Numerical study of bioinspired methods for solving global optimization problems

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Bioinspirated optimization methods performs models representing simplified analogues of some biological processes (population evolution, collective behavior of self-organizing agents, etc.). They refer to the so-called meta-heuristic approaches, which do not guarantee the global extrema finding, but often allows one to find a good approximation in a rather short time. In fact, meta-heuristics describe a set of rules for the search process implementation (mostly a stochastic process). It aims to find nearoptimal solution by the target function. In recent practice, large-scale problems with an "expansive" target functions are widely solved with the use of hybrids and multimethod schemes based on both bioinspired meta-heuristics and deterministic, in particular, gradient algorithms. Thus it becomes important to have some information about different meta-heuristics effectiveness and any preliminary assessment of their capabilities [1–3]. The work deals with the construction of an empirical rating, we perform a numerical study of more than 20 different modern bioinspired methods. For results of the research to be representative, we have defined a unified set of tests (synthetic and applied problems, dimensions of 100 or more variables). For each problems we generated a set of 100 starting points, each studied method runs on these sets with the same limit of an objective function computations. The main result of the work is a simple statistics (average, standard deviation, minimum and maximum value of the function, real time) of each method work on 100 starts for the whole set of the tests. Every considered method possessing its own parameters was searched for their possible values (using fixed step on a uniform grid). Thus, the results obtained are close to optimal in the sense of the methods parameters sets.

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