

## 求解双层CARP优化问题的知识型蚁群算法

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### The knowledge-based ant colony optimization to double layer capacitated arc routing problems

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全文: PDF (923 KB) HTML (1 KB) 输出: BibTeX | EndNote (RIS) 背景资料

**摘要** 双层CARP优化问题不仅要解决微观路径优化问题, 还要解决宏观配置优化问题, 最大程度地降低整体系统的固定成本和运行成本. 提出了一种求解双层CARP优化问题的知识型蚁群算法: 构建了一个动态参数决策模型, 并采用该模型为每次迭代动态地选择一组合适的参数; 基于弧段聚类知识和弧段顺序知识来构建可行解; 采用2-Opt方法对每次迭代中的最优解进行局部优化. 实验结果表明知识型蚁群算法在优化性能方面优于其他几种方法.

**关键词:** 弧段顺序 弧段聚类 动态参数调整 宏观配置优化 微观路径优化 蚁群算法

**Abstract:** The double layer capacitated arc routing problem considers a high-level configuration problem and a low-level routing problem, and its objective is minimize fixed costs and running costs of the whole system. A Knowledge-based Ant Colony Optimization (KACO) was proposed to the Double-layer Capacitated Arc Routing Problems. The exploitation of heuristic information, dynamic parameter adjustment and local optimization characterized the KACO. The dynamic parameter adjustment decreased the sensitivity of parameters to final experimental results. The feasible solution was constructed with the guidance of arc cluster knowledge and arc priority knowledge. Local optimization based on two-Opt heuristic largely improved the performance of KACO. In order to validate the performance of KACO, 87 benchmark problems were solved by KACO and some heuristic methods. Experimental results suggest that KACO outperforms these methods.

**Key words:** arc priority arc cluster dynamic parameter adjustment high-level configuration optimization low-level routing optimization ant colony optimization

收稿日期: 2010-07-02;


基金资助: 国家自然科学基金重点项目(71031007); 国家自然科学基金(70971131, 71101150, 70801062); 高等学校博士学科点专项科研基金(20104307120019)

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引用本文:

邢立宁, 陈英武, 姚锋等. 求解双层CARP优化问题的知识型蚁群算法[J]. 系统工程理论实践, 2012, 32(11): 2540-2549.

XING Li-ning, CHEN Ying-wu, YAO Feng et al. The knowledge-based ant colony optimization to double layer capacitated arc routing problems[J]. Systems Engineering - Theory & Practice, 2012, 32(11): 2540-2549.

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