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On the Complexity Analysis of Randomized Block-Coordinate Descent Methods

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In this paper we analyze the randomized block-coordinate descent (RBCD) methods proposed in [8,11] for minimizing the sum of a smooth convex function and a block-separable convex function. In particular, we extend Nesterov's technique developed in [8] for analyzing the RBCD method for minimizing a smooth convex function over a block-separable closed convex set to the aforementioned more general problem and obtain a sharper expected-value type of convergence rate than the one implied in [11]. Also, we obtain a better high-probability type of iteration complexity, which improves upon the one in [11] by at least the amount $O(n/\epsilon)$, where ϵ is the target solution accuracy and n is the number of problem blocks. In addition, for unconstrained smooth convex minimization, we develop a new technique called {\it randomized estimate sequence} to analyze the accelerated RBCD method proposed by Nesterov [11] and establish a sharper expected-value type of convergence rate than the one given in [11].

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