IDRISI Taiga

GIS and Image Processing Software

Technical Specifications

The IDRISI Taiga GIS and Image Processing software includes nearly 300 modules for the analysis and display of digital information. The specifications for these modules are presented in the same logic as the IDRISI menu structure within the software.

GIS Analysis

At the very heart of GIS is the ability to perform analyses based on geographic location. Indeed, no other type of software can provide this. IDRISI offers a wealth of analytical tools for geographic analysis.

DATABASE QUERY

Database Query is the most fundamental of GIS operations.

RECLASS performs image reclassification.

OVERLAY performs nine different operations between two images including add, subtract, multiply, divide, normalized ratio, exponentiate, minimize, maximize, and cover.

CROSSTAB performs a crosstabulation or a crosscorrelation between two qualitative maps.

EXTRACT calculates summary statistics for a set of input maps.

BREAKOUT creates Boolean maps for all categories in an image.

HISTO provides a graphic or numeric frequency histogram and statistics of the cell values within an image.

AREA calculates the area in a variety of units of each class in an image.

PERIM calculates the perimeter of each class in an image.

PROFILE creates profiles over space or over time.

QUERY extracts pixels designated by an independent mask into a sequential file for subsequent statistical analysis.

PCLASS performs a probability reclassification when the level of uncertainty in an image is known.

Database Workshop is a relational database manager and provides the ability to create, edit and analyze database files in IDRISI using the Microsoft ADO and Access Jet Engines. Both the Calculate and Filter operations are supported through the use of Structured Query Language (SQL).

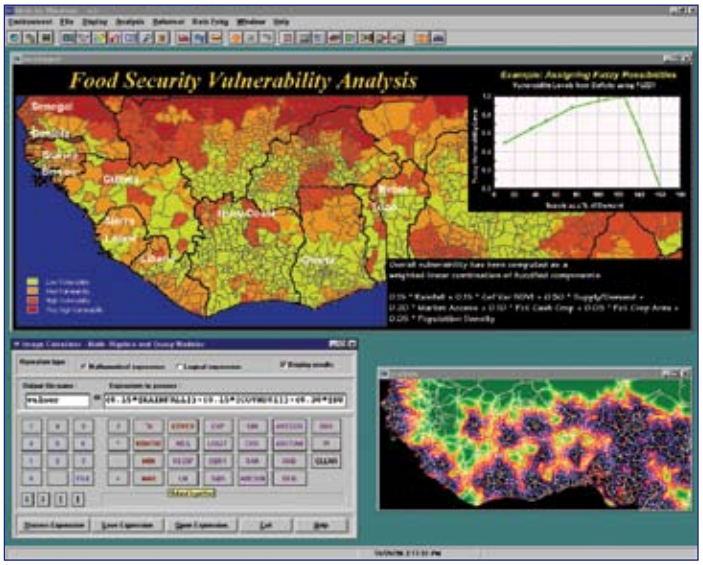


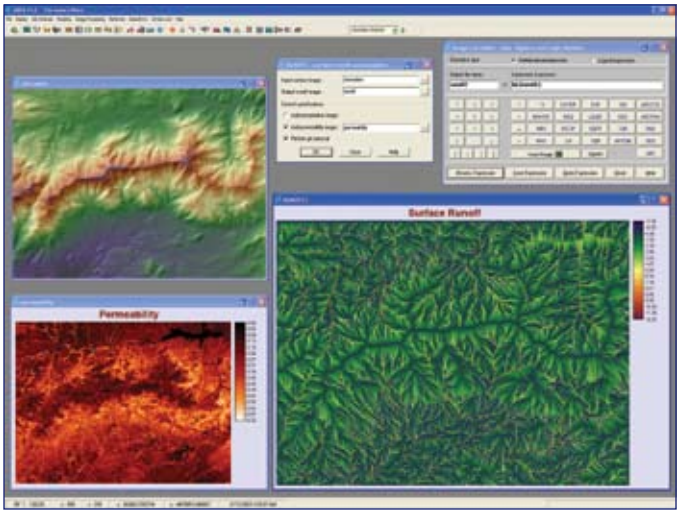
Image Calculator can evaluate models such as this vulnerability mapping analysis using fuzzy criteria in West Africa. The smaller image of market accessibility was produced with an anisotropic cost function that calculates effective distance from markets recognizing the frictional effects of landcover, road type, slope and aspect (i.e., whether the slope is uphill or downhill).

Image Calculator is an interactive mathematical modeling tool that allows you to enter a model as a full algebraic equation using a calculator-like interface. It also supports mathematical expressions and logical queries.

MATHEMATICAL OPERATORS

IDRISI provides a set of mathematical tools necessary for complete map algebra.

OVERLAY can perform nine different operations between two images including add, subtract, multiply, divide, normalized ratio, exponentiate, minimize, maximize, and cover.



IDRISI includes tools for the derivation of runoff potential and stream networks.

SCALAR undertakes arithmetic operations between a constant and a single image.

TRANSFORM can perform 15 different mathematical transformations on the attributes of a single image including natural logarithms and antilogs, a logit transformation, reciprocal, square and square root, absolute value, and all of the trigonometric operations.

Image Calculator is an interactive mathematical modeling tool that allows you to enter a model as a full algebraic equation using a calculator-like interface and supports mathematical expressions and logical queries.

DISTANCE OPERATORS

Distance operators provide tools where distance plays a key role in the analysis.

DISTANCE calculates the true Euclidean distance of each cell to the nearest of a set of target cells as specified in a separate image.

SPDIST is the equivalent of the DISTANCE module, except that it accommodates the special case of spherical distance units (degrees, radians).

COST calculates a distance/proximity surface where distance is measured as the least cost distance in moving over a friction surface.

BUFFER creates buffers around any set of specified features in an image.

The next set of four modules is used when frictions act with different strengths depending on the direction of movement.

VARCOST computes an anisotropic cost surface using direction and magnitude force images.

DISPERSE models movement caused by anisotropic forces in terms of direction and magnitude but unlike the VARCOST module, these terms have no motive force of their own.

RESULTANT computes the resultant force vector (as a magnitude and direction image pair) from two input force vector image pairs.

DECOMP decomposes a force vector (as a magnitude and direction image pair) into X and Y component images, or takes X and Y component images and produces a force vector image pair.

PATHWAY calculates the route of least cost distance between one or more points and the lowest point or points on an accumulated cost distance surface.

ALLOCATE performs spatial allocation based on a distance or cost distance image.

RELOCATE moves features in an image to a target set of features in another image based on minimum distance.

THIESSEN produces Thiessen polygons around a set of irregularly distributed points.

CONTEXT OPERATORS

Context operators assign new values in an image based on the values of its surrounding neighbors.

SURFACE calculates either the slope, aspect, or an analytical hillshading model of surface cells from a given input image of terrain heights.

FILTER applies 3 by 3, 5 by 5, 7 by 7, or user-defined kernels to calculate new values based on neighboring values. The following filters are available: mean, Gaussian, median, standard deviation, adaptive box, mode, Laplacian edge enhancement, high pass, Sobel edge detection, and user-defined.

PATTERN computes various numerical pattern indices (relative richness, diversity, dominance, frequency, fragmentation, and others), using a 3 by 3, 5 by 5, or 7 by 7 template.

TEXTURE calculates measures of variability (fractional dimension, class frequency, edge analysis, and others) using a 3 by 3, 5 by 5, or 7 by 7 template.

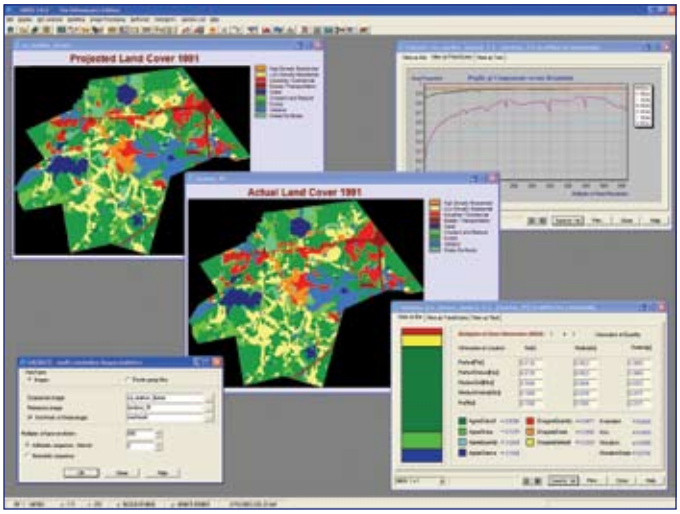
GROUP identifies unique contiguous polygon areas in an image.

VIEWSHED determines all visible cells from any single or multiple location on a surface or the proportion of viewpoint cells from which a viewshed is visible.

WATERSHED calculates all cells belonging to the watersheds of one or more target cells.

HINTERLAND determines the supply area dominated by point demand centers.

PIXEL LOCATION creates new images representing the X and Y coordinate of each cell center.



IDRISI has tools for the validation of classified maps to reality including crosstabulation and error matrix analysis.

STATISTICS

The Statistics submenu provides a series of tools for performing both traditional statistical analysis and specialized spatial statistics routines.

HISTO provides a graphic or numeric frequency histogram and statistics of the cell values within an image.

EXTRACT calculates summary statistics for a set of input maps.

PATTERN computes various numerical pattern indices (relative richness, diversity, dominance, frequency, fragmentation, and others), using a 3 by 3, 5 by 5, or 7 by 7 template.

COUNT calculates a relative frequency probability image derived from a set of input Boolean images.

REGRESS undertakes a linear regression analysis with summary statistics and graphs on image pairs.

MULTIREG performs a multivariate regression analysis between images, one dependent variable and two or more independent variables.

LOGISTICREG performs a logistical regression analysis on images, one dependent variable and two or more independent variables.

MULTILOGISTICREG undertakes a multinomial logistical regression on images where the dependent variable is multi-categorical.

TREND calculates up to a 9th-order best-fit trend surface between pixel values and their positions within the image.

AUTOCORR calculates the first-lag autocorrelation coefficient, using a "rook's case" or a "king's case" of an image using Moran's "I" statistic.

QUADRAT performs quadrat analysis, the character of a point set's pattern, in terms of its variance/mean ratio or density.

CENTER calculates the mean center ("center of gravity") and standard radius for a set of points.

CRATIO measures the compactness ratio of defined polygons.

CROSSTAB performs a crosstabulation or a crosscorrelation between two qualitative maps.

VALIDATE calculates specialized Kappa measures that discriminate between errors of quantity and errors of location between two qualitative maps.

ROC calculates the Relative Operating Characteristic providing a measure of the correspondence between a quantitative modeled image showing the likelihood that a particular class exists.

SAMPLE creates systematic, random, and stratified random point sampling schemes.

RANDOM creates a new image of specified dimensions with random values that obey either a rectilinear, normal, or lognormal distribution, according to a user-specified mean and standard deviation.

STANDARD converts the values in an image to standard scores.

SPLUSIDRIS and **STATIDRIS** import and export images and data between IDRISI and S-PLUS and Statistica software respectively.

DECISION SUPPORT

The modules in this menu are unique in that they specifically address multi-objective, multi-criteria resource allocation decision problems, as well as problems of assessing and incorporating uncertainty in the decision making process.

The **Decision Wizard** is an automated assistant that steps you through the decision support process in IDRISI. The Wizard facilitates the use of WEIGHT, MCE, RANK and MOLA.

WEIGHT employs the Analytical Hierarchy Process to compute a best-fit set of weights through a pairwise comparison of factors in a multi-criteria evaluation.

MCE performs a multi-criteria evaluation by means of either a Boolean analysis, Weighted Linear Combination (WLC) or Ordered Weighted Averaging (OWA) of factor images.

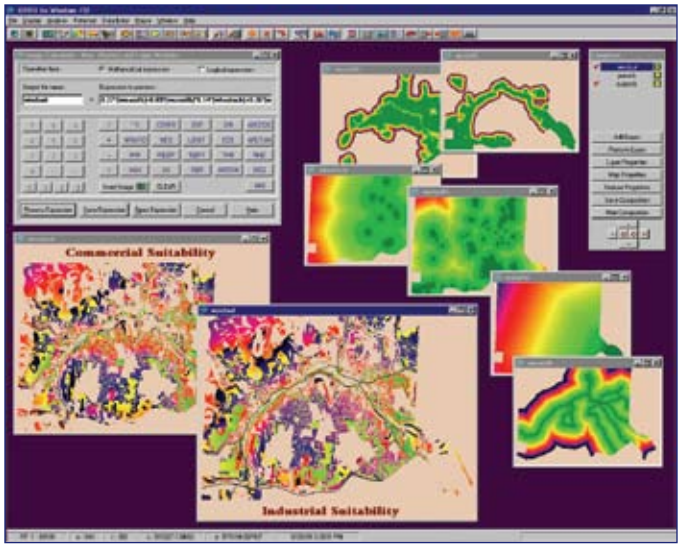
RANK orders every cell in a raster image.

MOLA performs a multi-objective land allocation analysis using a decision heuristic to resolve conflicts.

STANDARD converts an image to standard scores.

FUZZY evaluates the fuzzy set membership values (possibilities) of data cells based on any of three membership functions: sigmoidal, j-shaped, and linear, or through a user-defined membership.

COUNT calculates a relative frequency probability image derived from a set of input Boolean images.



IDRISI includes an unparalleled suite of tools for multi-objective/multi-criteria decision support. Multiple suitability problems are defined in terms of factors, constraints, factor weights and risk-taking strategy. Then the composite suitability images for each objective are used together to best allocate areas to each objective. Rather than one-shot black-box solutions, this approach provides decision makers with understandable and defensible methods that can be iteratively improved. Here, industrial and commercial suitability are modeled.

MDCHOICE resolves conflicts between competing objectives by means of a multiple ideal-point procedure.

The remaining modules in this submenu are used in the evaluation and handling of error in geographic analysis.

PCLASS evaluates the probability with which data cells exceed or are exceeded by a specified threshold based on the stated RMS error for the input map.

BAYES evaluates the probability that an entity belongs to any of a number of different sets.

Belief employs the Dempster-Shafer Weight-of-Evidence procedure to evaluate the degree to which evidence provides concrete support for a hypothesis (belief) and the degree to which that evidence does not refute the hypothesis (plausibility).

RANDOM creates random images according to rectilinear, normal or log-normal models.

SAMPLE creates systematic, random, and stratified random point sampling schemes.

ERRMAT produces an error matrix analysis of categorical map data compared to ground truth information and tabulates errors of omission and commission, marginal and total errors, per-category Kappa Index of Agreement, and selected confidence intervals.

CHANGE/TIME SERIES

Change and time series analysis tools identify and quantify change, as well as predict the effects of change on the environment, at scales ranging from local to global.

IMAGEDIFF compares two quantitative images of the same variable for different dates.

IMAGERATIO compares two quantitative images of the same variable for different dates through ratioing.

CVA (Change Vector Analysis) compares two-band sets of images for two dates and calculates the magnitude and direction of change.

CALIBRATE adjusts the overall numeric characteristics of an image to match an external standard using either image regression, user-defined offset and gain, or user-defined mean and standard deviation.

CROSSTAB performs a crosstabulation or a crosscorrelation between two qualitative maps.

To analyze change over multiple dates, the following modules may be used.

PROFILE creates profiles over space or over time.

TSA performs a standardized Principal Components Analysis for time series data.

TFA performs temporal Fourier analysis of time series images.

CORRELATE calculates the Pearson Product Moment Coefficient of Correlation between a set of values in an attribute values file and the values through a time series of images for each pixel of an image.

KENDALL calculates the monotonic trend in data over time using the non-parametric Mann Kendall statistic.

KENDAL TAU calculates a non-parametric statistic to estimate the degree of correspondence between two ordinal level variables.

Media Viewer is a presentation utility that can play Windows video (AVI) files and can create AVI video files from a sequence of IDRISI images.

TSTATS computes temporal statistics on a per-pixel basis across a raster group of images.

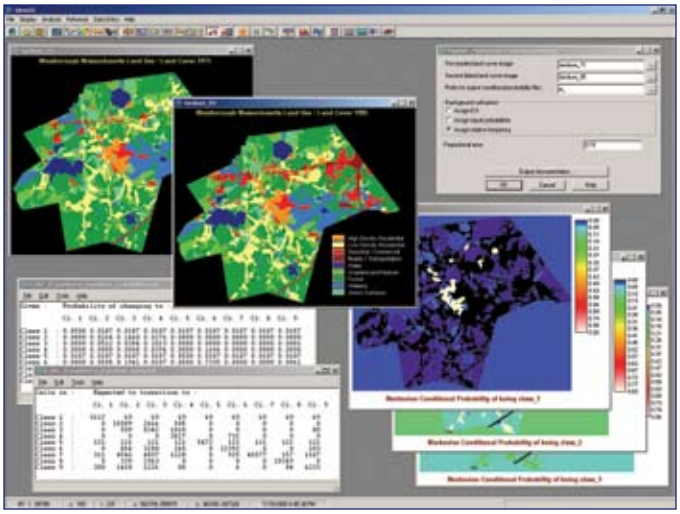
TCOR produces the correlations of a spatial pattern between a single image and each image in a time series.

The following modules are used in modeling future change.

MARKOV analyzes two qualitative landcover images from different dates and produces a transition matrix, a transition areas matrix, and a set of conditional probability images.

STCHOICE creates a stochastic landcover map by evaluating the conditional probabilities that each landcover can exist at each pixel location against a rectilinear random distribution of probabilities.

DISAGGREGATE redistributes the conditional probabilities of a particular landcover type according to a designated pattern.



Markov Chain Analysis, a technique for predictive change modeling, is supported in IDRISI with the module MARKOV. Predictions of future change are based on changes that have occurred in the past.

NORMALIZE linearly adjusts the values for a set of quantitative images so the values sum to 1.0 at each pixel.

LOGISTICREG performs a logistical regression analysis on images, one dependent variable and two or more independent variables.

CELLATOM performs a cellular automata set of operations according to a set of rules for changing states.

CA_MARKOV is a combined cellular automata / Markov change landcover prediction procedure that adds an element of spatial contiguity as well as knowledge of the likely spatial distribution of transitions to Markov change analysis.

GEOMOD is a landuse change simulation model that predicts, forward or backward, the locations of grid cells that change over time.

VALIDATE calculates specialized Kappa measures that discriminate between errors of quantity and errors of location between two qualitative maps.

ROC calculates the Relative Operating Characteristic providing a measure of the correspondence between a quantitative modeled image showing the likelihood that a particular class exists.

SURFACE ANALYSIS

Interpolation

INTERPOL interpolates a distance-weighted average or a potential model surface given an input set of points.

INTERCON interpolates a surface from a set of digitized contour lines.

TIN creates a constrained or non-constrained triangulated irregular network from isoline or point data.

* These modules access a modified version of Gstat©.

TINSURF interpolates a full raster surface from a TIN model and the original point attribute data.

GENERALIZATION creates a point vector file from the vertices of an input line file or thins vector point data according to a user-defined radial search distance.

LINTOPNT extracts the vertices of a vector line data file into a vector point data file.

TINPREP adds or removes points along an isoline given a user-specified tolerance distance.

Spatial Dependence Modeler* provides a wide range of tools to learn about the patterns of spatial dependence in a sample data set.

Model Fitting* allows the user to define mathematical models to describe the covariance relationships among sample data.

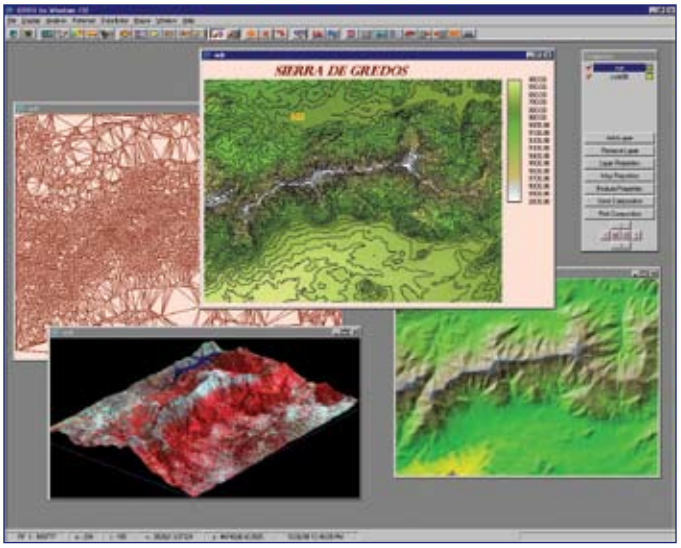
Kriging and Simulation* creates full raster surfaces from sample data and the models developed through spatial dependence modeler and model fitting.

THIESSEN produces Thiessen polygons around a set of irregularly distributed points.

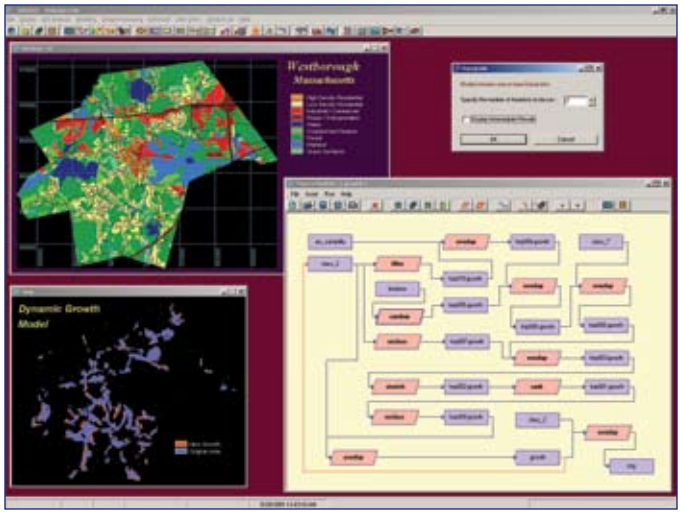
TREND calculates up to a 9th-order best fit trend surface between pixel values and their positions within the image.

Topographic Variables

SURFACE calculates either the slope, aspect, or an analytical hill-shading model of surface cells from a given input image of terrain heights.



IDRISI includes a wide range of surface generation, interpolation and analysis routines. Upper left, Triangulated Irregular Network model created from digital contour data. Upper right, digital elevation model (DEM) created from the TIN with original contours overlaid. Lower right, illuminated DEM emphasizes relief. Lower left, false color composite image (TM bands 234) draped over the DEM. All data in this screenshot are from the Sierra de Gredos area of Spain.



The IDRISI Macro Modeler provides a graphic environment for the construction of models. Facilities are included for batch processing of multiple images through the same model and for iterative processing with the output of one iteration becoming an input to the next.

CURVATURE calculates the maximum rate of change of a curve fit through a pixel in both the direction of aspect and also in the direction orthogonal to aspect.

FRACTAL calculates the fractal dimension of a surface using a 3 by 3 neighborhood.

Feature Extraction

CONTOUR creates vector isolines at specified contour intervals from a continuous surface.

TOPOSHAPE classifies a surface into eleven different features: peak, ridge, saddle, flat, ravine, pit, convex hillside, saddle hillside, slope hillside, concave hillside, and inflection hillside.

PIT REMOVAL creates an adjusted "depressionless" DEM in which the cells contained in depressions are raised to the lowest elevation value on the rim of the depression.

RUNOFF calculates the accumulation of rainfall units per pixel as if one unit of rainfall was dropped on every location.

FLOW calculates the flow direction from each pixel into its next "downhill" neighbor.

RUSLE (Revised Universal Soil Loss Equation) simulates farmland and rangeland nonchannelized soil loss by water.

WATERSHED calculates all cells belonging to the watersheds of one or more target cells.

SLOPELENGTH calculates the longest slope length in a given raster region.

FACET produces an image of homogeneity.

SEDIMENTATION evaluates the net soil movement (erosion or deposition) within patches, fields, or river basins.

Modeling

The diverse items in the Modeling menu unleash the power of raster analysis in IDRISI. Most modules in this menu are also located in other areas within the menu structure. Several modules are only found here.

LCM *(Land Change Modeler for Ecological Sustainability)* is an integrated software environment for analyzing landcover change, projecting its course into the future, and assessing its implications for habitat and biodiversity change.

ETM *(Earth Trends Modeler)* is an integrated software environment for the display, manipulation and analysis of time series data.

Macro Modeler provides a very mature graphical modeling interface that exposes all of IDRISI's GIS modules as objects that can be linked, dynamically and with feedbacks, with map layers in an algorithmic chain.

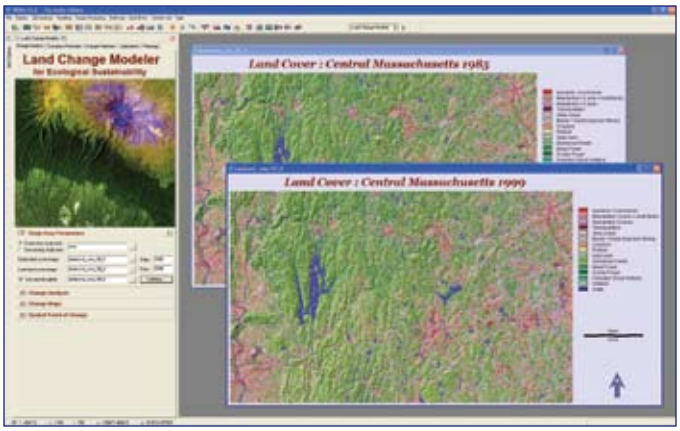
COM and **PYTHON** menu items allow for the development of stand-alone modules as add-ons to IDRISI using a scripting language such as Python or a full programming language such as C++, Delphi or Visual Basic. Using COM, client applications can be written that control all aspects of IDRISI's operations.

Image Processing

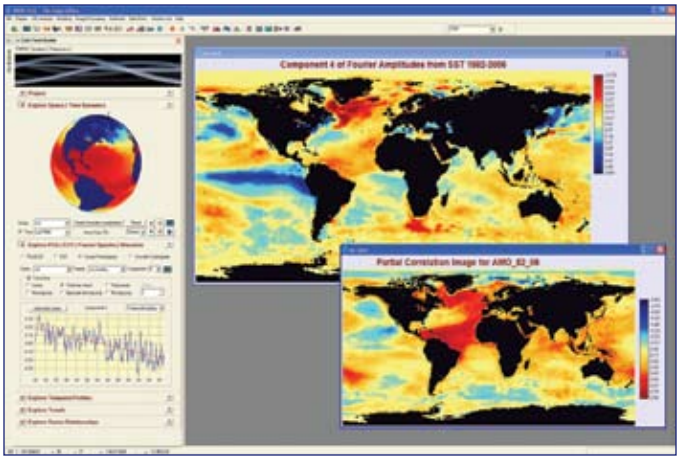
Alongside the geographic analytical operators found in IDRISI, the Image Processing capabilities round out a full suite of tools for the processing of spatial data.

RESTORATION

RESAMPLE performs a local affine transformation for the geometric restoration of images and can be used to georegister an image to a reference system or to another file.



The Land Change Modeler for Ecological Sustainability is organized around a set of tasks for landcover change assessment, change prediction, assessment of its impacts on habitat and biodiversity, and the exploration of planning interventions.



Earth Trends Modeler includes a coordinated suite of data mining tools for the extraction of trends and underlying determinants of variability.

LOCALAFFINE is used to rectify images that have an embedded grid of control points with precise known locations.

MOSAIC automates color balancing when adjacent overlapping images are joined into a single larger image.

DESTRIPE removes the striping caused by variable detector output in scanned imagery.

RADIANCE converts raw Landsat data values to calibrated radiance using lookup tables of gain and offset values.

ATMOSC corrects remotely sensed images for atmospheric effects using either the Dark Object Subtraction model, Chavez's Cos(t) model, the full radiative transfer equation model, or the Apparent Reflectance Model (ARM).

NDVICOMP creates temporal composite images of NDVI imagery using the maximum value or a quadratic mean.

SCREEN uses spatial autocorrelation to screen a hyperspectral series of images for the presence of significant atmospheric noise.

ENHANCEMENT

STRETCH increases the contrast in an image for the enhancement of visual interpretation.

COMPOSITE produces a 24-bit color composite image from three bands of imagery.

FILTER applies 3 by 3, 5 by 5, 7 by 7, or user-defined kernels to calculates new values using a mathematical operation on the original cell value and its neighbors. The following filters are available: mean, Gaussian, median, standard deviation, adaptive box, mode, Laplacian edge enhancement, high pass, Sobel edge detection, and user-defined.

PANSHARPEN performs a panchromatic merge using color space transformation, principal component transformation, and local regression transformation techniques.

TRANSFORMATION

PCA provides both standardized and unstandardized principal components analysis.

CCA performs a canonical components analysis transformation.

MNF (minimum noise fraction) maximizes the signal to noise ratio for a set of images.

TSA performs a standardized principal components analysis for time series data.

TFA (temporal Fourier analysis) performs harmonic analysis on temporal images.

COLSPACE performs Hue/Lightness/Saturation (HLS) to Red/Green/Blue (RGB) color space transformations.

TEXTURE calculates measures of variability (fractional dimension, class frequency, edge analysis, and others), using a 3 by 3, 5 by 5, or 7 by 7 template.

THERMAL converts Landsat TM Band 6 raw data values to blackbody temperatures.

VEGINDEX calculates 19 slope-based and distance-based vegetation indices from remotely sensed images.

TASSCAP performs the Tasseled Cap transformation.

FOURIER ANALYSIS

FOURIER allows for the transformation of images from the spatial domain to the frequency domain and back again.

ZEROPAD is used to prepare images used in FOURIER.

FILTERFQ, FREQDIST and **DRAWFILT** all facilitate the creation of filters to be applied to frequency domain images to enhance, suppress or remove particular frequencies prior to performing a reverse Fourier Transform. FILTERFQ offers 26 types of filters. FREQDIST creates a frequency distance image that may then be manipulated with RECLASS or FUZZY. DRAWFILT provides an interactive display utility in which the user may use the cursor to trace particular frequencies to be masked out.

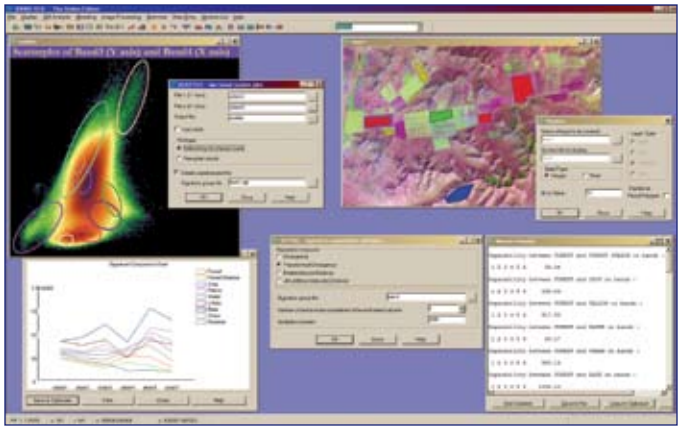
SIGNATURE DEVELOPMENT

MAKESIG creates statistical signature files for each informational training site class.

Endsig is used to create end-member (i.e., pure) signatures for use with UNMIX.

FUZSIG produces signatures from data that are assumed to be inherently fuzzy or ambiguous in character.

PURIFY performs a parametric (Mahalanobis distance) or a nonparametric (unsupervised clustering) purification on existing training site data.



IDRISI allows on-screen digitizing of training sites and the development and analysis of signatures including signature comparison, measures of separability, and scattergrams.

HYPERSIG creates statistical signatures from hyperspectral data, either from training site data or from spectral curve library files.

HYPERAUTOSIG automatically develops signatures for hyperspectral image data based on the Linear Spectral Unmixing logic.

SIGCOMP graphically displays and compares signatures.

SEPSIG provides statistical measures on the separability of signatures over a given set of bands.

SCATTER creates a scattergram of the band space between images used in the creation of signatures.

HARD CLASSIFIERS

PIPED is a parallelepiped classifier.

MINDIST is a minimum distance to means classifier.

MAXLIKE is a maximum likelihood classifier with options to specify prior probabilities as values or images.

FISHER provides image classification based on linear discriminant analysis.

KNN is a k-nearest neighbor classifier.

CLUSTER performs an unsupervised classification using a variant of the histogram peak technique.

ISOCLUST is an iterative self-organizing cluster analysis procedure using a predetermined number of clusters.

ISODATA provides an unsupervised classification of input images using an iterative self-organizing data analysis technique.

KMEANS classifies according to the K-means clustering technique.

MAXSET is a hard classifier that assigns to each pixel the class with the greatest degree of commitment based on a full Dempster-Shafer hierarchy describing all classes and their hierarchical combination.

MLP undertakes the classification of remotely sensed imagery through the artificial neural network multi-layer perceptron technique.

SOM undertakes either a supervised or unsupervised classification of remotely sensed imagery through the artificial neural network Self-Organizing Map technique.

Fuzzy ARTMAP undertakes either a supervised or unsupervised classification of remotely sensed imagery through the artificial neural network Fuzzy ARTMAP technique.

CTA undertakes the classification of remotely sensed imagery through Classification Tree Analysis with automatic and manual pruning options.

SOFT CLASSIFIERS/MIXTURE ANALYSIS

BAYCLASS employs Bayesian probability theory to express the degree of membership of a pixel to any class.

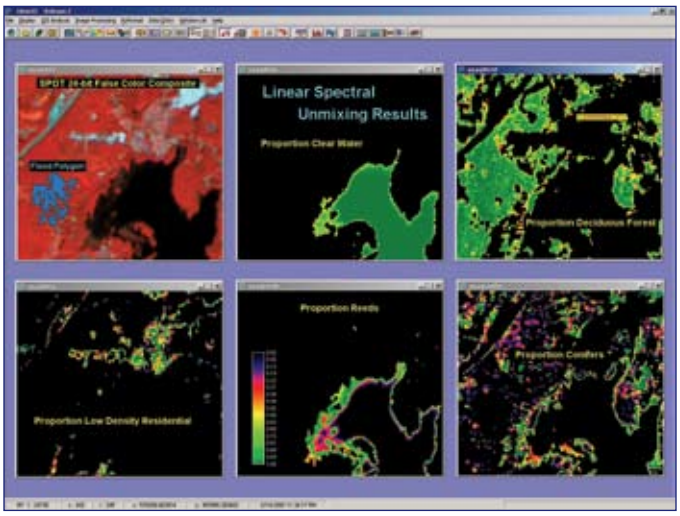
MAHALCLASS calculates Mahalanobis distance to produce a new set of signature classes.

BELCLASS employs Dempster-Shafer theory to express the degree of membership of a pixel to any class.

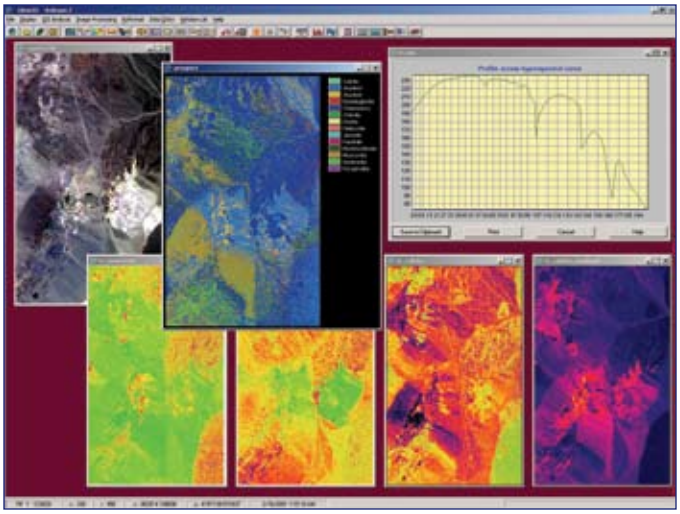
FUZCLASS employs Fuzzy Set theory to express the degree of membership of a pixel to any class.

KNN is a k-nearest neighbor classifier that can express for each category its proportion among the k-nearest neighbors.

MLP undertakes the classification of remotely sensed imagery through the artificial neural network multi-layer perceptron technique with an option to output soft activation level layers for each class.



Linear spectral unmixing is available in the module UNMIX. Three options are provided: the standard unmixing method, a probability guided method, and an exhaustive search method. The latter two methods allow the user to evaluate more classes than the standard unmixing method.



Techniques for hyperspectral image analysis are available in IDRISI. Tools include absorption spectra analysis using continuum removal for estimation of the degree of support for members of a library of spectral response curves developed in a laboratory setting, an unsupervised classifier, and several supervised classifiers including orthogonal subspace projection and linear spectral unmixing.

SOM undertakes either a supervised or unsupervised classification of remotely sensed imagery through the artificial neural network Self-Organizing Map technique with an option to output soft typicalities or commitment layers for each class.

UNMIX is used to classify remotely-sensed images using Linear Spectral Unmixing (LSU—also called Linear Mixture Modeling).

HYPERUSP provides unsupervised classification for hyperspectral image data.

HYPEROSP provides for hyperspectral image classification through an orthogonal subspace projection approach.

HYPERUNMIX extends the capabilities of Linear Spectral Unmixing to hyperspectral data sets.

HYPERABSORB provides for hyperspectral image classification based on library spectra and continuum removal of absorption areas and the correlation of these areas in terms of fit and depth between the library spectrum and the spectra from an imaging data set.

BELCALC calculates the degree of membership that each pixel exhibits for each of the classes for which training data has been provided using the logic of Dempster-Shafer theory.

Belief performs a Dempster-Shafer Weight-of-Evidence classification and extends the logic of mixture analysis, allowing for the ability to combine new evidence with existing knowledge.

HARDEN produces hard decision images from the soft classifier outputs of BAYCLASS, UNMIX, FUZCLASS, BELCLASS, or MAHALCLASS by choosing the class that has the maximum value.

SEGMENTATION CLASSIFIERS

Three tools available for classification from image segments.

SEGMENTATION groups adjacent pixels into image segments according to their spectral similarity.

SEGTRAIN is an interactive training site and signature development tool for use with the segmentation results created from SEGMENTATION.

SEGCLASS is a majority rule classifier based on the majority class within a segment.

HYPERSPECTRAL IMAGE ANALYSIS

HYPERSIG extends the logic of signature development to the special case of hyperspectral data. HYPERSIG creates and displays hyperspectral signatures either from training site data or from spectral curve library files.

ASDIDRISI imports the spectrometer data collected using the Analytical Spectral Device (ASD).

HYPERAUTOSIG automatically develops signatures for hyperspectral image data based on the Linear Spectral Unmixing logic.

SCREEN uses spatial autocorrelation to screen a hyperspectral series of images for the presence of significant atmospheric noise.

HYPERSAM is a spectral angle mapper hard classifier for hyperspectral data using a minimum-angle procedure.

HYPERMIN is a minimum-distance hyperspectral hard classifier specifically intended for use with image-based signatures developed using training sites.

HYPERUSP provides unsupervised classification for hyperspectral image data.

HYPEROSP provides for hyperspectral image classification through an orthogonal subspace projection approach.

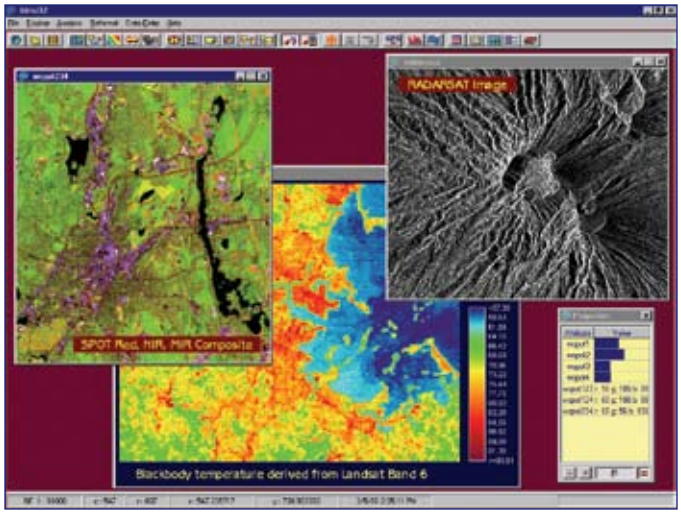
HYPERUNMIX extends the capabilities of Linear Spectral Unmixing to hyperspectral data sets.

HYPERABSORB provides for hyperspectral image classification based on library spectra and continuum removal of absorption areas and the correlation of these areas in terms of fit and depth between the library spectrum and the spectra from an imaging data set.

ACCURACY ASSESSMENT

SAMPLE creates systematic, random, and stratified random point sampling schemes.

ERRMAT produces an error matrix analysis of categorical map data compared to ground truth information.



Satellite imagery is easily imported by means of special import modules (e.g., Landsat), industry standard formats (e.g., GEOTIF) or generic import routines.

Reformat

IDRISI includes tools that allow you to change the data and file type of a file, reorient an image or vector file, change the extent of the study area, change resolution, generalize the level of detail in the file, join files together, and convert files from raster to vector and vice versa.

CONVERT changes the data type or file type of an image or vector file.

PROJECT reprojects the reference system coordinates of image or vector files.

RESAMPLE performs a local affine transformation for the geometric restoration of images and can be used to georegister an image to a reference system or to another file.

WINDOW extracts a rectangular sub-area of a larger image to create a new smaller image.

EXPAND alters the resolution of raster images through pixel duplication.

CONTRACT alters the resolution of raster images through pixel thinning or by pixel aggregation.

CONCAT concatenates multiple images or multiple vector files into a single image or vector file.

TRANSPOSE rotates an image by 90 degrees in either direction and can reverse the order of rows or columns.

METAUPDATE updates the documentation files for all files in a raster or vector group file.

RASTERVECTOR converts data between raster and vector formats.

GENERALIZATION is used to generalize vector point and line data. It can also generalize raster data by merging smaller regions into neighboring regions based on a given threshold.

LINTOPNT extracts the vertices of a vector line data file into a vector point data file.

Data Entry

IDRISI offers a host of tools to facilitate data entry. In addition to the data entry modules in this menu, conversion utilities for existing data that are in non-IDRISI formats are also included *(see Import and Export)*.

CartaLinx is a full vector topological editor and spatial database development tool also developed and distributed by Clark Labs. It provides tablet as well as on-screen digitizing capabilities and a wide range of data editing tools.

Edit is the IDRISI text editor utility for creating a variety of ASCII related IDRISI format files.

ASSIGN assigns new values to an image.

INITIAL creates an image containing a single value.

UPDATE assigns single values to specific cells or rectangular groups of cells.

UTMRef facilitates the creation of reference system parameter files based on the Universal Transverse Mercator system for subsequent use with PROJECT.

Database Workshop is a relational database manager, and lies at the heart of IDRISI's support for layer collections that link vector feature definition files to database tables. Database Workshop provides the ability to create, edit and analyze database files in IDRISI. IDRISI uses the Microsoft ADO and Access Jet Engines as the basis for Database Workshop. With this facility, one can undertake a wide variety of database operations including queries, calculations, and map display. Both the Calculate and Filter operations are supported through the use of Structured Query Language (SQL).

IDRISI Explorer is a general purpose utility to manage and explore IDRISI files and projects. Use IDRISI Explorer to set your project environment, manage your group files, review metadata, display files, and simply organize your data with such tools as copy, delete, rename, and move commands.

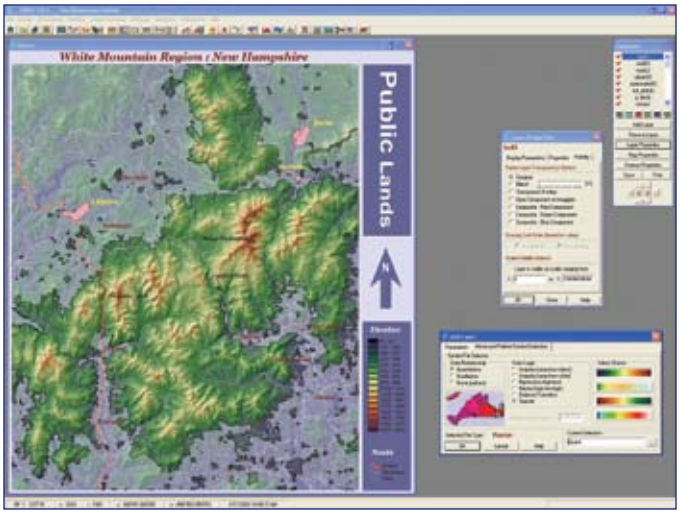
Import and Export

IDRISI includes a variety of utilities for file import and export—both general conversion routines as well as modules for specific software or data formats.

GENERAL CONVERSION TOOLS

GDALIDRISI is a front-end utility that interfaces with the open source GDAL raster translation software.

GENERICRASTER is an all-purpose utility to import raster data in a variety of data types and formats, including byte, integer and real,



IDRISI provides full map composition capabilities, including multiple raster and vector layers, layer blending, interactive RGB compositing, multiple legends, title, text labels, grid, north arrow, scale bar, text and image insets. This image depicts the White Mountain region in New Hampshire, USA, including data for elevation, roads, and boundaries using various layer blending options.

band-interleaved by line (BIL), band-interleaved by pixel (BIP) and band sequential (BSQ) formats.

CRLF adds or removes carriage returns or line feeds.

XYZIDRIS is used to import ASCII X,Y,Z coordinate data to a point vector file such as might be collected by a GPS unit or might be entered by hand into a spreadsheet or text file.

VAR2FIX changes variable-length ASCII files to fixed-length files.

SSTIDRIS is used to import spreadsheet data when the cells of the spreadsheet are to be interpreted as cells in the resulting image.

MODISQC creates the quality assurance science data sets for MODIS data products.

GOVERNMENT/DATA PROVIDER FORMATS

Landsat ETM for Landsat NLAPS, FAST, GEOTIFF or HDF formats.

SPOT for SPOT satellite data in GEOTIFF, SPOT Scene (CAP), or GEOSPOT–SPOTView formats.

GEOTIFF for generic GEOTIFF/TIFF files.

HDFEOS for HDF-EOS4 formats including HDF 4 and HDF-EOS 4.

GACPIDRISI imports Global Aerosol Climatology Project data into IDRISI.

NETCDF imports NETCDF data into IDRISI.

OLRIDRISI imports Outgoing Longwave Radiation into IDRISI.

PSDIDRISI imports Physical Science Division standard format into IDRISI.

XYZMONTHLY converts the University of Delaware's Center for Climatic Research ASCII monthly x, y, and multi-z data into IDRISI.

ASDIDRISI imports the spectrometer data collected using the Analytical Spectral Device (ASD).

SACIDRIS for SAC-C satellite data from Argentina.

RADARSAT for RADARSAT International data.

GPCIDRISI imports the International Satellite Cloud and Climatology Project's Global Processing Center data into IDRISI.

GOODE2LL for Global AVHRR 10-day composite data from USGS NASA DAAC in the Goodes Homosoline projection.

SDTS for Raster Spatial Data Transfer Standard data.

DLG for Digital Line Graphs (Optional Format) data.

CTG for the Composite Theme Grid data.

DEMIDRIS for USGS Digital Elevation Models.

DESKTOP PUBLISHING FORMATS

BMPIDRIS for Windows Bitmap files (BMP).

DXFIDRIS for CAD DXF files.

GEOTIFF/TIFF for Tagged Information File Format files (TIFF).

JPGIDRIS for JPEG files.

SOFTWARE-SPECIFIC FORMATS

The Explorer bar provides the functionality of the older IDRISI Explorer, MetaData, Data Paths and Collection Editor modules. The bar can be minimized against the left-hand edge whenever more workspace is required. Shown here are the Files and Metadata panels. Double clicking an image file causes it to be automatically displayed. Similarly, images can be dragged and dropped into any IDRISI dialog. Also shown in this illustration is the use of one of the two measure tools – in this case, the zone measurement tool. The linear measurement tool measures the length and azimuth of a single or multi-segmented line. Note also the new grid ticks option and one of the new north arrow styles.

SHAPEIDR, ARCRASTER, and **ARCIDRIS** for ESRI Shape files, ArcInfo Raster Exchange, and ArcInfo GENERATE/UNGEN file formats.

ATLIDRIS for Atlas*GIS BNA files.

ECWIDRIS for ECW files.

ENVIIDRIS for ENVI files.

ERDIDRIS for Erdas LAN and GIS files.

ERMIDRIS for ER Mapper files.

GRASSIDR for GRASS raster files.

MAPIDRIS for Map Analysis Package files.

MIFIDRIS for MapInfo Interchange files.

SRFIDRIS for Surfer GRD files.

SPLUSIDRIS for SPLUS statistical files.

STATIDRIS for STATISTICA files.

Display

Display and map composition utilities provide tools for visualization and enhancement.

DISPLAY Launcher is the main display facility for raster and vector IDRISI files.

ORTHO is a facility that creates orthographic perspective (3-D) displays of digital elevation models (DEMs) or any continuous raster image.

Fly Through is an interactive 3-D viewer using OpenGL technology that allows users to simulate movement through space using existing IDRISI images.

Media Viewer is a presentation utility that can play Windows video (AVI) files and can create AVI video files from a sequence of IDRISI images.

Symbol Workshop allows one to create and modify symbol and palette files for vector and raster display.

COMPOSITE produces a 24-bit color composite image from three bands of imagery.

SEPARATE performs color separation of palette images into RGB components.

ILLUMINATE is a hillshading merge facility.

HISTO provides a frequency histogram and statistics of the cell values within an image, presented graphically or numerically.

STRETCH increases the contrast in an image for the enhancement of visual interpretation.

System Requirements

- Intel Pentium IV or higher

- Windows XP and above

- Minimum display of 1024 x 768 with 64,000 colors

- 1 GB RAM or greater

- 1.3 GB hard disk space space for installation

- CD-ROM for installation

About Clark Labs

Clark Labs is dedicated to the research and development of geospatial technologies for effective and responsible decision making for environmental management, sustainable resource development and equitable resource allocation.

Based within the world-renowned Graduate School of Geography at Clark University, Clark Labs is known for pioneering advancements in areas such as decision support, uncertainty management, classifier development, change and time series analysis, and dynamic modeling. Partnering with such organizations as the Gordon and Betty Moore Foundation, Google.org, USDA, the United Nations and Conservation International, Clark Labs leverages its academic base to develop innovative and customized research tools, provide software solutions to organizations in need and apply geospatial expertise to a range of real-world problems.

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