



航空学报 2012, Vol. 33 Issue (1) :138-146 DOI: CNKI:11-1929/V.20111011.1410.001

电子与自动控制

最新目录 | 下期目录 | 过刊浏览 | 高级检索

<< Previous Articles | Next Articles >>

求解高超声速飞行器平衡状态的GA-SQP算法

张红梅^{1,2}, 张国山¹

- 1. 天津大学 电气与自动化工程学院, 天津 300072;
- 2. 沈阳航空航天大学 自动化学院, 辽宁 沈阳 110136

GA-SQP Algorithm for Solving Equilibrium States of Hypersonic Vehicles

ZHANG Hongmei^{1,2}, ZHANG Guoshan¹

- 1. School of Electrical Engineering & Automation, Tianjin University, Tianjin 300072, China;
- 2. School of Automation, Shenyang Aerospace University, Shenyang 110136, China

摘要

参考文献

相关文章

Download: PDF (1534KB) HTML 1KB Export: BibTeX or EndNote (RIS) Supporting Info

摘要 针对含有不稳定模态的高超声速飞行器平衡状态的求解问题,提出了遗传算法-序列二次规划(GA-SQP)混合优化求解算法.该算法基于GA,根据时间乘以误差绝对值积分(ITAE)性能指标,采用混沌搜索和淘汰机制,将配平问题转化为代价函数最小值的求解问题.此外,在局部搜索中引入SQP策略,分步求解升降舵偏角和油门设置,以及迎角初始值.通过建立基于Simulink的动态模型进行仿真,结果表明,该算法能够精确地收敛到平衡点,并具有较好的稳定性,而且与初始值无关.该算法为一类复杂非线性系统平衡状态的求解问题提供了一种实用有效的解决方法.

关键词: 飞行控制 高超声速飞行器 配平 遗传算法 序列二次规划

Abstract: In order to solve the equilibrium states of hypersonic vehicles with unstable modals, a hybrid optimization technique by the name of GA-SQP is developed. According to the performance index of the integral of time multiplied by the absolute value of error (ITAE), an improved genetic algorithm (GA) is used adopting chaos searching and elimination to calculate the equilibrium states, which are transformed into solutions of the minimum of the cost function.

Furthermore, sequential quadratic programming (SQP) is introduced so as to accelerate the local optimum. The elevator deflection, throttle setting, and initial angle of attack are obtained by steps based on the Simulink dynamic model of the vehicle. Simulation results show that the GA-SQP algorithm, with desired steadiness, is able to determine the final solution accurately without being sensitive to the initial point. The algorithm provides a practical and effective method to solve the equilibrium of complex nonlinear systems.

Keywords: flight control hypersonic vehicles equilibrium genetic algorithm sequential quadratic programming

Received 2011-03-21;

Fund:

国家自然科学基金(60674019,61074088)

Corresponding Authors: 张国山 Email: zhanggs@tju.edu.cn

About author: 张红梅 女,博士研究生,副教授.主要研究方向: 飞行控制. Tel: 024-89724448 E-mail: zhang.hongmei@163.com

引用本文:

张红梅, 张国山. 求解高超声速飞行器平衡状态的GA-SQP算法[J]. 航空学报, 2012, 33(1): 138-146.

ZHANG Hongmei, ZHANG Guoshan. GA-SQP Algorithm for Solving Equilibrium States of Hypersonic Vehicles[J]. Acta Aeronautica et Astronautica Sinica, 2012, 33(1): 138-146.

Service

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ Email Alert
- ▶ RSS

作者相关文章

