基于多目标改进蚁群算法的三维混合布局方案设计   3-D Mixed-layout Conceptual Design Based on   Multi-objective Improved Ant Colony Algorithm

张泓 李爱平 刘雪梅

同济大学

关键词：   布局设计 蚁群算法 适应度函数 填充球组

摘 要：   针对三维混合布局优化设计求解问题，建立了以空间分割方法为基础的布局模型表示方法。对圆柱体布局物体和长方体布局物体，分别对应采用线性八叉树模型和栅格数据模型进行模型转换。提出了填充球组的布局模型表示方法，根据布局设计要求推导出布局优化的数学模型。通过构建有向布局序列把TSP问题转化为布局优化问题，使用适应度函数来处理布局求解过程中多目标优化问题，运用改进蚁群算法对其进行优化计算得到了Pareto最优解。通过对几种布局设计方案的对比分析，验证了布局建模方法和布局优化算法的有效性。The layout model representation method based on space partition method was established to solve the 3-D mixed layout design. Linear octree and raster data model were used in conversion model for corresponding cylinders layout objects and cuboids layout objects respectively. The filled ball group was proposed for the layout model representation method, and on this foundation, the mathematical model of the layout optimization problem was obtained according to the layout design requirements. Then the TSP problem was transformed into the layout design problem by establishing directed layout sequence. Meanwhile, the fitness function was applied to deal with the multi-objective optimization in the course of the layout, and the improved ant colony algorithm was put into use to gain the Pareto optimum. At last, the effectiveness of the layout method for modeling and optimization algorithm was illustrated by the comparison of the layout design schemes.

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