航空学报
ACTA AERONAUTICA ET ASTRONAUTICA SINICA
ISSN 1000-6893
CN 11-1929/V

航空学报 » 2012, Vol. 33 » Issue (9) :1561-1570 DOI:

离散RCS的PWPF调制方式改进及混合控制逻辑设计

陆艳辉, 张曙光

北京航空航天大学 交通科学与工程学院, 北京 100191

An Improvement on PWPF Modulation of Discrete RCS and Design of the Blended Control Logic

LU Yanhui, ZHANG Shuguang

School of Transportation Science and Engineering, Beihang University, Beijing 100191, China

摘要 | 参考文献 | 相关文章

Download: PDF (5664KB) HTML 1KB Export: BibTeX or EndNote (RIS) Supporting Info

摘要 可重复使用飞行器(RLV)再入控制常涉及离散的反推力控制系统(RCS)和连续的气动舵面的混合控制,其中避免离散RCS出现极限环振荡和混合控制的逻辑是设计的关键问题。为此,对应用脉宽脉频(PWPF)调制的离散RCS进行极限环振荡行为的离散描述函数法预测,推导极限环出现条件,设计了一种前置非对称死区环节规避极限环而不损失性能,在此基础上提出便于工程应用的RCS与气动舵面混合控制逻辑。通过对典型飞行器的控制仿真验证表明,改进的离散RCS的PWPF调制方式及设计的混合控制逻辑能够获得良好的控制效果,满足控制要求。

关键词： 再入 反推力控制 脉宽脉频调制 极限环 混合控制逻辑

Abstract： The re-entry control of reusable launch vehicles (RLV) often involves both discrete reaction control system (RCS) and continuous aerodynamic controls, in which the avoidance of limit cycles and the blended control logic are the key issues of design. In this paper the limit cycle oscillation behavior of the discrete pulse-width and pulse-frequency (PWPF) modulation is predicted by application of the discrete describing function analysis technique, the appearance conditions are then derived, and an asymmetric dead zone is further constructed and used in the forward path to eliminate the limit cycle oscillations, without performance loss. Based on the improved PWPF modulation, a RCS and aerodynamic surfaces blended control logic is designed with concern on implementation. Simulations on the control of a typical RLV show that the improved discrete PWPF modulation and the blended logic work satisfactorily to the requirements of control.

Keywords： re-entry reaction control system pulse-width and pulse-frequency modulation limit cycle blended control logic

Received 2012-01-13;

Corresponding Authors: 张曙光 Email: gnahz@buaa.edu.cn

引用本文:

陆艳辉, 张曙光. 离散RCS的PWPF调制方式改进及混合控制逻辑设计[J]. 航空学报, 2012, 33(9): 1561-1570.

LU Yanhui, ZHANG Shuguang. An Improvement on PWPF Modulation of Discrete RCS and Design of the Blended Control Logic[J]. Acta Aeronautica et Astronautica Sinica, 2012, 33(9): 1561-1570.

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
陆艳辉
张曙光