Dynamic discrete power control
in cellular networks*

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Abstract

We consider an uplink power control problem where each mobile wishes to maximize its throughput (which depends on the transmission powers of all mobiles) but has a constraint on the average power consumption. A finite number of power levels are available to each mobile. The decision of a mobile to select a particular power level may depend on its channel state. We consider two frameworks concerning the state information of the channels of other mobiles: (i) the case of full state information and (ii) the case of local state information. In each of the two frameworks, we consider both cooperative as well as non-cooperative power control. We manage to characterize the structure of equilibria policies and, more generally, of best-response policies in the non-cooperative case. We present an algorithm to compute equilibria policies in the case of two non-cooperative players. Finally, we study the case where a malicious mobile, which also has average power constraints, tries to jam the communication of another mobile. Our results are illustrated and validated through various numerical examples.

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