wider implications. The action of each adaptive element has an impact on the others, and each transceiver in a network is coupled by the mutual interference. This interference is to some degree a function of the antenna beam patterns and power levels. Thus coupling of the adaptive loops exists at two levels. We describe a set of distributed gradient descent algorithms which under mild constraints on channel allocations converge with high probability even in peer-to-peer communication topologies. We describe other settings in which distributed adaptation is likely to also be successful.

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