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基于图禁忌的并行测试任务调度算法

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A Graph Tabu Algorithm for Parallel Test Task Scheduling

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摘要 现有算法处理强约束关系的并行测试任务调度问题具有运算时间长、寻优概率低、收敛性差等缺陷,针对这些问题提出了一种基于图禁忌的调度算法。该算法从测试任务间的约束关系入手,利用图论建立测试任务间的关系图,并结合禁忌算法实现并行测试任务的多目标优化调度。算法中将强约束关系的测试任务调度问题与无约束关系的资源配置问题进行分离,提高了算法的寻优速度。通过仿真实例证明了算法的有效性,与现有并行测试任务调度算法相比,运算时间减少96%、寻优率提高了36.5%,并且具有更好的收敛性。

关键词: 图论 禁忌搜索 并行测试 任务调度 强约束关系

Abstract: This paper presents a graph tabu approach to deal with problems existing in present parallel test task scheduling approaches, such as long computation time, low probability optimization rate, premature convergence to local optima, etc. The approach in this paper starts with strong constraints among parallel test tasks, then uses the graph theory to establish a diagram of test tasks, and finally realizes multi-objective optimization of parallel test task scheduling by combining with a tabu search algorithm. This approach makes a separation between strong constraint test task scheduling and no constraint test resource scheduling, which improves the optimization speed. The experimental results show that the approach is feasible. Compared with the existing approaches, the proposed approach realizes a 96% reduction of computing time, 36.5% increment of the optimization rate, and better convergence.

Keywords: graph theory tabu search parallel test task scheduling strong constraint

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