UNASSISTED QUANTITATIVE EVALUATION OF DESPECKLING FILTERS

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Abstract

SAR (Synthetic Aperture Radar) imaging plays a central role in Remote Sensing due to, among other important features, its ability to provide high-resolution, day-and-night and almost weather-independent images. SAR images are affected from a granular contamination, speckle, that can be described by a multiplicative model. Many despeckling techniques have been proposed in the literature, as well as measures of the quality of the results they provide. Assuming the multiplicative model, the observed image Z is the product of two independent fields: the backscatter X and the speckle Y. The result of any speckle filters is $\widehat{X}$, an estimator of the backscatter X, based solely on the observed data Z. An ideal estimator would be the one for which the ratio of the observed image to the filtered one $I = Z/\widehat{X}$ is only speckle: a collection of independent identically distributed samples from Gamma variates. We, then, assess the quality of a filter by the closeness of I to the hypothesis that it is adherent to the statistical properties of pure speckle. We analyze filters through the ratio image they produce with regards to first- and second-order statistics: the former check marginal properties, while the latter verifies lack of structure. A new quantitative image-quality index is then defined, and applied to state-of-the art despeckling filters. This new measure provides consistent results with commonly used quality measures (equivalent number of looks, PSNR, MSSIM, β edge correlation, and preservation of the mean), and ranks the filters results also in agreement with their visual analysis.

Information

- Subbmitted to http://www.mdpi.com/journal/remotesensing/special_issues/rsimages.
- Remote Sensing
- Title: Unassisted Quantitative Evaluation Of Despeckling Filters.
- Download: pdf

Source Code

The source codes are accessible at Here. Please read the instructions for installation Readme.

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