

## RADAR

### RADAR

Synthetic Aperture Radar (SAR) data can provide a wealth of useful information; however, due to the unique nature of airborne and satellite SAR systems, specific tools are required. The Radar package allows you to geometrically correct, process, and analyze radar imagery using a set of powerful radar-specific algorithms.

### PCI MODULE PREREQUISITES

The Radar module is an add-on to Geomatica Core.

### RADAR PROCESSING AND ANALYSIS

The Radar module provides a wide range of functionality used for radar processing and analysis, and can:

- Read radar image data from LGSOWG, CEOS, or ENVISAT ASAR N1 formats
- Generate a calibrated backscatter image from RADARSAT or Envisat ASAR data
- Generate a visible image channel from two input Single Look Complex (SLC) channels
- Generate a brightness channel from a scaled radar channel and an array of incident angles
- Generate a calibrated backscatter channel
- Perform SAR image segmentation and classification
- Apply radiometric terrain correction, including the generation of shadow and layover masks
- Perform a non-linear enhancement on SAR data to obtain more variability in uniform regions of an image, resulting in improved interpretability
- Generate a difference image between two SAR images by employing a user-specified threshold

### Airborne Radar Analysis Algorithms

- APC – Antenna Pattern Compensation
- CHDET – SAR Image Change Detection
- HISTEX – Histogram-based Texture Measures
- QAREP – Quality Analysis Report
- RSTR – SAR Image Contrast Stretch
- SARTEX – SAR-specific Texture Measures
- SRTOGR – Slant-Range-to-Ground-Range Conversion
- TEX – Texture Analysis

### SAR Radar Analysis Algorithms

- APC – Antenna Pattern Compensation
- CDASAR – CD Envisat ASAR Format
- CDSAR – CD ERS/RADARSAT CCT Format
- CDSAT – CD Satellite Format
- CHDET – SAR Image Change Detection
- HISTEX – Histogram-based Texture Measures
- QAREP – Quality Analysis Report
- RTCSIGM - Generate Calibrated Radar Backscatter with radiometric terrain correction
- RSTR – SAR Image Contrast Stretch
- SARBETA – Generate Radar Brightness
- SARINCD – Create Array Segment of Incidence Angles
- SARSIGM – Generate Calibrated Radar Backscatter
- SARTEX – SAR-specific Texture Measures
- SLC2IMG – Convert SLC to Image
- TEX – Texture Analysis
- SARSEG – SAR Image Segmentation
- SARCLASS – Classify Segmented Image

### RADAR GEOMETRIC CORRECTION

Geometric correction functionality in the Radar package lets you:

- Calculate the flight-path parameters (altitude, heading, angle, point-on flight path, and coefficients for line function) for airborne SAR imagery,

# Technical Specifications

given initial estimates of the flight parameters, digital elevation data, and GCPs

- Register slant-range or ground-range imagery to a UTM grid using flight path parameters and a DEM as input
- Simulate a SAR image using a geocoded DEM and sensor characteristics as input. Use the resultant geocoded simulated SAR image as a master image to collect GCPs with an uncorrected SAR image. The uncorrected SAR image can then be registered to the geocoded simulated image where ground control information is lacking.

## Radar Geometric Correction Algorithms

- SARGEO – Geocode (Rectify) Real SAR Image
- SARSIM1 – Range-Azimuth Simulated SAR Image
- SARSIM2 – Pseudo-Geocoded Simulated SAR Image
- STGBIG – Radar Image Registration
- FLIGHT – Flight Parameter Estimation

## RADAR DESPECKLING FILTERS

A number of filters designed specifically for improving the appearance and interpretability of radar data are available. These filters can be previewed and applied directly from the viewer or through application programs.

- *Frost Filter* uses an adaptive filtering algorithm, which is an exponentially damped convolution kernel that uses local statistics to adapt to features.
- *Enhanced Frost Filter* further divides the radar image into homogeneous, heterogeneous, and isolated point-target areas, and optimally filters each region.
- *Lee Filter* removes additive or multiplicative noise, or both.
- *Enhanced Lee Adaptive Filter* further divides the radar image into homogeneous, heterogeneous, and

isolated point-target areas, and optimally filters each region.

- *Gamma Map Filter* assumes the radar imagery has a Gamma distribution.
- *Kuan Filter* transforms the multiplicative-noise model into a signal-dependent, additive-noise model, and a minimum mean square error is applied.
- *Standard Deviation Filter* removes high-frequency noise, while preserving high-frequency features.
- *Touzi Filter* removes SAR speckle, while preserving the spatial-signal variability (texture and fine structures).

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