

SAR图像去噪的分数阶多尺度变分PDE模型及自适应算法

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Fractional-Order Multi-scale Variation PDE Model and Adaptive Algorithm for SAR Image Denoising

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摘要

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摘要 在合成孔径雷达(SAR)图像相干斑噪声抑制中,保持图像的边缘和纹理是非常重要的。该文首先利用分数阶导数和负指数Sobolev空间对图像进行建模,建立了分数阶多尺度变分偏微分方程(PDE)模型,然后给出了模型参数自适应选择方法,并在此基础上提出了区域、尺度自适应的去噪算法。数值实验表明,新方法能在去除噪声,抑制图像的“阶梯效应”,保持图像的边缘、纹理细节几个方面取得较好的效果。

关键词: 合成孔径雷达 相干斑噪声抑制 分数阶导数 多尺度 细节保持 阶梯效应

Abstract: In the processing of Synthetic Aperture Radar (SAR) image speckle noise reduction, maintaining the edges and textures of image are very important. This paper proposes a fractional-order multi-scale Partial Differential Equation (PDE) model by modeling the image with fractional-order derivative and negative Sobolev space, and then gives the adaptive selection method for the model parameters and the region-scale adaptive algorithm for SAR image denoising. Numerical experiments show that the new method can achieve better results in removing the noise, restraining the staircase effect and preserving edges and textures.

Keywords: Synthetic Aperture Radar (SAR) Speckle noise removal Fractional-order derivative Multi-scale Detail preserving Staircase effect

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