

Abstract

Suppression of Scalloping and Inter-Scan Banding in Non-Stationary ScanSAR Images Based on Kalman Filter and Image Segmentation [†]

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The antenna pattern of a SAR sensor can be represented as a two-dimensional sinc function, whose width is determined by the size of the antenna sensor. Therefore, the brightness of a SAR image at the center is higher than that at the edge, which needs to be corrected. However, due to the antenna pattern calibration error in practice, the brightness imbalance cannot be completely compensated, which results in the degradation of image quality, especially in ScanSAR mode. ScanSAR mode obtains wide-swath coverage by periodically switching the antenna elevation beam to points in several range sub-swaths, which results in scalloping and inter-scan banding (ISB) effects and image quality degradation. To solve this problem, a novel method is proposed based on the Kalman filter, especially in the case of the complex scene. First, a two-dimensional periodic variation noise model is presented to describe the scalloping and ISB phenomenon. Then, on the basis of analysis of image statistical characteristics, image segmentation and brightness modification are performed, which provided a precise precondition for implementing the linear Kalman filtering operation. Finally, experimental results validate the proposed method.



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