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A HYBRID FAST DESCENT METHOD FOR GLOBALLY OPTIMIZING HIGH DIMENSIONAL FUNCTIONS

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Abstract. A new algorithm built on a hybrid method (GRSA) for large scale global optimization problems is proposed. Unlike the previous proposed method that the original objective functions keep unchanged during the whole course of optimizing, a convexized auxiliary function on the obtained local minimizer so far is employed to improve the SA search ability. The experiments conducted show that the new method provides excellent results especially for large scale problems, compared to other state-of-the-art algorithm.

Keywords. Global optimization; Gradient algorithm; Auxiliary function; Simulated annealing method (SA).

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1 Introduction

A global optimization problem (GOP) can be expressed by

$$\min f(x) \ s.t. \ x \in S \tag{1}$$

where $f(x)$ is a real-valued function defined on $S \subseteq R^n$ which refers to the feasible region. A vector $x^* \in S$ satisfying $f(x^*) \leq f(x)$ for all $x \in S$ is called a global minimizer of $f(x)$ over S and the corresponding value $f(x^*)$ is called a global minimum.

Definition.1.1 A function $f(x) : R^n \to R$ is called a globally convex one, if

$$\lim_{\|x\to\|+\infty} f(x) = +\infty \tag{2}$$

where $\|x\|$ denotes the standard Euclidean norm of vector x. In this paper, we assume that all the objective functions are global convex ones.

Finding the optimal solution to a complex optimization problem is of great importance in many fields, ranging from molecular structure prediction to the design of microprocessor circuitry and from production management