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Pareto强度值演化算法求解约束优化问题

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Abstract
A new approach is presented to handle constraints optimization using evolutionary algorithms. It neither uses any penalty function nor makes distinction between feasible solutions and infeasible solutions. The new technique treats constrained optimization as a two-objective optimization. One objective is original objective function, the other is the degree violating the constraints. Individual's ranking procedure is based on its Pareto strength which appears first in multi-objective optimization. Pareto strength evaluates an individual's fitness dependent on the number of dominated points in the population. By combining Pareto strength ranking procedure with minimal generation gap modal, a new real-coded genetic algorithm is proposed. The new approach is compared against other evolutionary optimization techniques in several benchmark functions. The results obtained show that the new approach is a general, effective and robust method. Its performance outperforms some other techniques. Especially for some complicated optimization problems with inequality and equality constraints, the proposed method provides better numerical accuracy.

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摘要
提出了一种求解约束函数优化问题的方法.它不使用传统的惩罚函数,也不区分可行解和不可行解.新的演化算法将约束优化问题转换成两个目标优化问题,其中一个为原问题的目标函数,另一个为违反约束条件的程度函数.利用多目标优化问题中的Pareto优于关系,定义个体Pareto强度值指标以便对个体进行排序选优,根据Pareto强度值排序和最小代数代沟模型设计出新的实数编码遗传算法.对常见测试函数的数值实验证实了新方法的有效性、通用性和稳健性,其性能优于现有的一些演化算法.特别是对于一些既有等式约束又有不等式约束的复杂非线性规划问题,该算法获得了更高精度的解.

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