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Anisotropic Total Fractional Order Variation Model in Seismic Data Denoising

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Abstract : In seismic data processing, attenuation of random noise is the basic step to improve quality of data for further application of seismic data in exploration and development in different gas and oil industries. The signal-to-noise ratio of the data also highly determines quality of seismic data. This factor affects the reliability as well as the accuracy of seismic signal during interpretation for different purposes in different companies. To use seismic data for further application and interpretation, we need to improve the signal-to-noise ration while attenuating random noise effectively. To improve the signal-to-noise ration and attenuating seismic random noise by preserving important features and information about seismic signals, we introduce the concept of anisotropic total fractional order denoising algorithm. The anisotropic total fractional order variation model defined in fractional order bounded variation is proposed as a regularization in seismic denoising. The split Bregman algorithm is employed to solve the minimization problem of the anisotropic total fractional order variation model and the corresponding denoising algorithm for the proposed method is derived. We test the effectiveness of theproposed method for synthetic and real seismic data sets and the denoised result is compared with F-X deconvolution and non-local means denoising algorithm.

Keywords : anisotropic total fractional order variation, fractional order bounded variation, seismic random noise attenuation, split Bregman algorithm
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