A NOTE ON GLOBAL NUMERICAL OPTIMIZATION BASED ON CHAOTIC SEARCH

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Résumé : In this communication we undertake a performance analysis for a new class of evolutionary algorithms called chaos optimization algorithm (COA), recently proposed by Caponetto and al. [1], [2], [3], It was originally proposed to solve nonlinear optimization problems with bounded variables. Different chaotic mapping have been considered, combined with several working strategy. In this work, a chaotic strategy is proposed based on a new two-dimensional discrete chaotic attractor. Experiments results showed that the proposed algorithm can achieve good performance.

Mots-Clefs : Chaos ; Chaos optimization ; discrete map ; Global optimization.

Classification MSC2010 : Un ou deux codes MSC2010

1 Introduction

Global optimization problems arise in many fields, including materials science, biology, chemistry, and engineering [1]. Virtually all methods for global optimization consist of two phases: a global phase, aimed at thorough exploration of the feasible region or subsets of the feasible region where it is known the global optimum will be found, and a local phase aimed at locally improving the approximation to some local optima. Often these two phases are blended into the same algorithm, which automatically switches between exploration and refinement. The term "two-phase" associated with global optimization algorithms appears quite often in the literature, generally associated with stochastic techniques which make use of deterministic local searches. Two-phase methods had a very relevant position and were considered among the most promising global optimization algorithms.

More recently, however, much more demanding problems have been solved, usually by means of other, general purpose algorithms (typically simulated annealing and genetic methods) which are mostly based upon sampling, without local searches.

The main reason behind the use of such methods might be that, when the dimension is quite high, methods based upon uniform random sampling, a characteristic shared by most two-phase methods, are not capable of sufficiently covering the search space.

Chaos has been widely studied since the first publication on this issue. These days, the existence of chaotic systems is an accepted fact of science. Chaos is a term used to describe behavior that is seemingly random, but has an underlying mathematical order to it. Chaos is very common in nature, but is often mistaken for random behavior. Chaotic systems have been noticed in optimization problems. Because chaos has three properties: randomness, ergodicityï¼and regularityï¼ generating new population by applying chaotic function ensures almost every state in solution space can be visited.

Due to the easy implementation and special ability to avoid being trapped in local optima, chaos has been a novel optimization technique and chaos-based searching algorithms have aroused intense interests [1,2,3].

References

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