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求解约束优化问题的内外交叉遗传算法

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Inward-outward crossover based genetic algorithm for constrained optimization problem

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- 摘要
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全文: PDF (528 KB)   HTML (1 KB)   输出: BibTeX | EndNote (RIS)   背景资料

摘要 针对很多约束优化问题的最优解位于可行域的边界上或其附近的特点,提出了一种新的遗传算法.算法将种群中的可行解和不可行解分别存贮在两个容器中,新设计的交叉算子(内外交叉法)尽量让可行域内的可行解与可行域外的不可行解交叉,并顺着有利的方向一维搜索到可行域边界,此举既增大了个体接近全局最优解的几率,又增强了算法的收敛速度;粒子群变异法则吸取粒子群 (PSO)算法的优点,让粒子沿粒子自身历史最优和全局最优的方向变异, 而选择算子则采取了保留固定比例不可行解的方法. 仿真结果证明了算法能够在种群规模小,迭代次数少的情况下迅速接近或找到全局最优解.

关键词: 约束优化   内外交叉法   一维搜索   粒子群变异法

Abstract： Considering that the global optimal solutions often locate on or near the boundary of the feasible region for many constrained optimization problems, a novel genetic algorithm was proposed in this paper. The basic idea of the proposed algorithm was to put feasible solutions and infeasible solutions into two different containers respectively. Subsequently, a new designed crossover operator(named inwardoutward crossover operator) was used to a feasible solution and a infeasible solution, then a line search along a potential decent direction was used to improve the offspring so as to find a good solution on or near to the boundary of feasible region. By this search procedure, the possibility for obtaining the globally optimal solution is obviously enhanced, and similarly, the convergent speed is also strengthened. The "particle swarm mutation" inherited the advantages of Particle Swarm Optimization (PSO) algorithm and searched for the potential solution along the direction of the best current particle and the direction of the best individual of the whole swarm in the past. Selection operator retained a constant rate of infeasible solutions. Numerical results indicate that the proposed algorithm can be efficient to get global optimal solutions or near to them in smaller population and less iteration times.

Key words： constrained optimization   inward-outward crossover operator   line search   particle swarm mutation method

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[1] Wang Y, Cai Z X, Zhou Y R, et al. Constrained optimization based on hybrid evolutionary algorithm and adaptive constraint-handling technique[J]. Structural and Multidisciplinary Optimization, 2009, 37: 395-413.

[2] Farmani R, Wright J A. Self-adaptive fitness formulation for constrained optimization[J]. IEEE Transactions on Evolutionary Computation, 2003, 7(5): 424-455.

[3] Venkatraman S, Yen G G. A genetic framework for constrained optimization using genetic algorithms[J]. IEEE Transactions on Evolutionary Computation, 2005, 9(4): 424-435.

[4] 周育人, 李元香, 王勇, 等. Pareto强度值演化算法求解约束优化问题[J]. 软件学报, 2003, 14(7): 1243-1249. Zhou Y R, Li Y X, Wang Y, et al. A Pareto strength evolutionary algorithm for constrained optimization[J]. Journal of Software, 2003, 14(7): 1243-1249.

[5] Wang Y P, Liu D L, Cheng Y M. Preference bi-objective evolutionary algorithm for constrained optimization[J]. Computational Intelligence and Security, 2005, 3801: 184-191.

[6] Kennedy J, Eberhart R C. Particle swarm optimization[C] // Proceedings IEEE International Conference on Neural Networks, Piscataway, NJ: IEEE Service Center, 1995: 1942-1948.

[7] 魏静萱, 王宇平. 求解约束优化问题的改进粒子群算法[J]. 系统工程与电子技术, 2008, 30(4): 739-742. Wei J X, Wang Y P. Smooth scheme and line search based particle swarm optimization for constrained optimization problems[J]. Systems Engineering and Electronics, 2008, 30(4): 739-742.

[8] 朱海梅, 吴永萍. 一种高速收敛粒子群优化算法[J]. 控制与决策, 2010, 25(1): 20-24. Zhu H M, Wu Y P. A PSO algorithm with high speed convergence[J]. Control and Decision, 2010, 25(1): 20-24.

[9] 王宇平, 刘大莲. 基于平滑技术和一维搜索的全局优化进化算法及其收敛性[J]. 计算机 学报, 2006, 29(4): 670-675. Wang Y P, Liu D L. A global optimization evolutionary algorithm and its convergence based on a smooth scheme and line search[J]. Chinese Journal of Computers, 2006, 29(4): 670-675.

[10] Runarsson T P, Xin Y. Stochastic ranking for constrained evolutionary optimization[J]. IEEE Transactions on Evolutionary Computation, 2000, 4(3): 284-294.

[11] 董红斌, 黄厚宽. 一种求解约束优化问题的演化规划算法[J]. 计算机研究与发展, 2006, 43(5): 841-850. Dong H B, Huang H K. An evolutionary programming to solve constrained optimization problem[J]. Journal of Computer Research and Development, 2006, 43(5): 841-850.

[12] 刘智明, 周激流, 敖薔. 遗传算法交叉算子的分析[J]. 四川大学学报: 自然科学版, 2002, 39(5): 857-860. Liu Z M, Zhou J L, Ao Q. The analysis on running mechanism of crossover in genetic algorithm[J]. Journal of Sichuan University: Natural Science Edition, 2002, 39(5): 857-860.

[1] 唐苏妍;朱一凡;葛伟;李群. **网络化防空导弹体系集中式拦截联盟形成方法**[J]. 系统工程理论实践, 2011, 31(2): 357-363.

[2] 骆晨钟;邵惠鹤. **用混沌搜索求解非线性约束优化问题**[J]. 系统工程理论实践, 2000, 20(8): 54-57.

[3] 何耀华;夏志忠. **BP网络的快速自适应学习算法**[J]. 系统工程理论实践, 2000, 20(1): 93-98.