

基于球面多区域划分的并行量子遗传算法

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Parallel Quantum Genetic Algorithm Using Sphere Multi-region Division

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摘要

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摘要 论文提出一种基于球面解空间划分的量子遗传算法,引入多区域并行搜索的机制,制定了群间的染色体置换策略,设计了新的量子变异操作,并以种群退化的程度来确定变异的概率。通过理论分析证明了该算法能够以概率1收敛到全局最优解。在组合优化和连续优化问题的实验中,该算法能够以较快的速率收敛到目标值,收敛过程相对平稳,降低了早熟现象产生的概率,表现出了良好的性能。

关键词: 量子遗传算法 多区域划分 并行搜索 染色体置换 量子变异

Abstract: This paper proposes a quantum genetic algorithm based on spherical solution space multi-region division. It introduces multi-region parallel searching mechanism with a permutation policy among sub-swarms, designs a novel quantum mutation operator using a variable probability decided by the extend of devolution. It is proved that this algorithm can converge to a global optimal solution with probability 1. The experiments of combinatorial and continuous optimization issue show that the proposed algorithm accelerates the convergence to the expected value smoothly, reducing the probability of premature. It performs well comparatively.

Keywords: Quantum Genetic Algorithm (QGA) Multi-region division Parallel search Chromosome permutation Quantum mutation

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