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Termite Spatial Correlation based Particle Swarm Optimization for Unconstrained Optimization

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Abstract

In last few years, swarm intelligence has become the mainstay in the field of continuous optimization with many researchers developing algorithms simulating swarm behavior for the purpose of numerical optimization. This work proposes a new Termite Spatial Correlation based Particle Swarm Optimization (TSC-PSO) algorithm inspired by the movement strategy shown within Termites (Cornitermes cumulans). TSC-PSO modifies the velocity equation in the original PSO algorithm by replicating the step correlation based termite motion mechanism that exhibits individually in nature and works with decentralized control to collectively perform the overall task. Further, the algorithm incorporates the mutation strategy within it to make it suitable to avoid stagnation conditions while performing optimization in complex search spaces. For deriving its utility various benchmark functions of different geometric properties have been used. Experiments clearly demonstrate the success of the proposed algorithm in different benchmark conditions against various state-of-the-art optimization algorithms.

Keywords: Spatial correlation, Metaheuristic, Unconstrained optimization and self organization

1. Introduction

Since 1990’s researchers around the world have been analyzing and trying to replicate various natural processes common in physical and biological systems around us. These processes had been proved quite effective when used to formulate optimization algorithms for solving various scientific and engineering problems. In general, the task of optimization is to optimize/tune certain system parameters by formulating the system in terms of a set of mathematical equations. On the basis of whether the algorithm formulation involves randomness or not the optimization algorithm can either be deterministic [1] or stochastic (random) [2]. One such category of the stochastic algorithm called heuristic algorithm
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