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SUPER-RESOLUTION METHODS FOR ENHANCED IMAGING OF RADAR DATA

Abstract

The paper focuses on the application of Super-Resolution (SR) algorithms to Ground Penetration Radar (GPR) and sounder data to enhance the radar range resolution up to a factor three or more. Here, SR techniques are applied to three ongoing mission instruments with te aim of extracting information about Mars crust: the Shallow Radar (Sharad) and the Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS) sounders from orbit and on Radar Imager for Mars' Subsurface Exploration (RIMFAX) data acquired from the rover Perseverance. The application of such spectral estimation based techniques has proven to be effective for improving target-resolution and positioning by expanding the acquired bandwidth. The methods can be exploited for the prediction of missing or corrupted samples in the spectrum and for merging adjoining bandwidths acquired almost simultaneously. This results in a a more accurate application of data inversion methodologies whose aim is the estimation of the dielectric properties of material composing the surface and the subsurface of planetary bodies.