

遥感应用

基于多尺度静态小波分解的改进型CFAR船只检测算法

摘要:

SAR船只目标检测是实现海上安全监测的有效手段。由于在海杂波较为复杂的情况下,传统CFAR算法对于弱小船只检测效果不佳,本文提出了基于多尺度静态小波分解的改进型CFAR检测算法。首先通过实验选出最优小波基及最佳小波分解级数,再利用幂运算对经多尺度乘性增强的小波系数进行优化,以增强船只与海洋背景的对比度,从而运用简单的CFAR算法即可得到较好的检测效果。最后,以新型星载ALOS PALSAR数据为例,通过与传统CFAR算法的对比实验,验证本文算法的有效性。实验表明,利用Sym2最优小波基的较强边缘检测能力以及小波多尺度乘性增强,双重强化了船只目标的边缘影像特征,并有效抑制了海杂波噪声,使得本文算法在提高检测率与降低虚警率两方面都优于传统CFAR算法,有利于高海杂波下弱小船只的检测。

关键词: 船只目标检测 SAR CFAR 静态小波 最优小波基

An Improved CFAR Ship Detection Algorithm Based on Multi-scale Stationary Wavelet Transform

Abstract:

Ship detecting using SAR image is an effective method of maritime safety monitoring. The common CFAR algorithm has a low detection performance of dim ship targets detection in high sea clutter. In this paper, an improved CFAR ship detection algorithm based on multi scale stationary wavelet transform is proposed. Firstly, the optimal wavelet basis and decomposition level of wavelet transformation are chosen by experiments. Then the strengthened high frequency wavelet coefficients by multi scale product are optimized using the exponentiation algorithm so as to increase the sea clutter to ship ratio of SAR images. After that a better detection result can be made using a simple CFAR algorithm. At the end, to verify the proposed algorithm, a comparison experiment with common CFAR algorithm is done using new satellite ALOS PALSAR data. The experiment shows that the edge of ship can be double strengthened by Sym2 the optimal wavelet basis and multi scale product, and therefore the speckle is depressed. The proposed algorithm excels common CFAR algorithm in two aspects of increasing the detection and reducing the false alarm, which has better detection performance on dim ships in high sea clutter.

Keywords: ship detection SAR CFAR stationary wavelet optimal wavelet basis

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