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应用

一种改进的VI-CFAR检测器

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摘要：

修正的削减平均MTM（modified trimmed mean）恒虚警（constant false alarm rate, CFAR）算法通过对前后滑窗的削减平均再求和实现杂波功率估计，其在多目标环境下具有很好的抗干扰性能。为了提高VI检测器在多目标背景尤其是前后滑窗都存在干扰目标时的检测性能，将MTM算法应用于VI（variability index）检测器，提出了一种改进的恒虚警检测器（VIMTM），该检测器的检测阈值由CA、GO和MTM算法产生。同时本文推导了MTM算法标称化因子TMTM的表达式，在Swerlling Ⅱ假设下，对VIMTM在不同的杂波背景下的性能进行了仿真分析，并与VI和基于OS (order statistic)的OSVI进行了比较。结果表明，在均匀环境和多目标背景下，VIMTM检测性能较好，且具有更强的鲁棒性；在杂波边缘背景下，VIMTM控制虚警的能力与VI、OSVI相当。另外，与OSVI相比，VIMTM缩短了参考样本的排序时间，提高了检测器的工作效率。

关键词： 雷达目标检测； 恒虚警率； 修正的削减平均算法；非均匀背景

An Improved VI-CFAR Detector

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Abstract:

The modified trimmed mean (MTM) scheme is robust in multiple targets background. It takes the sum of two local estimations of leading and lagging reference windows which apply TM method as the total clutter power estimation. In order to improve the robust performance of the variability index (VI) scheme in multiple targets situation where the interfering targets are present in both the halves of the reference window, an improved VI constant false alarm rate (CAFR) detector based on MTM (VIMTM) scheme is proposed. It employs a composite approach based on the cell averaging CFAR (CA-CFAR), greatest-of CFAR (GO-CFAR), and modified trimmed mean CFAR (MTM-CFAR) detectors. The analytic expression of its threshold multiplier factor TMTM is also derived. Under Swerlling Ⅱ assumption, the performance of the VIMTM detector in different clutter environments is compared with the VI and OSVI (order statistic VI) through Monte-Carlo simulation and analysis. Results show that the VIMTM detector has better detection performance and robustness in homogeneous environment and multiple targets background. In clutter edge environment, the false alarm performance of the VIMTM detector is almost consistent with the VI and OSVI. In addition, the sample sorting time of VIMTM detector is less than that of OSVI.

Keywords: Radar target detection Constant false alarm rate (CFAR) Modified trimmed mean (MTM) algorithm Nonhomogeneous background

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