

制导、导航与控制

惯性信息辅助的高动态弱GPS信号快速捕获

张敏虎, 任章, 华春红

北京航空航天大学自动化科学与电气工程学院, 北京 100191

摘要:

通过分析高动态弱GPS信号对捕获的影响, 提出了一种惯性信息辅助的快速捕获算法。该算法利用惯性系统的速度估算GPS载波信号的多普勒频移, 减小频率搜索范围。同时, 通过改进基于快速傅里叶变换 (fast Fourier transform, FFT) 的相干-非相干积分捕获策略, 克服了导航数据位边沿和多普勒速率引起的能量扩散, 提高了捕获的灵敏度和速度。最后, 对高动态弱GPS信号捕获进行了仿真验证, 结果表明该算法仅用300 ms的输入数据就可以有效捕获载噪比为24dB-Hz的GPS信号。

关键词: 捕获 惯性信息 高动态 弱GPS信号

Fast acquisition of high-dynamic and weak GPS signals aided by inertial information

ZHANG Min-hu, REN Zhang, HUA Chun-hong

School of Automation Science and Electrical Engineering, Beihang University, Beijing 100191, China

Abstract:

Based on the influence analysis of weak GPS signals on acquisition under high dynamic environment, a fast acquisition algorithm is developed. The involvement of the inertial navigation system is applied to estimate the GPS carrier Doppler frequency so as to decrease the range of frequency uncertainty. By improving the acquisition method of coherent and non-coherent integration based on fast Fourier transform (FFT), it overcomes the energy diffusion caused by the data bit sync and Doppler rate. In addition, the acquisition time is reduced and its sensitivity is enhanced. Simulation results illustrate that the proposed algorithm is valid to 24 dB-Hz carrier to noise (CNR) GPS signal acquisition within 300 ms.

Keywords: acquisition inertial information high-dynamic weak GPS signal

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通讯作者:

作者简介:

作者Email:

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