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低成本的多普勒-捷联惯性组合导航系统

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LOW COST DOPPLER AIDED STARPDOWN INERTIAL NAVIGATION SYSTEM

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摘要

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摘要

本文研究了一种采用低精度的惯性器件,应用卡尔曼滤波技术的多普勒捷联惯性组合导航系统。讨论了组合方案,推导了系统的动态方程,设计了一种最优和四种次优卡尔曼滤波器。对系统进行了协方差分析。分析结果表明,采用随机漂移为 $0.1^\circ/h$ 的陀螺仪,零位误差为 $10^{-4}g$ 的加速度计,应用卡尔曼滤波技术可以实现 1nmile/h 的导航精度,成为一种低成本、中等精度的导航系统。

关键词:

Abstract:

This paper presents a Doppler aided strapdown inertial navigation system which adopts low accuracy inertial sensors. The configuration and dynamic equations of the integrated system are discussed and derived. One optimum Kalman filter and four suboptimum Kalman filters are designed and evaluated. A covariance analysis of the integrated system performance is completed. The results of the covariance analysis indicate that the integrated system which adopts the gyros with random drift of $0.1/h$ and the accelerometers with bias of $10^{-4}g$ can achieve the navigation accuracy of 1 nm/h by means of the Kalman filter.

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