

求解非线性二层规划问题的模拟植物生长算法

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Plant Growth Simulation Algorithm for Solving Nonlinear Bilevel Programming

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摘要 本文以植物向光性生长理论为启发式准则,提出了一种求解非线性二层规划问题的智能优化算法。在该算法中,将二层规划上层解空间和下层反应集分别作为植物的两个生长环境,建立以生长规则为基础的植物系统演绎方式和以植物向光性理论为基础的概率生长模型,两者结合所形成的优化模式,实现了模拟植物从初始状态到完整形式的终态(没有新的树枝生长),从而得到二层规划问题的解。该方法具有搜索精度较高,求解稳定性较强的特点,通过与国外学者在非线性二层规划实际测试问题的最优值进行精度比较,表明模拟植物生长算法是有效可行的。

关键词: 模拟植物生长算法(PGSA) 二层规划 非线性二层规划

Abstract: Based on plant phototropism growth pattern as its heuristic criterion, an intelligence optimization algorithm for solving nonlinear bilevel programming is proposed herein. In this algorithm, the upper solution space and lower reaction set of bilevel programming are looked as two growth environments of plant. Then the plant system evolution style based on growth regulation and the probability growth model based on plant phototropism theory are established. The optimization model combined with above two realizes the evolution of artificial plant from initial status to whole final status (that means no new branch growing), thus the optimal solution of bilevel programming can be found. This algorithm herein shows its high accuracy and strong astringency. Comparing with typical optimal solutions obtained from western scholars worked on actual test problems of nonlinear bilevel programming, plant growth simulation algorithm herein also shows its good effectiveness and feasibility.

收稿日期: 2011-07-23;

基金资助:国家自然科学基金资助项目(71171070, 71072161, 71173066);浙江省自然科学基金资助项目(Y7100447);教育部人文社会科学研究规划基金(12YJAZH063);浙江省高校人文社科基地重大项目(RWSKZD04-2012ZB,RWSKZD04-2012ZB3)

引用本文:

李彤, 陈畴镛. 求解非线性二层规划问题的模拟植物生长算法[J]. 中国管理科学, 2012, V(4): 160-166

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