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.

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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 Total package.

Visualization Tools - VIEW Menu

- **Thumbnails –** The Thumbnails window lets you 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

Information Tools - LAYER Menu

- **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
  - Provides reports

Analysis Tools - ANALYSIS Menu

- **Spectra Extraction** – allows you to select input channel data and choose a bit depth for the output data
- **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
- **Overlay** – derives information from two or more input layers. This tool is a fully functional overlay wizard allowing Spatial, Statistical, and Suitability overlay.

Algorithm Librarian – TOOLS Menu

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.

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

Hyperspectral Data Analysis

- APPLRT – Apply Radiometric Transformation
- ATRLUT – Atmospheric Transformation Using an At-Sensor Radiance Look-up Table
- BRDFCOR – Cross-swath Brightness Correction
- DRSUB – Dark Reflectance Subtraction
- EMPLINE – Empirical Line Calibration
- ENDMEMB – Select Endmembers
- FTLOC – Locate Spectrally Flat Targets
- 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
- I2SP – Output Band Vectors as Image Spectra
- LINTRN – Linearly Transform Image Channels
- MNFLT – Generate a Maximum Noice Fraction Linear Transformation
- MNFNR – Maximum Noise Fraction Based Noise Removal
- PCLT – Generate a Principal Components Linear Transformation
- PRINTLT – Print a Linear Transformation
- 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
- SAM – Spectral Angle Mapper
- 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
- SPUNMIX – Spectral Linear Unmixing
- STRPCOR – Stripe Correction
- VIEWZAZ – View Zenith and Azimuth Angles Calculator

Radar Data Analysis

- APC – Antenna Pattern Correction
- ASMF – Adjustable SAR-MS Fusion
- CALSCAT – Calibrate Scattering Matrix Data
- CALSTOK – Calibrate Stokes Matrix Data
- CHDET – SAR Image Change Detection
- CORNRD – Read Corner Reflector Data
- CORNREP _ Print Corner Reflector Report
- DIJPL – Read Polarimetric Data from JPL File
- DITOP – Read TOPSAR Data from JPL File
- 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)
- FLIGHT – Flight Path Parameter Estimation
- FSPEC – SAR Speckle Filters
- FSTDEV – Standard Deviation Filtering (up to 11x11)
- HEADMOD – Modify JPL Header Entries
- HEADREP – Print JPL Header Report
- HISTEX – Histogram-based Texture Measures
- QAREP – Quality Analysis Report
- RSTR – SAR Image Contrast Stretch
- SARBETA – Generate Radar Brightness
- SARCLASS – Segmented SAR Image Classification
- SARGEO – Geocode (Rectify) Real SAR Image
- SARINCD – Create Array Segment of Incidence Angles
- SARSEG – SAR Image Channel Segmentation
- SARSIGM – Generate Calibrate Radar Backscatter
- SARSIM1 – Range-azimuth Simulated SAR Image
- SARSIM2 – Psuedo-Geocoded Simulated SAR Image
- SARTEX – SAR-Specific Texture Measures
- SCATREP – Scattering Matrix Calibration Report
- SHRINK – Shrink Areas in Theme Image
- SLC2IMG – Convert SLC to Image
- SRTOGR – Slant Range to Ground Range Conversion
- STATJPL – Print Statistics for Polarimetric Data
- STDIJPL – Create Seven Standard Images
- STGBIG – Radar Image Registration (Big)
- STOKREP – Print Stokes Matrix Calibration Report
- SYNTH – Synthesize Arbitrary Polarization Image
- TEX – Texture Analysis
- TOPCLS – Classify C-Band TOPSAR Data

Raster Spatial Analysis

- AREAOFINF – Create an Area of Influence Thematic Raster From Points Using an Attribute Weight
- AREAPROB – Create an Area Probability Raster Using an Attribute Weight
- ASP – Calculate Surface Aspect of Elevation Data
- CONTACTX – Contact Extension
- DENSITY – Create a Density Raster For a Point Layer Using an Attribute
- DIP – Dip and Strike Calculation
- DRAIN – Drainage Basin from Elevation Data
- DWCON – Drainage and Watershed Conditioning
- 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 Neighbour Interpolation
- OVERLND – Overland Path Generation
- OVL – Overlay Analysis
- POTMAPSTAT – Create a Raster Representing Statistics For a Set of Points
- POTMAPSUR – Create a Raster From Points
- PPTABLE – Pour Point Table Report
- REL – Shaded Relief from Elevation Data
- SEED – Automatic Watershed Seed Starter
- SEENARE – Determine Seen Areas From a Point
- SLP – Slope of Elevation Data
- STAMPJOIN – Raster Layer Overlay
- 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
- VBUFFER2 – Create Buffer Raster from vectors
- VECBUF – Create Buffer Zone Around Vector Set
- VIMAGE – Collect Image Point/Polygon Statistics
- VLM – Calculate Volume Under a Bitmap Using Elevation Data
- VPROJ – Reproject Shoreline
- WTRSHED – Create Watersheds from Elevation Data

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).

Also available are hyperspectral image compression and MODTRAN4-based atmospheric correction.

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

Spectral Angle Mapper Image Classification

- SAM – Perform a spectral angle mapper classification
  - Classifies hyperspectral data, using reference spectra that defines classes
  - Extracts lab-measured reflectance spectra
  - Computes the "spectral angle" between each band vector and each reference spectra

- Results in a raster layer showing the smallest spectral angle (to reference spectra) for each pixel
- Resamples input reference spectra to match image wavelength sampling if necessary
- 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 colum 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
- VIEWAZ – Evaluate the view zenith angle and azimuth
- SOLARAZ – Evaluate the solar zenith angle and azimuth

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

- 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
- WATEXT – Determine water pixels in Imagery

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, 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).

PCI Geomatics gratefully acknowledges the financial support provided by the Canadian Space Agency through the Earth Observation Application Development Program (EOADP). This support was essential to the development of the Radar module.

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

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.

- SLP – Calculates Slope of Elevation Data
- ASP – Calculates Surface Aspect of 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
- 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

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