



航空学报 » 1999, Vol. 20 » Issue (6) :503-508 DOI:

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### 几何规划在飞机总体设计中的应用

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### APPLICATION OF GEOMETRIC PROGRAMMING FOR THE SKETCHY DESIGN OF AIRPLANES

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摘要

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**摘要** 系统地讨论了代数多项式的算术—几何均值定理, 并对原型几何规划理论作出了简明的推导与分析。提出了具有缩并迭代特性的几何规划求解理论和编程步骤。还用2个工程设计的优化求解算例来说明这种缩并迭代几何规划优化求解特点和优点。例1显示了几何规划的工程实用性和简易性; 例2通过轻型飞机总体方案参数优化, 说明所提出的优化方法, 可随设计人员思路的变动而得到及时地相适应。

**关键词:** 优化设计 数学规划 几何规划 飞机设计

**Abstract:** This paper discussed the theorem of the average arithmetic geometric mean of algebraic polynomials systematically, then derived and analyzed the original geometric programming (GP) briefly. In the programming theory the dual conditions of constraint are linear algebraic polynomials, and the dual object function is a nonlinear monomial. The paper presents an approach of reduction and iteration for GP which transforms primary functions of original GP into approximate monomials based on Duffin formula, and dual object function into an approximate linear polynomial. Thus solved dual programming is a linear programming problem and an approximate optimum solution can be obtained simply. By means of iteration approach the real optimum of original GP can be solved. The paper offers the steps of solving process on computer. At the end two examples of sketchy design for airplane (the optimum distribution of aileron supports, the optimum layout of parameters for aircraft global configuration) are explained for solving process and the solutions, compared with the given results. It can be shown that the approach presented in the paper is correct, simple and useful for engineering design, even to Expert System or Artificial Intelligence.

**Keywords:** optimization design mathematical programming geometric programming air plane design

Received 1994-04-15; published 1999-12-25

#### 引用本文:

王小宛; 刘天丰; 张永顺. 几何规划在飞机总体设计中的应用[J]. 航空学报, 1999, 20(6): 503-508.

WANG Xiao-wan; LIU Tian-feng; ZHANG Yong-shun. APPLICATION OF GEOMETRIC PROGRAMMING FOR THE SKETCHY DESIGN OF AIRPLANES[J]. Acta Aeronautica et Astronautica Sinica, 1999, 20(6): 503-508.

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