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捷联惯导系统的开环初始对准

崔中兴, 施国梁

北京航空学院

AN OPEN-LOOP INITIAL ALIGNMENT SCHEME FOR STRAPDOWN INERTIAL NAVIGATION SYSTEMS

Cut Zhongxing, Shi Guoliang

Beijing Institute of Aeronautics and Astronautics

摘要 本文对一种捷联惯导系统的开环初始对准方法作了详尽的讨论。对准过程分作二步完成,即解析对准与开环精对准。根据解析对准的具体特点,采用了Gram-Schmidt正交化方法来确保所得粗对准矩阵的正交性,最小二乘估计器的应用免除了最佳滤波器对各种噪声模型的要求。并且,开环对准中还引入了低通数字滤波器来改善对准的精度及快速性。不同条件下的数字仿真用来验证这种对准方法的可行性,取得了满意的结果。

关键词:

Abstract: In this paper, a ptactical open-loop alignment scheme for strapdown inertial navigation systems is discussed in detail. The alignment process is separated into two steps, i.e.,coarse alignment, or analytical alignment, and open-loop fine alignment. Gram-Schmidt method, which can result in an ideal orthogonal matrix, is used to orthogonalize coarse alignment matrix. Least Squares estimators are used to estimate instantaneous misalignment angle between the true geographic frame and the computed one, which is determined by the coarse alignment matrix. To eliminate efficiently the affections of environment disturbance on alignment process the misalignment angle is divided into two components, i. e., instantaneous one and average one. All measurement equations used to estimate the two components are in the same form. This feature will be helpful in implementing the scheme in a real strapdown sys-tem, since it can reduce the burden on on-line computer. Lowpass digital filters are introduced into the open-loop alignment process to enhance the accuracy and shorten the time needed.Digital simulations are employed to verify the effectiveness of such an alignment scheme. The simulation results reveal that this scheme can reach the accuracy superior to 1 arc-minute in azimuth misalignment and less than 6 minutes is needed to complete the alignment process under the simulation conditions listed in Table 1 . Other results also indicate that this scheme is efficient and satisfactory.

Keywords:

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