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Dynamic discrete power control in cellular networks*

Eitan Altman† Konstantin Avrachenkov‡ Ishai Menache§
Gregory Miller¶ Balakrishna Prabhu‖ Adam Shwartz**

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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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†INRIA, 2004 route des Lucioles BP 93, 06902 Sophia Antipolis, France, email: altman@sophia.inria.fr

‡INRIA, 2004 route des Lucioles BP 93, 06902 Sophia Antipolis, France, email: k.avrachenkov@sophia.inria.fr

§Department of Electrical Engineering, Technion, Haifa, 32000, Israel, email: imenache@technion.ac.il

¶The Institute of Informatics Problems of the Russian Academy of Sciences, 44/2 Vavilova Street, Moscow, 117333, Russia, email: gmiller@ipiran.ru

‖CWI, Kruislaan 413, 1098 SJ Amsterdam, The Netherlands, email: b.j.prabhu@cwi.nl. The author is also affiliated with the Department of Mathematics and Computer Science, Eindhoven University of Technology, 5612 AZ Eindhoven, The Netherlands and EURANDOM, P.O. Box 513 - 5600 MB Eindhoven, The Netherlands.

**Department of Electrical Engineering, Technion, Haifa, 32000, Israel, email:adam@ee.technion.ac.il