Geomatica Prime

Most of today's geomatics applications are interdisciplinary; remote sensing, image processing, GIS, and cartography must all be used to extract information and provide answers from existing data.

Geomatica Prime includes all the capabilities found in Geomatica Core, including state-of-the-art tools for geometric correction, data visualization and editing, image classification, cartographic map production plus a whole lot more, including applications for raster spatial analysis, radar analysis, hyperspectral analysis, along with a comprehensive desktop automation environment.

Geomatica Prime offers robust solutions for all types of desktop geomatics.

This technical specification document outlines the great tools and functionality available in Geomatica Prime. For the list of capabilities in Geomatica Core, see the Technical Specifications for that package.

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Geomatica Focus

Geomatica Focus includes all of the tools and functionality needed to view and analyze geospatial data. The bulk of the capabilities within Focus are included with Geomatica Core.

The following items within Geomatica Focus are licensed by the Geomatica Prime package.

VIEW Menu

Thumbnails

The Thumbnails window lets one view overviews simultaneously from multiple image bands. The Thumbnails window works for multispectral and hyperspectral data, but displays raster layers only. If a file contains no channels, the Thumbnails option is not available. You can view images across several spectral bands in a tiled rectangular array and display the images that correspond to several or all bands in the cube side by side

3D Data Cube

The 3-D Data Cube is an independent graphical tool that displays a three-dimensional data model. You can work in the view pane while the 3-D display is active. You can work with any multi-layer data, including hyperspectral data.

The Cube Excavation Area has text and slide controls that let you view a rectangular section of the layers in the cube. You can change the shape and the depth of the excavation with the slide controls. When you use a wheel mouse, you can lock the excavation of the x, y, or z plains of the cube. You can also lock all plains at once and change the view of the excavation by using the mouse wheel

LAYER Menu

Hyperspectral Spectra Plot

The Spectra Plotting dialog box allows you to view and configure a detailed graph that plots radiometric quantity and wavelength. You can import spectra from several sources that include the cursor position in the view pane, a region of interest drawn in the view pane and listed in the Spectra Extraction dialog box, and spectra signatures from Spectra Library files.

The spectra plot tool allows one to examine spectra and analyze the separability of classes, allowing you to:

- View spectra from regions of interest
- Open spectra from a spectral library to compare with spectra from your regions of interest
- Save spectra to a either an XML or to an SPL library
- Provide an Active Radiometric Quantity and Wavelength graph
- Provide an Active Displayed Spectra table
- Include data controls
- Adjust hyperspectral images
- Set plotting ranges
- View spectra reports

Spectra Reflectance Plot

A critical part of validating the accuracy of the reflectance correction process is to compare the reflectance signatures computed from different image pixels (samples) with the library spectra of a similar feature. For example, you can compare the reflectance signature computed from a pixel of a pine tree in an image with the library signature for pine trees. You can establish confidence that you have a good correction applied by sampling a variety of features (pixels).

The Spectra Reflectance Plot tool is specially designed to work with layers that are reflectance data. The plot and the tools are linked to the currently selected image in the Focus tree list.

With the Spectra Reflectance plot panel you can compare the image reflectance values with the library signatures of known features. This allows you to validate the results from the atmospheric correction process.

ANALYSIS Menu

Hyperspectral Extraction

One can extract spectra from image data using multispectral or hyperspectral data. The spectra extraction process begins with the configuration of data with the Spectra Extraction Configuration window. Focus creates a hyperspectral metalayer to hold the extracted spectra.

One must first specify the input file and channels that they want to work with. The spectra extraction tools let you:

- Collect regions of interest from a hyperspectral image or a scatter plot
- Review mean and ellipse information in a scatter plot for your spectra
- Create and review spectra plots from a region of interest
- Compare spectra signatures of regions with reference spectra from either a spectra library or another image
- Save spectra to either an XLS or to an SPL library

Change Detection

Wizard tool that allows users to detect change between images. Change detection can reveal the differences between two images of the same content from different dates. This feature can be useful in numerous circumstances in which you may want to analyze change, such as:

- Storm damage
- Forest-fire damage
- Flooding
- Urban sprawl

You can perform change detection with both airphoto and satellite imagery, and you can choose from several options on how you want to the changes to be shown. That is, areas of change can be shown using one of three available options for output display: red, green, and blue (RGB), pseudocolor, or grayscale.

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You can choose from either of two types of change detection:

- Difference - method which compares images of the same location from different dates, and then subtracts the imagery of one date from that of the other.
- Ratio - method that compares the pixel-by-pixel ratio of the data from two registered images. Pixels that show no change will have a value of one, while pixels that changed will have a higher or lower value.

Buffer

Fully functional, interactive GUI allowing multiple buffer levels. Miter, bevel, and rounded vertex options. Round, button, and projected end-styles and inside/outside polygon options.

Dissolve

Interactive GUI environment to combine shapes based on a similar attributes. The resulting output is a layer that contains the newly combined shapes with each shape represented as a layer record.

Overlay

Wizard tool that derives information from two or more input layers. The Overlay Wizard contains three overlay types:

- Spatial Overlay forms a new layer containing the attributes from two or more layers
- Statistical Overlay transfers the selected attributes from layer to another
- Suitability Overlay analyses the relative importance of input layers and attributes to identify the areas that produce the most positive result

TOOLS Menu

Python Scripting

Geomatica Focus features a Python Scripting window in which you can create, edit, and run Python scripts.

In the folder Examples\Python of your Geomatica installation, you will find sample Python scripts you can use as a starting point. These scripts are similar to the ones used in the algorithms in the Python Algorithm Library; however, you must define values for each of the parameters, as applicable.

The Python Scripting window features a toolbar, on which you can click buttons to perform common commands.

Each button is described in the following table.

Button	Command name	Description	Keyboard shortcut
	New	Start a new Python scripting session	CTRL+N
	Open	Open a saved Python script. In the File Selector window, the default file type is .py.	CTRL+O

Button	Command name	Description	Keyboard shortcut
💾	Save	Save the active script to a Python file (<script_file_name>.py)	CTRL+S
💾	Save As	Save the active script to a Python file using a new or existing file name (<script_file_name>.py)	
🏃	Run	Run the active Python script	CTRL+R

Smart GeoFill

The Smart GeoFill tool allows users to copy a specified area of an image layer, make changes to it, and then paste the selection to another layer of the image.

You can also adjust settings for blend width, color balance, contrast, and brightness of the selected area to enhance or adjust its appearance in the destination layer.

This tool allows users to perform edits directly in the Geographic space, while quickly finding candidate images for copying.

It is perfect for image vetting and cosmetic touch ups, because it keeps imagery in correct bit depth, even beyond most traditional photo editing software which only allow 8bit or 16bit data. It will also performs image blending and color balancing as well as automatic resampling on the fly.

EASI Modeling

You can use the EASI scripting language to write scripts and run them on data you have open in Focus. You can also open the EASI Modeling window to run EASI scripts for data that is not open in Focus. Dozens of pre-written scripts are available in the Geomatica pro folder.

Algorithm Librarian

The Algorithm Librarian provides easy access to many robust algorithm modules for geospatial data processing and analysis.

The Algorithm Librarian lists modules by category and subcategory. You can also define categories and subcategories. The Find search tool performs intelligent keyword searches for individual tasks.

Functions Available in Geomatica Prime

The following algorithms are available with Geomatica Prime. Other algorithms are available in the Algorithm Librarian through various Geomatica add-on modules.

- APPLRT – Apply Radiometric Transformation
- AREAOFINF – Create an Area of Influence Thematic Raster From Points Using an Attribute Weight
- AREAPROB – Create an Area Probability Raster Using an Attribute Weight
- ATRLUT – Atmospheric Transformation Using an At-Sensor Radiance Look-up Table

- AUTOSHIFT – Shift SAR image position
- BRDFCOR – Cross-swath Brightness Correction
- CCDINTEN – Intensity change detection
- CCDPHASE – Phase change detection
- CCDWISH – Wishart change detection
- CCDWM – Change detection using a weighted matrix
- CHDET – SAR Image Change Detection
- CHDETOP – Optical change detection
- CONTACTX – Contact Extension
- CONTEXT – Contextual classifier
- DENSITY – Create a Density Raster For a Point Layer Using an Attribute
- DIP – Dip and Strike Calculation
- DRAIN – Drainage Basin from Elevation Data
- DRSUB – Dark Reflectance Subtraction
- DWCON – Drainage and Watershed Conditioning
- EMPLINE – Empirical Line Calibration
- ENDMEMB – Select Endmembers
- EXPOLRAS – Extract and refine polygons from a raster
- FEFROST – Enhanced Frost Filtering (up to 33x33)
- FELEE – Enhanced Lee Adaptive Filtering (up to 11x11)
- FFROST – Frost Adaptive Filtering (up to 33x33)
- FGAMMA – Gamma Filtering (up to 11x11)
- FKUAN – Kuan Filtering (up to 11x11)
- FLAP – Laplacian Filtering (up to 11x11)
- FLE – Lee Adaptive Filtering (up to 11x11)
- FSPEC – SAR Speckle Filters
- FSTDEV – Standard Deviation Filtering (up to 11x11)
- FTLOC – Locate Spectrally Flat Targets
- FTOUZI – Touzi filter
- GENAWVC – Generate an Atmospheric Water Vapor Content Map
- GENCLUT – Generate a Spectral Line Curvature Correction Look-up Table
- GENRLUT – Generate an At-Sensor Radiance Look-up Table
- GENTP5 – Generate a MODTRAN4 Tape5 Input File
- GRDPIN – Point Grid Interpolation
- GRDPNT – Point Coverage Gridding
- GRDPOL – Polygon Coverage Gridding
- HISTEX – Histogram-based Texture Measures
- I2SP – Output Band Vectors as Image Spectra
- IDINT – Inverse Distance Interpolation
- KRIGING – Point Interpolation with Kriging
- LINTRN – Linearly Transform Image Channels
- MNFLT – Generate a Maximum Noise Fraction Linear Transformation
- MNFNR – Maximum Noise Fraction Based Noise Removal
- MQSINT – Multiquadratic Spline Interpolation
- NNINT – Natural Neighbour Interpolation
- OVERLND – Overland Path Generation
- OVL – Overlay Analysis

- PCLT – Generate a Principal Components Linear Transformation
- POTMAPSTAT – Create a Raster Representing Statistics For a Set of Points
- POTMAPSUR – Create a Raster From Points
- PPTABLE – Pour Point Table Report
- PRINTLT – Print a Linear Transformation
- PYRINT – Fast pyramid based interpolation
- RANFRAC – Evaluate a random fraction map
- REL – Shaded Relief from Elevation Data
- RESRLUT – Resample an At-Sensor Radiance Look-up Table
- RLUTSP – Extract Radiance Spectra From a Radiance Look-up Table
- ROLLCOR – Pushbroom Scanner Image Roll Correction
- RTCSIGM – Calibrated radar backscatter with radiometric terrain correction
- RVDEMINT – Fills holes in raster digital elevation models (DEM) by interpolation
- SAM – Spectral Angle Mapper
- SARBETA – Generate Radar Brightness
- SARCLASS – Segmented SAR Image Classification
- SARGEO – Geocode (Rectify) Real SAR Image
- SARINCD – Create Array Segment of Incidence Angles
- SARINGEST – Ingest a SAR data set
- SARSEG – SAR Image Channel Segmentation
- SARSIGM – Generate Calibrate Radar Backscatter
- SARSIM1 – Range-azimuth Simulated SAR Image
- SARSIM2 – Pseudo-Geocoded Simulated SAR Image
- SARTEX – SAR-Specific Texture Measures
- SEED – Automatic Watershed Seed Starter
- SEENARE – Determine Seen Areas From a Point
- SHFTCW – Shift Center Wavelength Values
- SLCCOR – Apply a Spectral Line Curvature Correction Look-up Table
- SMSPEC – Smooth Spectra
- SOLARZAZ – Solar Zenith and Azimuth Angles Calculator
- SP2RT – Convert a Spectrum to a Radiometric Transformation
- SP2SP – Spectral Library Reformat
- SPCONVP – Convolve Spectra with Response Profiles
- SPECL – Calculate Spectral Classification From Ground-Reflectance Data
- SPMIX – Linear Spectra Mixing
- SPUNMIX – Spectral Linear Unmixing
- SRTOGR – Slant Range to Ground Range Conversion
- STAMPJOIN – Raster Layer Overlay
- STRPCOR – Stripe Correction
- TEX – Texture Analysis
- THMRMER – Merge Thematic Rasters
- THMROVR – Overlay Thematic Rasters
- THSNPOLY – Create a Thiessen Polygon Layer
- TPSINT – Thin Plate Spline Interpolation
- TRANSEC – Create Perpendicular Transects
- VBUFFER – Create Buffer Raster from vectors
- VECBUF – Create Buffer Zone Around Vector Set

- VIEWZAZ – View Zenith and Azimuth Angles Calculator
- VIMAGE – Collect Image Point/Polygon Statistics
- VLM – Calculate Volume Under a Bitmap Using Elevation Data
- VPROJ – Reproject Shoreline
- WATEXT – Determine Pixels That Correspond to Water
- WTRSHED – Create Watersheds from Elevation Data

NOTE: With a license for the Geomatica Prime, the functions can also be executed either independently or sequentially via an EASI™ or Python™ script. They are also available in the PCI Modeler.

PCI Modeler

Modeler provides a set of tools that arrange modular commands and algorithms together in a customized data flow. Graphical elements in Modeler are ordered like a command-line script, but there is neither a command line nor a scripting language. Modeler gives professionals and those with a limited programming background the ability to develop sophisticated process flows.

Modeler includes a variety of remote-sensing and spatial-analysis functions. With Modeler, you can use graphical objects to build a script by linking configurable modules together in the Modeler workspace. When all of the data requirements are in place, click Run to execute your script. You can save your customized script and batch process any number of data files through your script.

The Main Panel

- Imports and exports data easily using any format supported by the Generic Database (GDB)
- Provides an interactive methodology for the creation of sophisticated data processing flows
- Provides an easy-to-interpret process flow chart
- Offers different colored pipes for different data types
- Saves process flows in a device-independent format
- Lets you stop and start executed process flows easily
- Allows you to perform batch executions of several process flows
- Supports stand-alone module execution
- Supports full data rendering (raster, bitmaps, vectors, and so on)
- Deactivated Mode breaks icon of module that is not correctly configured
- Allows the inspection of intermediate results by way of pipe caches
- Offers an integrated Help system

The Module Librarian

- Offers access to more than 275 processing modules (algorithms) categorized in an easy-to-navigate library
- Provides example models (processing flows) for each of the supported modules
- Offers a module search capability
- Provides a task description adjacent to each processing module
- Gives modules a unique icon grouping for clear task identification

The EASI Environment

EASI (Engineering Analysis and Scientific Interface) is a full-featured interpreted programming language. The command-line and scripting environment provides you with powerful tools for customizing and programming. As a command environment, EASI provides a simple and convenient mechanism for querying and setting input parameters required by an executable module. As a scripting language, EASI can be used to automate those manual procedures that are performed interactively.

EASI operates independently of its host environment and eliminates the differences between host-operating systems, presenting you with a simple, powerful environment.

The capabilities of EASI include:

- Error handling, which produces a numeric error code and corresponding textual error message
- Support for all PCI Geomatica command-mode functions, with complete syntax documentation
- Data-modeling performance through direct access to strings, projections, vectors, rasters, binary files, and text files
- Defining local or global variable types, which include:
    - integer - 4-byte signed integer number
    - float - 4-byte, single-precision, floating-point number
    - double - 8-byte, double-precision, floating-point number
    - char - single character (1 byte) o byte - single unsigned byte
    - string - an arbitrary long string of characters
    - mstring - multi-line string
    - mvar - modeling intermediate array
    - arrays
- Declaring local or global pointers with dynamic memory allocation
- Using conditional statements (if, else, elseif)
- Creating expressions (numeric, string, mstring, and logical); logical expressions include:
    - logical numeric expressions (= , < , > , <= , >= , <>)
    - logical string expressions (= , <> , literal string, string variable, indexed element of an mstring variable, character or character array variable, character parameter)
    - logical relations (and, or, not)
    - looping (while)
    - counted loop (for)
    - branching (go to)
    - returning (return)
    - stopping (stop)
- Building structures and functions
- Modifying command files in the Text Editor. Tools include: open, new, save, save as, execute, cut, copy, paste, and clear.
- Specifying your favorite editor as the default in the system settings
- The add-on Software Development Kit with GDB Technology, which can be used for user-developed PACE programs using Fortran or C/C++

Enhanced Desktop Production

The Desktop Production capabilities of Geomatica are greatly enhance with the ability to batch process workflows in the PCI Modeler Environment. Input file, output files and parameter variations are made possible through a Batch table included in each Modeler module.

Features of the batch table include:

- Each row of the table is a batch parameter set
- Select multiple rows or the whole table and then edit all the parameters so that selected parameter sets are identical
- Set Automatically: takes the parameter value from the input file or generates the parameter value from the system
- Add Files: enables the addition of multiple input or output files simultaneously.

Hyperspectral Analysis

The Hyperspectral capabilities are designed for processing and analyzing images acquired with airborne and satellite-borne imaging spectrometers. It consists of a set of hyperspectral-specific application programs, a set of visualization programs, and spectral libraries (*splib04a* and *splib04b*) from the United States Geological Service (USGS).

Data Preprocessing

Preprocessing tasks, which prepare data for visual interpretation, removal of atmospheric effects, or automated analysis can be divided into sensor-related calibration, geometric correction, and noise removal.

Sensor–Related Calibration

- DRSUB – Dark Reference subtraction: Obtains band-image values that are more closely proportional to at-sensor radiance
- SHFTCW – Shift-center wavelength value: Directly changes the center wavelength values in band-response profiles

Geometric Correction

- ROLLCOR – Pushbroom scanner image roll correction: Removes roll distortion without ancillary data; shifts image lines by an integer number of pixels

Noise Removal

- STRPCOR – Remove periodic striping: Multiplies pixel values in each bad row or column stripe by a gain value that is a function of neighboring rows or columns
- BRDFCOR – Reduce cross-swath brightness variation: Reduces along-scanline tone variation without knowing the instantaneous view direction
- PCLT – Generate a principal components linear transformation: Computes and applies parameters of band-wise linear data transformations and their inverses. This value is computed from the band-vector covariance matrix and results in bands being ordered in decreasing image quality
- MNFLT – Generate a maximum noise fraction linear transformation: Computes and applies parameters of band-wise linear data transformations and their inverse values; accepts explicit

noise image or approximation for certain kinds of noise (salt-and-pepper, image striping). Results in bands being ordered in an increasing signal-to-noise ratio
- PRINTLT – Print linear transformation parameter values
- LINTRN – Linearly transform image channels: Computes and applies parameters of band-wise linear data transformations and their inverse values. Transforms an image using the parameters read from a transformation parameters file and applies either the forward or inverse transformation
- MNFNR – Maximum noise fraction noise removal: Used when an image band has significantly more noise than the other image bands. Transforms an image band so that its noise content is close to that of the other bands. Applies multiple times to the same image in order to reduce the noise in multiple bands

Simple Atmospheric Correction

Geomatica supports the following simple atmospheric correction for Hyperspectral data.

Empirical Line Calibration

- EMPLINE – Empirical line calibration: Computes parameters of band- specific radiometric transformations to transform multi-band image values to estimates of scene reflectance. Relies on ground or lab reflectance spectrum for surface types that can be localized in an image. Does not account for the effect of variations in atmospheric conditions over the full extent of image

Flat Field Correction

- FTLOC – Locate spectrally flat targets: Generates reference spectrum by finding image locations where image spectra are best approximated by a polynomial function of wavelength
- SP2RT – Convert a spectrum to a radiometric transformation: Converts reference spectrum (FTLOC) into a radiometric transformation. Stores transformation in the image file. Can be applied on-the-fly
- APPLRT – Apply radiometric transformation: applies transformation and creates new transformed image

Local Analysis

The following local analysis capabilities are supported:

Endmember Selection

- ENDMEMB – Select Endmembers: Estimates a set of Endmember spectra for a specified image region using iterative error analysis (IEA). Outputs endmembers to a file, used as input into SPUNMIX. Specifies the size of an endmember set.

Spectral Unmixing

- SPUNMIX – Spectral Linear Unmixing:
    o Linearly unmixes a hyperspectral image
    o Estimates the contribution of each endmember to the spectrum at each image location
    o Computes a fraction map for each endmember
    o Provides a single map output for each endmember spectra
    o Provides a value at a given location as an estimated fractional contribution of a map's reference spectrum to image spectrum
    o Determines information on a "subpixel" scale
    o Extracts information from "mixed pixels"

- o Includes an RMS-error for each endmember in an output report

Spectral Angle Mapper Image Classification

- SAM – Perform a spectral angle mapper classification
    - o Classifies hyperspectral data, using reference spectra that defines classes
    - o Extracts lab-measured reflectance spectra
    - o Computes the "spectral angle" between each band vector and each reference spectra
    - o Results in a raster layer showing the smallest spectral angle (to reference spectra) for each pixel
    - o Resamples input reference spectra to match image wavelength sampling if necessary
    - o Prints a tabular summary of classification results

Spectra Handling

The following spectra handling functions are included:

- I2SP – Derive spectra from an image
- SPCONVP – Convolve spectra with band response profiles
- SP2SP – Reformat a set of spectra

Hyperspectral Atmospheric Correction

Atmospheric correction for Hyperspectral is included as part of Geomatica Prime.

The advanced software employs the MODTRAN4 atmospheric radiative transfer model, and is augmented by software for deriving an atmospheric water vapor content map from the image data, and for spectral line curvature and correction. PCI Geomatics customers can obtain the MODTRAN4 executable and data files directly from PCI Geomatics. We have been licensed by the United States Department of the Air Force to provide this service. These new capabilities provide end-users with the capability to better analyze and view their hyperspectral data.

- GENTP5 – Generate a MODTRAN4 'tape5' files (Note: this is not a general `tape 5' file generation utility, but rather is limited to the parameters relevant to the atmospheric correction method)
- GENRLUT – Generate an at-sensor radiance look up table from a MODTRAN4 'tape7' output file
- RESRLUT – Resample at-sensor radiance to surface reflectance dataset
- ATRLUT – Transform at-sensor radiance to surface reflectance dataset
- GENAWC – Generate a water vapor column map
- GENCLUT – Detect spectral line curvature correction
- SLCCOR – Apply a spectral line curvature correction
- SMSPEC – Smooth the dataset in the along-band dimension
- RLUTSP – Extract radiance spectra from a radiance look up table
- VIEWZAZ – Evaluate the view zenith angle and azimuth
- SOLARAZ – Evaluate the solar zenith angle and azimuth

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Radar Processing and Analysis

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 functions in Geomatica Prime allow you to geometrically correct, process, and analyze radar imagery using a set of powerful radar-specific algorithms.

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

- CHDET – SAR Image Change Detection
- HISTEX – Histogram-based Texture Measures
- SARTEX – SAR-specific Texture Measures
- SRTOGR – Slant-Range-to-Ground-Range Conversion
- TEX – Texture Analysis

SAR Radar Analysis Algorithms

- 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
- SARBETA – Generate Radar Brightness
- SARINCD – Create Array Segment of Incidence Angles
- SARSIGM – Generate Calibrated Radar Backscatter
- SARTEX – SAR-specific Texture Measures
- TEX – Texture Analysis
- SARSEG – SAR Image Segmentation
- SARCLASS – Classify Segmented Image
- WATEXT – Determine water pixels in Imagery

Radar Geometric Correction

Geometric correction functionality in the Radar package lets you:

- 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

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).

Spatial Analysis

Built on a robust legacy, the Spatial Analysis tools let you visualize, analyze, and model geographic information, allowing you to discover problem-solving spatial relationships, trends, and patterns.

Buffering

Geomatica Focus includes a fully functional, interactive GUI allowing multiple buffer levels. Miter, bevel, and rounded vertex options. Round, button, and projected end-styles and Inside/Outside polygon options.

Algorithms Available

- VECBUF – Creates buffer zone around buffer set
- VBUFFER – Burns a vector layer into a raster layer

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Dissolve

Geomatica Focus includes an interactive GUI environment to combine shapes based on a similar attributes.

Algorithms Available
- THMRMER – Merges similar thematic raster classes

Overlay

Geomatica Focus includes a fully functional overlay wizard allowing Spatial, Statistical, and Suitability overlay.

Algorithms Available
- THMOVR – Overlay of two Thematic Rasters, union or intersection method
- STAMPJOIN – Overly of two raster layers with the union method
- OVL – Overlay Analysis
- VIMAGE – Point or Polygon statistical overlay

Proximity Analysis

A variety of algorithms used for carrying-out proximity analysis, using point and/or raster data.

- AREAOFINF - Area of influence thematic raster from points using attribute weight
- AREAPROB - Area probability raster from points using an attribute weight
- DENSITY - Density raster for point layer using an attribute
- POTMAPSTAT - Creates raster representing statistics for a set of points
- POTMAPSUR - Creates raster from points
- THMRMER – Merges similar Thematic Raster Classes
- THSNPOLY – Create a Thiessen polygon layer
- THMROVR – Overlay of two or more thematic rasters creating a new thematic raster

Topographic Analysis

A variety of algorithms used for carrying-out topographic analysis, using elevation data.

- SLASP – Slope and aspect from elevation data
- SEENARE – Determines Seen Areas from a Point
- REL – Shaded Relief from Elevation Data
- VLM – Calculates Elevation Data Volume under a Bitmap

Spatial Interpolation

These algorithms are used to interpolate various input data types to create raster output.

- GRDPIN - Point Grid Interpolation
- GRDPNT - Point Coverage Gridding
- GRDPOL - Polygon Coverage Gridding
- IDINT - Inverse Distance Interpolation
- KRIGING - Point Interpolation with Kriging
- MQSINT - Multiquadratic Spline Interpolation
- NNINT - Natural Neighbor Interpolation

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- TPSINT – Thin plate spline interpolation

Watershed Analysis

The watershed analysis group of algorithms includes a series of watershed drainage programs used as a unit to identify stream networks and their watershed, trace overland path flows, and identify the minimum elevation along each drainage divide (pour point table).

- DRAIN – Drainage Basin from Elevation Data
- DWCON – Drainage Watershed Conditioning
- OVERLAND – Overland Flow path Generation
- PPTABLE – Pour Point Table report
- SEED – Automatic Watershed Seed starter
- WTRSHED – Watersheds from Elevation data

Geologic Analysis

- CONTACTX - Contact Extension
- DIP - Dip and Strike Calculation
- VPROJ – Reproject shoreline
- TRANSEC – Creates perpendicular transects
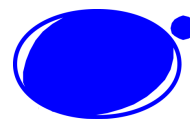
For more information, contact

PCI Geomatics
90 Allstate Parkway, Suite 501
Markham, ON L3R 6H3
Canada

Phone: 1 905 764 0614
Fax: 1 905 764 9604
Email: info@pcigeomatics.com
Web: www.pcigeomatics.com

株式会社 インフォサーブ

〒 101-0021
東京都千代田区外神田6丁目2番8号 松本ビル
TEL: 03-3833-8201   FAX: 03-3833-8203
E-mail: product_info@infoserve.co.jp
URL: http://www.infoserve.co.jp

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