SAR Layover Correction Using Digital Surface Model

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Abstract: Synthetic Aperture Radar (SAR) data are often used in environmental and disaster observations. Using the Differential SAR Interferometry (DInSAR) technique, the displacement of the surface can be obtained effectively. The result may achieve centimeter-level or higher accuracy. However, in mountainous and urban areas, there may be serious problems such as layover and shadow. These artifacts may lead to errors in the geo-coding of SAR images. Combining synthetic aperture radar imagery and digital surface model (DSM) is a potential solution to reduce these artifacts. Using ray-tracing techniques, the coordinates of a DSM can be back-projected onto the SAR image plane to produce a simulated pseudo-SAR image whose data are the world coordinates of each pixel. Stacking the simulated image with the radar image, the spatial position of each pixel in the real SAR image is provided by the simulated SAR image. However, due to the layover effect, some areas in the simulated SAR image will not match the real SAR image. The objective of this study is to produce simulated SAR image and fix the problems caused by layover using DSM of the target area. The experiment examples of this study demonstrate that based on these three-dimensional spatial data, the results generated from the SAR data (such as PS-InSAR) can be projected onto three-dimensional space correctly for subsequent analyses.

Keywords: Synthetic Aperture Radar, Digital Surface Model, Layover, SAR Geo-coding