航空学报 » 2006, Vol. 27 » Issue (4) :682-686 DOI:

一种无源双星与多普勒导航系统组合的实现方法

孙国良, 沈士团, 丁子明, 郑玉簜, 李锐

北京航空航天大学 电子信息工程学院, 北京 100083

An Integration Method for Passive RDSS and DNS

SUN Guo-liang, SHEN Shi-tuan, DING Zi-ming, ZHENG Yu-gui, LI Rui

School of Electrical Engineer, Beijing University of Aeronautics and Astronautics, Beijing 100083, China

摘要 提出了一种双星定位系统(RDSS)无源测距信息与多普勒导航系统(DNS)组合导航的方法。首先对多普勒导航系统的定位误差进行了计算机仿真分析,得到了航姿系统(AHS)的航向角误差是系统主要误差源的结论。随后讨论了在气压高度信息辅助下无源双星和多普勒导航系统组合消除航向角误差影响的可行性,并且给出了利用卡尔曼滤波进行无源双星与多普勒导航系统组合的实现方法。计算机仿真和直升机搭载试飞的组合定位结果表明:无源双星与多普勒导航系统组合仅通过对多普勒导航系统的地速数据和两颗卫星无源测距差进行处理即可完成平面导航定位,从而摆脱了对航姿系统中航向角信息的依赖,抑制了平面定位误差的增长,获得较高导航定位精度的同时能够满足高动态导航定位的要求,为双星系统的无源应用提供了一条新的途径。

关键词: 双星定位系统 多普勒导航系统 卡尔曼滤波 组合导航 无源定位

Abstract: An Integration method for RDSS/DNS is put forward. At first, positioning error of DNS is analyzed through computer simulation. It is found that the measurement error of yaw from AHS is the main error source of DNS. From this point, the possibility of integration for Passive RDSS/DNS without using the yaw data from AHS is discussed in condition that the height information can be obtained from barometer. Kalman filter is used to realize the integration. The model of the integrated system is described in detail. Computer simulation and flight-test are used to check the validity of the Integration. It is indicated that this kind of integration can greatly reduce the error emulation of DNS. The passive RDSS/DNS integrated system can not only give out more precise position but also has the character of high dynamic navigation performance. It greatly extends the passive applications of RDSS.

Keywords: RDSS DNS Kalman filter integrated navigation passive positioning

Received 2005-01-13; published 2006-08-25

引用本文:

孙国良;沈士团;丁子明;郑玉簜;李锐. 一种无源双星与多普勒导航系统组合的实现方法[J]. 航空学报, 2006, 27(4): 682-686.

SUN Guo-liang;SHEN Shi-tuan;DING Zi-ming;ZHENG Yu-gui;LI Rui. An Integration Method for Passive RDSS and DNS[J]. Acta Aeronautica et Astronautica Sinica, 2006, 27(4): 682-686.