Accepted Manuscript

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PII: S0167-739X(17)30469-7
DOI: http://dx.doi.org/10.1016/j.future.2017.07.036
Reference: FUTURE 3566

To appear in: *Future Generation Computer Systems*

Received date : 23 March 2017
Revised date : 2 June 2017
Accepted date : 16 July 2017

Please cite this article as: W. Zang, L. Ren, W. Zhang, X. Liu, A cloud model based DNA genetic algorithm for numerical optimization problems, *Future Generation Computer Systems* (2017), http://dx.doi.org/10.1016/j.future.2017.07.036

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ACCEPTED MANUSCRIPT

A cloud model based DNA genetic algorithm for numerical optimization problems

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H E I G H T S

- A Cloud model based genetic algorithm with DNA encoding called CM-DNAGA is proposed.
- The main idea of the CM-DNAGA is combined the properties of randomness and stable tendency of the normal cloud mode with bio-inspired encoding GA.
- In the CM-DNAGA, the Y conditional normal cloud generator is used as the crossover operator and the basic normal cloud generator is used as the mutation operator.

ARTICLE INFO

Article history:
Received
Received in revised from
Accepted
Available online

Kewords:
Cloud model
DNA
genetic algorithm
DNA-GA
numerical optimization

A B S T R A C T

Bio-inspired algorithms for optimization are significant topics in the areas of computational intelligence. Traditional genetic algorithm easily gets stuck at a local optimum, and often has slow convergent speed. To overcome these drawbacks, the Cloud model based genetic algorithm with DNA encoding (CM-DNAGA) is originally proposed in this study. The CM-DNAGA algorithm is based on not only the properties of randomness and stable tendency of the normal cloud model, but also the idea of GA with the bio-inspired coding method, i.e., DNA. In CM-DNAGA, a Y conditional normal cloud generator is used as the genetic crossover operator, and a basic normal cloud generator is used as the mutation operator. The simulation experiments are conducted on 12 numerical optimization functions, which evaluate the performance of the proposed algorithm. The experimental results indicate that the proposed method is a competitive optimizer in comparison with the three state-of-the-art heuristic algorithms, i.e. standard GA, PSO and RNA-GA.

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1. Introduction

Numerical optimization problems exist widely in different areas of science research and engineering practice. In the past decades, these optimization problems are solved by using the traditional mathematical methods [1]. With increasing complexity of these optimization problems, the traditional mathematical methods cannot find the satisfactory solutions. Therefore, the effective optimization algorithms are needed to solve these kinds of optimization problems. One class of the optimization algorithms inspired by natural computing is effective method to solve these problems, such as genetic algorithm (GA) [2], particle swarm

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