



航空学报 2011, Vol. 32 Issue (12) :2268-2276 DOI: CNKI:11-1929/ V.20110810.1118.002

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一种基于多跳自相关的差分跳频信号检测方法

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A Method of Detecting Differential Frequency Hopping Signal Based on Multiple-hop Autocorrelation

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摘要 针对差分跳频(DFH)信号跳频序列无周期特性和与常规短波跳频信号相似的时频特性给未知参数条件下的检测造成的困难,提出了一种基于多跳自相关的差分跳频信号检测方法。通过深入分析差分跳频信号多跳自相关函数,利用差分跳频信号与噪声信号自相关函数分布特性的不同建立检测统计量,由多跳自相关结果估计跳驻留时间和跳速,用跳驻留时间估计值计算检测统计量,以检测统计量和跳速为判定依据,实现了在未知信号参数条件下短波差分跳频信号的有效检测。仿真结果表明,提出的算法可以在信噪比(SNR)大于-18 dB条件下实现对差分跳频信号的有效检测,可通过增加处理数据点数来提高低信噪比下差分跳频信号的检测能力。

关键词: 差分跳频 检测 相关 扩频 参数估计

Abstract: In view of the difficulty caused by nonperiodic characteristic of frequency hopping sequence and the similar time and frequency characteristics to the general shortwave frequency hopping signal for detecting the differential frequency hopping (DFH) signal without parameters, an algorithm is proposed for detecting the DFH signal based on multi-hop autocorrelation. Utilizing different autocorrelation function distribution characteristics of DFH signal and noise signal, test statistics are established. The dwell-time and hop-rate of DFH signal are estimated with autocorrelation result. The test statistics are calculated with dwell-time. Utilizing the test statistics and hop-rate, the DFH signal is effectively detected. The result of simulation shows that the proposed method could effectively detect DFH signal with signal to noise ratio (SNR) larger than -18 dB. The performance of detecting differential frequency hopping signal under lower SNR could be enhanced by increasing data number.

Keywords: differential frequency hopping detection correlation spread spectrum parameter estimation

Received 2011-01-07;

Fund:

国家自然科学基金 (60802031); 辽宁省高校创新团队项目(LT2010090)

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钱博, 冯永新, 潘成胜, 田明浩. 一种基于多跳自相关的差分跳频信号检测方法[J]. 航空学报, 2011, 32(12): 2268-2276.

QIAN Bo, FENG Yongxin, PAN Chengsheng, TIAN Minghao. A Method of Detecting Differential Frequency Hopping Signal Based on Multiple-hop Autocorrelation[J]. Acta Aeronautica et Astronautica Sinica, 2011, 32(12): 2268-2276.

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