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A Linear Downlink Power Control Algorithm for Cellular Networks

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In order to optimize its capacity, a cellular radio system can use a power control algorithm to provide the best overall carrier-to-interference ratio to all of its links. Unfortunately, the optimum algorithm has an impractical exponential complexity of O(2^n) . However, an approach to the problem has been overlooked. By taking advantage of propagation effects it is possible to split up a large problem into overlapping smaller ones. Doing so can achieve virtually identical results to that of the optimum algorithm in O(n) time (having a stable system). Moreover, this proposed algorithm is suitable as a distributed power control algorithm, whereas the optimum algorithm is a centralized one. This makes the proposed algorithm more suitable for today's cellular network architectures. Furthermore, it is also very easy to parallelize the proposed algorithm over multiple threads and cores offering a great added hardware advantage. In this paper we introduce this algorithm, prove its linear complexity and provide numerical results from simulations.

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