



A HYBRID GENETIC ALGORITHM AND GRAVITATIONAL SEARCH ALGORITHM FOR GLOBAL OPTIMIZATION

Aizhu Zhang*, Genyun Sun*, Zhenjie Wang*, Yanjuan Yao[†]

Abstract: The laws of gravity and mass interactions inspire the gravitational search algorithm (GSA), which finds optimal regions of complex search spaces through the interaction of individuals in a population of particles. Although GSA has proven effective in both science and engineering, it is still easy to suffer from premature convergence especially facing complex problems. In this paper, we proposed a new hybrid algorithm by integrating genetic algorithm (GA) and GSA (GA-GSA) to avoid premature convergence and to improve the search ability of GSA. In GA-GSA, crossover and mutation operators are introduced from GA to GSA for jumping out of the local optima. To demonstrate the search ability of the proposed GA-GSA, 23 complex benchmark test functions were employed, including unimodal and multimodal high-dimensional test functions as well as multimodal test functions with fixed dimensions. Wilcoxon signed-rank tests were also utilized to execute statistical analysis of the results obtained by PSO, GSA, and GA-GSA. Experimental results demonstrated that the proposed algorithm is both efficient and effective.

Key words: *Heuristic algorithms, genetic algorithm, gravitational search algorithm, optimization*

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1. Introduction

When solving optimization problems with a high-dimensional search space, classical optimization algorithms do not provide suitable solutions because the search space increases exponentially with problem size; solving these problems by exact techniques is thus not practical [26]. Researchers have developed several algorithms to solve complex optimization problems, including the branch-and-bound [20], heuristic [14], and gradient-based methods [34]. Among them, heuristic algorithms have become increasingly popular.

*Aizhu Zhang, Genyun Sun – Corresponding author, Zhenjie Wang, China University of Petroleum, School of Geosciences, Qingdao, Shandong, 266580, China, E-mail: zhangaiizu789@163.com, genyunsun@163.com, sdwzj@upc.edu.cn

[†]Yanjuan Yao, Satellite Environment Center (SEC), Ministry of Environmental Protection (MEP) of China, Beijing, 100094, China, E-mail: yjya02008@yahoo.com.cn