A COMBINED APPROACH TO ADAPTIVE DIFFERENTIAL EVOLUTION

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Abstract: The paper deals with the adaptive mechanisms in differential evolution (DE) algorithm. DE is a simple and effective stochastic algorithm frequently used in solving the real-world global optimization problems. The efficiency of the algorithm is sensitive to setting its control parameters. Several adaptive approaches have appeared recently in order to avoid control-parameter tuning. A new adaptive variant of differential evolution is proposed in this study. It is based on a combination of two adaptive approaches published before. The new algorithm was tested on the well-known set of benchmark problems developed for the special session of CEC2005 at four levels of population size and its performance was compared with the adaptive variants that were applied in the design of the new algorithm. The new adaptive DE variant outperformed the others in several test problems but its efficiency on average was not better.

Key words: *Global optimization, differential evolution, adaption, combined adaptive mechanism, experimental comparison*

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1. Introduction

Optimization problems are frequent part of human activities in many fields. We address the single-objective optimization problem defined as follows: for a given objective function $f : S \to \mathcal{R}$, $S \subset \mathcal{R}^d$ we are searching for a point $\boldsymbol{x}^*$ which is called the global minimum point when it satisfies

$$\forall \boldsymbol{x} \in S, f(\boldsymbol{x}^*) \leq f(\boldsymbol{x}). \tag{1}$$

The search space S is closed compact set $S = \prod_{i=1}^{D}[a_i, b_i]; \quad a_i < b_i, \quad i = 1, 2, \ldots, D$. The $f(\boldsymbol{x})$ can be evaluated at any point $\boldsymbol{x} \in S$.

It is well-known that there is no deterministic algorithm solving this problem in polynomial time [1] in general. Standard iterative deterministic algorithms tend

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