

控制理论与实践

基于单轴转动的捷联系统粗对准技术研究

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摘要:

阐述了基于单轴旋转的捷联惯导系统误差抑制原理。针对旋转捷联惯导系统的粗对准问题,对比分析了解析法和惯性系粗对准法的本质区别与适用范围,利用惯性系对准过程是动态过程这一性质,提出在旋转捷联惯导系统中引入惯性系粗对准法,并进行理论推导与分析。【JP2】在三轴摇摆运动形式下,对单轴旋转捷联惯导系统的粗对准过程进行仿真分析,并与不旋转时的粗对准结果相对比。结果表明,惯性系粗对准过程中,惯性测量单元(inertial measurement unit, IMU)的转动调制了惯性器件常值偏差,有效地提高了旋转捷联系统的粗对准精度

关键词: 捷联惯导系统 单轴旋转 粗对准 误差调制 摇摆状态

Coarse alignment of SINS based on IMU single-axial rotation

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Abstract:

The error modulation principle of a strapdown inertial navigation system (SINS) based on single axial rotation is presented. To finish the coarse alignment of SINS with inertial measurement unit (IMU) rotated, the essential distinction and applicability between the analytic coarse alignment and the inertial coarse alignment are analyzed contrastively. According to the nature that inertial coarse alignment is a dynamic process, the inertial coarse alignment is quoted in the rotary SINS, the theoretical derivation and the mathematical analysis are also presented. By simulation, the process of coarse alignment with IMU rotary is analyzed on the typical three axial rotation, and the results are compared with the situation of non rotation. The simulation results show that the constant error of sensors is modulated by the IMU rotated on the condition of the inertial coarse alignment, the precision of coarse alignment can be improved effectively.

Keywords: strapdown inertial navigation system (SINS) single-axial rotation coarse alignment error modulation swing base

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