改进的自适应约束差分进化算法

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摘　要：为了更好地求解约束优化问题，提出了一种新的差分进化算法.首先该算法利用两个变异策略平衡局部搜索与全局搜索.其次用可行性规则选出新种群，并利用替换策略替换新种群中的较差个体.然后使用一种劣解变异机制，对最差个体进行变异以保持种群多样性.最后引入自适应参数控制机制，增强算法的鲁棒性和适应性.为了验证该算法的有效性，算法测试了 10 个标准约束优化问题和 10 个工程约束优化问题，实验结果表明，该算法求解精度较高、具有较快的收敛速度和较强的鲁棒性.

关键词：差分进化算法；约束优化；参数自适应；可行性规则

Improved self-adaptive constrained differential evolution algorithm

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Abstract：In order to solve constrained optimization problems, a novel differential evolution algorithm is proposed. Firstly, the algorithm uses two mutation strategies to balance local search ability and global search ability. Secondly, the new population is selected based on the feasibility-based rule, and poor individuals in the new population are replaced by the substitution strategy. Then, a mutation mechanism is used to mutate the worst individual to maintain the diversity of the population. Finally, the adaptive parameter control mechanism is introduced to enhance the robustness and adaptability of the algorithm. In order to verify the effectiveness of this algorithm, 10 benchmark constraint optimization problems and 10 engineering constraint optimization problems are tested. Experimental results show that the algorithm has high precision, fast convergence speed, and strong robustness.

Key words： differential evolution algorithm; constrained optimization; parameter self-adaptive; feasibility rule