

制导、导航与控制

微弱GPS信号捕获中的远近效应消除方法

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摘要:

首先分析了全球定位系统(global positioning system, GPS)互相关对微弱卫星信号捕获的影响, 并针对该问题给出了子空间投影算法的推导, 从理论上证明其能消除远近效应对微弱卫星信号捕获的干扰。在此基础上, 重点分析了码相位和频率误差对子空间投影算法的影响, 并通过模拟数据和真实数据加以验证。实验证明模拟数据由于其码相位和频率误差较小并可预测, 采用子空间投影能够有效消除强、弱卫星信号互相关对某个微弱卫星信号捕获的影响, 但对于实际信号由于频率误差一部分来源于晶振的抖动并不容易预测, 针对捕获卫星能量极弱情况下, 采用子空间投影的方法则存在较大的强信号残差并不容易被消除。

关键词: 微弱信号捕获 远近效应 子空间投影 误差分析

Near far effect cancellation in weak GPS acquisition

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Abstract:

Effect of cross correlation on weak global positioning system (GPS) signal acquisition is firstly analyzed, and is considered as a kind of near far problem in GPS communication. In order to solve this problem, a sub-space projection algorithm is given and derived theoretically to improve its ability of eliminating near far interference. The error analysis of the sub space projection algorithm related to the GPS frequency and code errors during the acquisition procedure is discussed, and experiments are carried out with simulated data and real intermediate frequency data. Results show that in the simulated data case because the frequency and code error are minor and easy to estimate, the sub-space projection algorithm works well in both strong and weak signal environments; while in the real data case the frequency error is difficult to predict, and the sub-space projection algorithm suffers great uncertainty in the weak signal environment.

Keywords: weak signal acquisition near far effect sub-space projection error analysis

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1. 陆安南, 杨小牛. 单星测频测相位差无源定位[J]. 系统工程与电子技术, 2010,32(2): 244-247
2. 刘晓军, 刘聪锋, 廖桂生. 子空间投影稳健波束形成算法及其性能分析[J]. 系统工程与电子技术, 2010,32(4): 669-673
3. 袁保伦, 饶谷音, 廖丹. 光学陀螺旋转式惯导系统的安装误差效应分析[J]. 系统工程与电子技术, 2010,32(11): 2407-2411
4. 刘杨, 金天. 小波降噪在微弱GPS信号捕获中的应用[J]. 系统工程与电子技术, 2011,33(4): 842-846

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