A COMPARISON OF TRACKING ALGORITHM STATISTICS IN MULTITEMPORAL SAR IMAGES

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Abstract

The performance of a tracking algorithms considering remotely sensed data strongly depends on a correct statistical description of the data, i.e., its noise model. In [1], a new tracking algorithm which takes into account that SAR images are characterized by multiplicative noise structure is proposed. The objective of this paper is to compare the accuracy of recently proposed new tracking algorithm called as maximum likelihood (ML) texture tracking with the well-known tracking algorithms described in [2], [3].

Tracking algorithms define the displacement as the shift that yields the best fit between different images in time. However, the most common one, known as cross correlation, is not a maximum likelihood approach for SAR intensity images. It is the ML solution for optical data with an additive noise model and for complex SAR data following circular Gaussian statistics. For SAR intensity data, which follow the gamma distribution, cross correlation is not ML estimation. Therefore, traditional incoherent cross correlation is not optimal for SAR intensity images regarding its multiplicative speckle/noise model. The tree statistics, which are ML intensity tracking, coherent cross correlation and incoherent cross correlation, are compared on both simulated and real data for their efficacy in tracking. Even though a new intensity based tracking algorithm, which has been proposed in [1] especially for incoherent data sets, the analysis of the proposed techniques was also performed for correlated and partly correlated data sets. Therefore, this paper discuss the accuracy assessment of tracking algorithms, which mainly has two parts: the first, image processing including imagining geometry, signal theory, and etc., and the second, estimation theory. The accuracy assessment with real data is discussed regarding the measurement of glacier velocities. It will be demonstrated that the proposed technique is capable of robustly and precisely detecting the surface velocity field and velocity changes in time.

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