A PSEUDO-MARGINAL SIMULATED ANNEALING ALGORITHM

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In this work, we consider a stochastic global optimization problem where only unbiased estimators of the cost function are accessible. For instance, we want to find $x \in X$ such that $f(x) = \inf_{y \in X} f(y)$, where $f : X \to \mathbb{R}_+$ is a function that can be accessed to only through independent measures $f(x_i) + \epsilon_i$ with $\mathbb{E}[\epsilon_i] = 0$, for all $i \geq 1$. In this setting, random explorations of the space $X$ converging to such an $x$ based on an inhomogeneous Markov chain can be performed in a similar fashion to the simulated annealing algorithm. This approach gives raise to noisy simulated annealing algorithms, as proposed in [1]. Here we propose pseudo-marginal versions of the simulated annealing algorithm, which turns out to be exact, in the sense that, regardless the size of the Monte Carlo sample for the cost function, the transition of the inhomogeneous Markov kernel turns out to be reversible with respect to the Gibbs measure associated to the (unnoisy) cost function. We also provide a Rao–Blackwellised version of this algorithm. The performances of these new algorithms are assessed by numerical experiments.

References