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A MODIFIED RANDOM IMPLEMENTATION OF THE LEVEL-VALUE ESTIMATION METHOD FOR GLOBAL OPTIMIZATION

Zheng Peng[1,2] and Donghua Wu[1], Haidong Zhang[1]

[1]Department of Mathematics
Shanghai University, Shanghai, P. R. China

[2]Department of Applied Mathematics
Hunan Institute of Science and Technology, YueYang Hunan, P. R. China

Abstract. In this paper, we propose a modified random implementation of the level-value estimation method for global optimization which was proposed in [11]. In the modified implementable algorithm, we employ a kernel density function in nonparametric function estimation as the importance sampling density, and use the main idea of the cross-entropy method to update this density function. Numerical results show that the modified implementation is better numerical precision than that one which uses a coordinate-normal density as the sample density.

Keywords. Global optimization; Level-value estimation method; Importance sampling; Kernel density function; The cross-entropy method.

AMS (MOS) subject classification: 90C30; 65K05.

1 Introduction

Consider the global optimization problem

$$c^* = \text{glob} \min_{x \in D} f(x), \tag{1}$$

where $f(x)$ is continuous on D, and D is a compact subset in R^p.

There are various applications in management science and engineering of problem (1), and there are various methods for solving this problem with various conditions (see, for example, [1, 6, 7, 8, 12, 17]). These methods include deterministic algorithms and stochastic algorithms, for example, the modified function method (filled and tunnelling function) is the deterministic method, whereas genetic algorithm, tabu search and simulated annealing algorithm are the stochastic ones, see [9].

The integral level-set method for global optimization which is proposed by Zheng Quan firstly (see, for example, [3, 18]), which is regarded as a deterministic method. We modified the integral level-set method in [15]. The cross-entropy method for continuous optimization is a stochastic method which is developed by R.Y. Rubinstein (see, for example, [4, 5]). Being lighted