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Chaotic catfish particle swarm optimization for solving global numerical optimization problems. (English) Zbl 1213.65087

Summary: Chaotic catfish particle swarm optimization (C-CatfishPSO) is a novel optimization algorithm proposed in this paper. C-CatfishPSO introduces chaotic maps into catfish particle swarm optimization (CatfishPSO), which increase the search capability of CatfishPSO via the chaos approach. Simple CatfishPSO relies on the incorporation of catfish particles into particle swarm optimization (PSO). The introduced catfish particles improve the performance of PSO considerably. Unlike other ordinary particles, the catfish particles initialize a new search from extreme points of the search space when the gbest fitness value (global optimum at each iteration) has not changed for a certain number of consecutive iterations.

This results in further opportunities of finding better solutions for the swarm by guiding the entire swarm to promising new regions of the search space and accelerating the search. The introduced chaotic maps strengthen the solution quality of PSO and CatfishPSO significantly. The resulting improved PSO and CatfishPSO are called chaotic PSO (C-PSO) and chaotic CatfishPSO (C-CatfishPSO), respectively. PSO, C-PSO, CatfishPSO, C-CatfishPSO, as well as other advanced PSO procedures from the literature were extensively compared on several benchmark test functions. Statistical analysis of the experimental results indicate that the performance of C-CatfishPSO is better than the performance of PSO, C-PSO, CatfishPSO and that C-CatfishPSO is also superior to advanced PSO methods from the literature.

MSC:
65K05 Numerical mathematical programming methods
90C15 Stochastic programming
90C26 Nonconvex programming, global optimization

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chaotic catfish particle swarm optimization; catfish effect; numerical examples; global optimization; algorithm

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Catfish

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