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TOWARDS REAL-TIME BLIND FOCUSING OF SAR DATA

Abstract

In the last decades, SAR data processing related to radar satellite missions has led to the development of many applications related to several fields of earth observation, such as land and infrastructure monitoring. Satellite SAR configuration is often monostatic, that is with transmitter and receiver in the same space platform, and it can also be bistatic, where the main challenge is related to the synchronization between transmitter and receiver. Regardless of the type of SAR configuration, the geometric set-up of SAR acquisition system, as well as ancillary data acquired in correspondence of transmitter and receiver locations are necessary in order to apply canonic model-based algorithms of SAR data-focusing. Aiming to maximize opportunistic SAR applications, this article presents the potential applications of a blind technique to SAR data-focusing based on the use of the Singular Values Decomposition (SVD) and LMS fitting of the phase information extracted from singular vectors. The presented blind SAR-data focusing algorithm, which can be applied to areas with at least one reflective point scatterer in the scene, is able to obtain a focused-SAR image with a good quality based on a complex SAR raw data matrix without any additional geometric or radiometric information. To reduce the computational time of SAR data focusing, algorithm works partitioning in blocks the raw image and, after focusing, merging the focalized blocks. To show the potential of this blind technique, such as the utilization of opportunistic radar receivers, the development of cost-effective SAR systems related to aerial unmanned vehicles, and potentialities of real-time on-board SAR data focusing, preliminary results related to raw SAR data will be presented and discussed, highlighting strengths and weaknesses of such applications. In particular, emphasis will be placed on raw SAR data acquired by the Italian Earth-imaging constellation Cosmo Sky-Med with reference to the "stripmap" sensor imaging operating mode, which is among the most common mode to obtain SAR image.