

算法研究

基于复小波方向信息的SAR图像斑点噪声抑制

许慰玲, 沈民奋, 方若宇

仲恺农业工程学院 信息学院, 广东

摘要:

针对一般小波去噪方法在去除合成孔径雷达(Synthetic Aperture Radar-SAR)图像斑点噪声时不能有效保持图像边缘信息的问题, 提出结合双密度双树复小波变换(Double-Density Dual Tree Complex Wavelet Transform-DD_DTCWT)方向信息进行边缘检测的SAR图像噪声抑制算法。本文对边缘检测指标进行改进, 利用DD_DTCWT方向复小波系数的相对方差作为边缘检测指标, 通过相对方差分布密度函数获取阈值处理的自适应门限, 由此实现SAR图像的自适应滤波。实验结果表明, 本文提出的边缘检测和主方向高频复系数提升方法可以有效保持并增强图像的边缘信息。与SRAD算法和基于DD_DTCWT的双变量收缩函数(Bivariate Shrinkage Function--BSF)算法相比较, 本文算法具有更好的边缘保持能力。

关键词: 合成孔径雷达图像; 斑点噪声; 双密度双树复小波变换; 相对方差; 边缘检测

Speckle Reduction for SAR Image Using Edge Directions in Complex Wavelet Domain

XU Wei-Ling, SHEN Min-Fen, FANG Ruo-Yu

Information College, Zhongkai University of Agriculture and Engineering, Guangzhou

Abstract:

In general, the edge information of an image can not be effectively preserved when traditional wavelet-based de-noising methods are adopted to reduce the speckle in synthetic aperture radar (SAR) images. In view of this problem, we propose a novel noise reducing algorithm for SAR images, which is based on edge detection of the images using directional information of double-density dual tree complex wavelet transform (DD_DTCWT). The relative variance of the directional complex wavelet coefficients of DD_DTCWT is used as a measure for edge detection. Furthermore, the adaptive threshold is calculated using the probability density function of relative variance. In such a manner, the adaptive filter in DD_DTCWT domain is realized. Experimental results demonstrate that the edge information of an image can be effectively preserved and enhanced via the proposed method in improving image edge detection and high frequency complex coefficients in main directions. Also, our proposed method outperforms the speckle reduction anisotropic diffusion (SRAD) method and bivariate shrinkage function (BSF) based on DD_DTCWT in high degree of edge preservation.

Keywords: synthetic aperture radar image speckle double-density dual tree complex wavelet transform relative variance edge detection

收稿日期 2011-03-28 修回日期 2011-06-28 网络版发布日期 2011-08-25

DOI:

基金项目:

国家自然科学基金(61072037); 广东省科技厅科技计划项目(2010B060900111)资助

通讯作者:

作者简介:

作者Email: xwl_72@163.com

参考文献:

本刊中的类似文章

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF(1490KB)
- ▶ [HTML全文]
- ▶ 参考文献[PDF]
- ▶ 参考文献

服务与反馈

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ 引用本文
- ▶ Email Alert
- ▶ 文章反馈
- ▶ 浏览反馈信息

本文关键词相关文章

- 合成孔径雷达图像; 斑点噪声; 双密度双树复小波变换; 相对方差; 边缘检测

本文作者相关文章

- ▶ 许慰玲
- ▶ 沈民奋
- ▶ 方若宇

PubMed

- ▶ Article by Xu, W. L.
- ▶ Article by Shen, M. F.
- ▶ Article by Fang, R. Y.

反馈人	<input type="text"/>	邮箱地址	<input type="text"/>
反馈标题	<input type="text"/>	验证码	<input type="text" value="5414"/>