

制导火箭捷联惯组在架标定方案研究

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摘要:

长时间整弹存储的制导火箭,其捷联惯组的标定参数将发生较大的改变。本文设计了一种制导火箭捷联惯组的在架标定方案。在给出惯性器件误差模型和惯导系统误差方程的基础上,详细推导了在俯仰、偏航(通过发射架摆动实现)和横滚(通过内部横滚隔离环转动实现)三种单轴旋转条件下,惯导系统速度误差变化率的变化量与捷联惯组标定参数的关系。与通常的系统级标定方案不同,该方案不必求解惯导系统误差微分方程,而是对由机动前后系统速度误差变化率构造的代数方程进行求解。这使得标定方案的计算量大为降低。该方案无需将捷联惯组从制导火箭上拆卸下来,适用于外场条件下弹载惯组的定期标定。

关键词: 制导火箭; 捷联惯组; 在架标定; 速度误差变化率的变化量

On-launcher calibration of SIMU for the Guided Multiple Launch Rocket System(GMLRS)

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Abstract:

The calibration parameters of the Strapdown Inertial Measurement Unit(SIMU) in the guided munitions would change dramatically after a long time of storage. A calibration scheme intended to update these parameters which can be implemented on the launcher of the Guided Multiple Launch Rocket System(GMLRS) is devised. Based on the sensor error models and the Inertial Navigation System(INS) error equations, the relationship between changes in velocity error rates of change and inertial sensor errors is presented. The pitch or yaw rotation can be completed by the launcher's swing, while the roll one must be done through a single gimbal which can accomplish the roll-isolation for the SIMU. The algebraic equations reconstructed from the velocity error rates of change before and after some rotation rather than the INS differential equations are used to solve for the inertial sensor errors. This results in a considerable reduction in computation burden. The benefit that the SIMU needn't to be teared down from the guided munitions makes the calibration periodically under actual conditions more easily.

Keywords: Guided Multiple Launch Rocket System(GMLRS); Strapdown Inertial Measurement Unit(SIMU); on-launcher calibration; changes in velocity error rates of change

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