首页 | 关于本刊 | 编委会 | 投稿指南 | 期刊订阅 | 下载中心 | 学术会议 | 联系我们 | English

简报

最新目录 | 下期目录 | 过刊浏览 | 高级检索　　<< Previous Articles | Next Articles

鸭式旋翼/机翼无人机飞行动力学建模与分析

盖文东[1,2], 王宏伦[1,2], 李大伟[2]

1. 北京航空航天大学 飞行器控制一体化技术重点实验室, 北京 100191; 2.北京航空航天大学 无人驾驶飞行器设计研究所, 北京 100191

Flight dynamic modeling and analysis for the Canard Rotor/Wing UAV

- 摘要
- 参考文献
- 相关文章

Download: PDF (651KB)　HTML (1KB)　Export: BibTeX or EndNote (RIS)　Supporting Info

摘要 针对鸭式旋翼/机翼无人机兼有直升机和固定翼机飞行特性的特点, 对其飞行动力学模型进行了理论建模与分析研究。应用动量理论建立了旋翼/机翼尾迹模型, 分析了旋翼/机翼尾迹对鸭翼、平尾等气动部件的干扰特性, 建立了直升机和转换飞行模式受旋翼/机翼尾迹干扰影响的动力学模型以及固定翼飞行模式的动力学模型。提出了各飞行模式的配平策略, 使用Matlab工具箱函数简化了平衡特性计算和模型线性化过程, 并进行了不同飞行模式、典型飞行状态的纵向运动稳定性分析。结果表明所建立的模型能够反映该类鸭式旋翼/机翼无人机各飞行模式的典型特性, 并可用于飞行控制系统设计。

关键词: 鸭式旋翼/机翼无人机　模态转换　平衡特性计算　稳定性分析

Abstract： Canard Rotor/Wing UAV combines the hover flight characteristic of a helicopter with high subsonic cruise of a fixed-wing aircraft. The flight dynamic model for the CRW was developed and analyzed. The momentum theory was used to build the rotor/wing slipstream model in the rotary-wing and conversion flight. The influence produced by rotor/wing slipstream on canard and horizontal tail was analyzed. In the rotary-wing and conversion flight, the flight dynamic model affected by the rotor/wing slipstream was developed. At the same time, the flight dynamic model in the fix-wing flight was developed too. The balance strategy was suggested in different flight modes. The Matlab toolbox functions were used to simplify trim calculation and model linearization in different flight modes. And the longitude dynamical stability for typical flight states was analyzed in different flight modes. The results show that the model contains the typical characteristic of the CRW, and can be used in flight control system design.

Keywords： Canard Rotor/Wing UAV,　mode conversion,　trim calculation,　stability analysis

引用本文:

盖文东, 王宏伦, 李大伟 .鸭式旋翼/机翼无人机飞行动力学建模与分析[J] 空气动力学学报, 2012,V30(2): 244-249

GAI Wen-Dong, WANG Hong-Lun, LI Da-Wei .Flight dynamic modeling and analysis for the Canard Rotor/Wing UAV[J] , 2012,V30(2): 244-249

链接本文:

http://kqdlxxb.cars.org.cn/Jweb_aas/CN/10.3881/j.issn.1000-503X.2010.03.002　　或　　http://kqdlxxb.cars.org.cn/Jweb_aas/CN/Y2012/V30/I2/244

[1] MITCHELL C A, VOGEL B J. The canard rotor wing (CRW) aircraft a new way of fly[R]. AIAA-2003-2517, 2003.

[2] 邓阳平,高正红,詹浩.鸭式旋翼/机翼飞机的技术发展及其关键技术[J].飞行力学,2006,24(3): 1-4.

[3] BASS S M, THOMPSON T L. Low-speed wind tunnel test result of the canard rotor/wing concept[R].AIAA-1993-3412, 1993.

[4] BASS S M, THOMPSON T L. Fixed-wing performance predictions of the canard rotor/wing concept based on wind tunnel test results[R]. A 1995-1887, 1995.

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
- 盖文东
- 王宏伦
- 李大伟

[5] PANDYA S A, AFTOSMIS M J. Computation of external aerodynamics for a canard rotor/wing aircraft[R].AIAA-2001-0997,2001.

[6] 邓阳平,高正红,詹浩. 鸭式旋翼/机翼飞机悬停及小速度前飞气动干扰实验研究[J]. 实验力学,2009,24(6): 563-567.

[7] 盖文东,王宏伦,李大伟. 一类可变飞行模态飞行器的统一建模研究[J]. 系统仿真学报, 2010,22(增): 249-253.

[8] CARLSON E B. Optimal tiltrotor aircraft operations during power failure[D]. University of Minnesota, 1999.

[9] 高正, 陈仁良. 直升机飞行动力学[M]. 北京:科学出版社,2003:64-65.

[1] 盖文东,,王宏伦,,李大伟.鸭式旋翼/机翼无人机飞行动力学建模与分析[J]. 空气动力学学报, 2012,30(2): 244-249

[2] 盖文东,,王宏伦,,李大伟.鸭式旋翼/机翼无人机飞行动力学建模与分析[J]. 空气动力学学报, 2012,30(2): 244-249

[3] 盖文东,,王宏伦,,李大伟.鸭式旋翼/机翼无人机飞行动力学建模与分析[J]. 空气动力学学报, 2012,30(2): 244-249

[4] 魏淑惠 ，包福兵 ，朱赠好 .二维Woods-Burnett方程的稳定性分析[J]. 空气动力学学报, 2012,30(1): 90-94

[5] 肖隐利, 陈亮, 宋文艳.超燃冲压发动机隔离段流动特性研究[J]. 空气动力学学报, 2007,25(01): 75-79

[6] 贺小艳, 马汉东, 王强.三维可压气体射流在液体中剪切稳定性分析[J]. 空气动力学学报, 2002,20(01): 78-83

[7] 王强, 马汉东, 周伟江.共轴异向旋转筒间不可压流的临界主不稳定性[J]. 空气动力学学报, 2001,19(01): 8-15

[8] 黄达, 李志强, 史志伟, 吴根兴.飞机大振幅非定常滚转运动的非线性稳定性分析[J]. 空气动力学学报, 2000,18(04): 401-406