

Operating Systems

Windows 2000, XP (32-bit and 64-bit), Vista
Linux Red Hat Fedora Core 3,
Enterprise 3.x (32-bit and 64-bit)
Mac OS X (10.4 and 10.5), Intel, PPC
HP-UX 11.0 (32-bit and 64-bit)
IBM AIX 5.1 (32-bit and 64-bit)
SGI IRIX 6.5.1 (32-bit and 64-bit)
SUN Solaris 9, 10 (32-bit and 64-bit)

Data Import

ADS 40
ASAR Data
AATSR Data
ALOS Data:
• PRISM / PRISM RPC
• AVNIR-2
• PALSAR
ArcGIS® Geodatabase
ASTER Data
ATSR Data
AVHRR Data
AVIRIS Data
CARTOSAT-1 Data
DMSP Data
ECW Format
Elevation Data:
• USGS DEM
• USGS SDTS DEM
• DTED
• FORMOSAT-2
• GEOTIFF & RPC
• SRTM
ENVISAT level 1b and level 2 Data
• MERIS
• AATSR
• ASAR
EOS Data (HDF-EOS format):
• ASTER
• MISR
• MODIS
EROS A level 1a and 1b Data
ESRI GRID Format
FORMOSAT-2
Generic Image Formats:
• ASCII (x,y,z columns, grids)
• BMP
• ECW
• Flat binary files
• GeoJ2K
HDF, HDF-EOS
• JPEG
• JPEG 2000
• MrSID
• PDS
• PICT
• PNG
• SRF
• TIFF, GeoTIFF
• XWD
Gzip Compressed Files
Hymap Data

Image Processing Software Formats:

- ArcView (.bil)
- ECW
- ENVI
- ERDAS (.lan, .img, .ige)
- ER Mapper
- MrSID
- PCI (.pix)

IRS Data in EOSAT Fast Format & Superstructural
JPEG 2000 Format
Landsat MSS, TM, ETM Data:
• EOSAT FAST
• GeoTIFF
• HDF
• NLAPS
• ACRES CCRS
• MRLS
• ESA CEOS
LAS Lidar Format
Military Formats:
• NITF 2.0, 2.1
• NSIF 1.0
• ADRG, CADRG
• CIB
• TFRD
MERIS Data
MIVIS Data
MODIS Data
MODIS Simulator (MAS-50 HDF) Data
MrSID Format
OrbView
• GEOTIFF / RPC
• NITF / RPC
• Mosaic Tiled
QuickBird
• GEOTIFF / RPC
• NITF / RPC
• Mosaic Tiled
Radar Data:
• RADARSAT
• ASAR
• PALSAR
• AIRSAR
• SIR-C/X-SAR
• TOPSAR
• ERS
• JERS
SeaWiFS (OrbView-2) Data:
• CEOS
• HDF
SPOT Data:
• SPOT 5 (DIMAP) and level 1 metadata
• 1A, 1B, 2A, CAP
• ACRES
• HDF Vegetation
• GeoSPOT
Thermal Data:
• TIMS
• MASTER (MODIS/ASTER Simulator)
• ASTER
• AATSR

User-Definable Data Formats

USGS DOQ Files
Vector Formats:
• ARC Interchange Format (Uncompressed)
• ESRI Shape (.shp) with attributes
• AutoCAD DXF
• USGS DLG
• USGS SDTS
• MapInfo
• Microstation .DGN
WorldView-1 Data
• GeoTIFF/RPC
• NITF/RPC
• Mosaic Tiled

Output Formats

ArcGIS Geodatabase
Raster Formats:
• ArcView (.bil)
• ASCII
• BMP
• ENVI
• ERDAS (.lan, .img)
• ER Mapper (.ers)
• ESRI GRID
• GeoTIFF
• Gzip Compressed
• HDF
• JPEG
• NITF 1.1, 2.0, 2.1
• PCI (.pix)
• PICT
• PNG
• SRF
• TIFF
• XWD
Vector Formats:
• ESRI Shapefiles (with attributes)
• DXF
• ENVI Vector Format
Direct Output to Printer
MPEG
PostScript
VRML
Output to Tape

Display Functions

Color Mapping
Color Tables:
• Pre-built Tables
• Interactive Color Table Editor
Cursor Query for Data/Screen Value,
Elevation, Map Coordinates
Dynamic Overlays (unlimited displays)
Histogram Matching Between Displays
Image Flickering and "Movies"
Image Overlays:
• Annotation
• Classification Results
• Contour Lines
• Density (gray level) Color Slicing
• Grid Lines
• Regions of Interest

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- Vector Layers

Interactive 2-D Scatter Plotting
Interactive Histograms & Stretching:

- Arbitrary Stretching
- Auto Apply Stretches
- Gaussian Stretching
- Histogram Equalization Stretching
- Histogram Matching Between Displays
- Linear, Piecewise Linear Stretching
- Square Root Stretching
- Import/Export ASCII Look Up Tables
- User-Defined Look Up Tables

Interactive Pixel Editor
Line-of-Sight (Viewshed) Analysis
Link Unlimited Displays
Measurement Tool
Output Displays to File or Printer
Output Displays of Zoom Window
Quick Filters:

- Sharpen
- Smooth
- Median

Quick Color-Infrared, True-Color Displays
Save and/or Restore Display Group
Select Display Bands from Spectral Plots
Set Default Display Bands
Spatial and Spectral Pixel Editing
Spatial and Spectral Profiles
Sub-Pixel Cursor Location
Unlimited Number of Displays
Virtual Mosaic
Vector Overlays & GIS Capabilities

Regions of Interest

Buffer Zones Around ROIs
Classification Images from ROIs
Export ROIs to Vectors
Input ROIs from ASCII
Interactive, Easy-to-use ROI Definition:

- Draw Polygons, Polylines, Pixels
- Draw ROIs with Interior Spaces (Donuts)
- ROIs from Intersection of Other ROIs
- Multiple Objects Within One ROI
- ROI Definition via Scatter Plots
- Threshold Images to ROI
- Merge ROIs
- Import ROIs from Vectors

Output ROIs to ASCII
ROI Save & Restore
Reconcile ROIs between Images via
Map Coordinates
ROI Growing Based on Statistics
ROI Statistics

Data Preparation

Create New Standard or Virtual Image File
from Existing Bands
Generate Test Image
Mask Generation From:

- Annotation
- Image Data Values
- ROIs
- Intersection of ROIs
- Vectors
- NaN

Mosaic Functions:

- Color Mosaic Preview
- Cutline & Edge Feathering
- Interactively Mosaic Multiple Bands, Files

- Mosaic by Pixel (Line, Sample) or Map Coordinates
- Automatic Color Balancing
- Standard Image or Virtual Mosaic Output

Define Spatial Subset by:

- Drawing on Display
- File, Map Coordinates
- Region of Interest
- Other Image Extent
- Meta Scroll Extent

Rotate/Flip Data
Spatial and Spectral Subsets
Storage Order (Interleave) Conversions:

- BSQ, BIL, BIP
- New File or Replace Original

Stretch Data
Subsample Images

Pre-processing & Calibration

Apply Gain & Offset
Bad Band Identification
Bad Line Replacement
Bad Pixel Replacement
Cross-Track Illumination Correction
Dark Subtraction
Destripe Data
Empirical Line Calibration
ERS and Radarsat Data Calibration
Flat Field Calibration
Ignore Pixel Value
Internal Average Relative Reflectance
Calibration
Log Residuals
MODIS Bowtie Correction
Radiometric Calibrations:

- AVHRR
- Landsat MSS, TM, ETM
- TIMS
- QuickBird

Sea Surface Temperature From AVHRR
Thermal Atmospheric Correction

Registration & Rectification

Associate DEM With Image
Automatic Georeferencing of ASTER,
AVHRR, AATSR, ASAR, MERIS, MODIS,
Radarsat, SeaWiFS, SPOT
Subpixel Ground Control Point Locations
Georectify SPOT Using Information From
Leader File
Ground Control Points Prediction
Image-to-Map Registration
Image-to-Image Registration
Interactive Ground Control Point Collection
Import Ground Control Points from File
Orthorectification:

- Aerial Photographs (Digital and Frame)
- ASTER
- CARTOSAT-1
- Generic RPC
- Generic Pushbroom Sensors
- IKONOS
- OrbView - 3
- QuickBird
- SPOT 1-5

Radial Resampling
Rational Polynomial Coefficients
(RPCs) Support
Replacement Sensor Model (RSM)

Real-time GPS Link
Rotated Projections
Save Transformation Matrix to ASCII
Warp Resampling Methods:

- Bilinear
- Cubic Convolution
- Nearest Neighbor

Warping Methods:

- Delaunay Triangulation
- Polynomial
- Rotation, Scaling, Translation (RST)

Map Projection Support

Convert Coordinates Among Projections
Contours From Any Registered Image
Convert Map Projection
Datum Support (>100)
Dozens of Prebuilt Map Projections
(Examples Include):

- Universal Transverse Mercator (UTM)
- State Plane
- Gauss-Kruger
- Map Grid of Australia
- Mississippi Standard Transverse Mercator Ellipsoid Support (>35)

Pseudo-Projections from RPCs and RSM
User-Defined Map Projections
User-Defined Projection Units
USGS GCTP Projections, Including:

- Albers Conical Equal Area
- Azimuthal Equal Area
- Lambert Conformal Conic
- Space Oblique Mercator (A & B)
- Stereographic
- Transverse Mercator

Vector GIS Functions

Add Nodes to Vectors
Annotate Vector Windows
Attributes:

- Create New Vector Attributes
- Edit Query Vector Attributes
- Import from ArcView Shapefiles, ASCII
- Query to Create New Vector Layer

Burn-in Vectors on Raster Image
Convert Vector Layer Projection
Create Contour Vectors from Raster Data
Create New Vector Layers
Create Vector Boundaries:

- Countries, States, Coasts, Rivers
- For Whole World
- For Lat/Long Boundaries

Direct Printing of GIS Layers
Display Vectors with Different Projections in
the Same Window
Drag/Drop to Arrange Layer Order
Edit Layer Characteristics
Export Vector Data to Common GIS Formats
Export Vector Attributes
GPS Input
Heads-up (On-screen) Digitizing
Intelligent Digitizer
Import Common GIS Formats:

- ESRI Shapefiles
- Arc Interchange
- AutoCAD DXF
- MapInfo
- Microstation DGN
- USGS DLG

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- USGS SDTS
- ENVI Native Vector Format
- Interactive Vector Layer Querying
- Join Vectors
- Multiple Vector Selection
- On-the-fly Vector Projection Conversion
- Raster to Vector Conversions
- Split Vectors
- Vector Cursor Query
- Vector Display Zooming
- Vector Editing
- Vector to Raster Conversion

Spectral Analysis Tools

- Anomaly Detection
- Automated Corner Clustering in N-D Scatter Plot
- BandMax Band Optimization
- Continuum Removal of Images, Spectra
- Decision Tree Classifier
- Extraction of Endmember Spectra
- Integrated Spectral Viewing & Analysis
- Linear Spectral Unmixing
- Least Squares (LS) Fit
- Matched Filtering
- Mixture Tuned Matched Filtering
- N-Dimensional Visualizer (Scatter Plot)
- Pixel Editing
- Pixel Purity Index (PPI)
- Registration Suppression Algorithm
- SAM Target Finder With BandMax
- SMACC Endmember Extraction & Sub-pixel Analysis
- SPEAR Tools:
 - Change Detection - PCA
 - Change Detection - Subtractive
 - Pan-Sharpener
 - Lines of Communication - Water
 - Lines of Communication - Roads
 - Watercraft Finder
 - Relative Water Depth
 - Vegetation Delineation and Stress Detection
 - Spectral Analogues
 - TERCAT (Terrain Categorizations)
- Spectral Resampling:
 - Predefined Sensor Band Filters
 - User Defined Filters
 - Spectral Libraries and Images
- Spectral Analyst for Material Identification
- Spectral Angle Mapper (SAM)
- Spectral Feature Fitting (SFF)
- Spectral Hourglass Wizard
- Spectral Information Divergence
- Spectral Libraries Included:
 - Spectral Information Divergence
 - Minerals, Vegetation, Rocks, Water, Soils, Snow, Manmade
 - VNIR, SWIR, MWIR, LWIR
- Spectral Library Builder/Importer
- Spectral Library Viewer
- Spectral Math
- Spectral Plots:
 - Boxcar Average of Pixel Spectra
 - Continuum Removal
 - Cursor Query of X,Y Plot Values
 - Drag and Drop Spectra Among Plot
 - From 3D SurfaceView
 - From Image Pixels (Z Profile)
 - From Spectral Libraries
 - From ROI Averages

- Link Spectral Plots from Multiple Images
- Plot Stacked Spectra
- User-Defined Plot Functions
- Wavenumber or Wavelength Spectral Slices
- Vegetation Guided Workflows
 - Fire Fuel Load
 - Agricultural Stress
 - Forest Health
- Vegetation Indices
 - Greenness
 - Light-use Efficiency
 - Canopy Nitrogen
 - Senescent Carbon
 - Canopy Water
 - Leaf Pigment
- Vegetation Suppression Algorithm

Transforms

- Band Ratios
- Color Transforms:
 - RGB to HSV, HSL, or Munsell HSV
 - HSV, HSL, or Munsell HSV to RGB
- Decorrelation Stretch
- Independent Components Analysis
- Image Sharpening:
 - Color Normalized Spectral
 - Gram-Schmidt Spectral
 - HSV and Brovey
 - PC Spectral
 - Preserving Spectral Integrity
- Minimum Noise Fraction (MNF)
- Normalized Difference Vegetation Index (NDVI)
- Pan Sharpening (see Image Sharpening)
- Principal Components Rotation
- Saturation Stretch
- Synthetic Color Image
- Tasseled Cap

Filters

- Adaptive Filters:
 - Frost, Enhanced Frost Gamma, Kuan, Lee, Enhanced Lee, Local Sigma, Bit Error
- Convolution Filters:
 - High & Low Pass, Laplacian, Directional, Gaussian, Median, Sobel, Roberts
- Filtering Preview
- Interactive Fourier Filtering:
 - Forward Transform
 - Interactive Frequency Domain Masking
 - Inverse Transform
- Morphology Filters:
 - Dilate, Erode, Opening, Closing
- Texture Filters:
 - Data Range, Mean, Variance, Entropy, Skewness, Homogeneity, Contrast, Dissimilarity, Second Moment, Correlation
- User-Defined Filter Kernels

Mathematics & Statistics

- Autocorrelation
- Band Histograms
- Band Math and Spectral Math:
 - Boolean Operators
 - Trigonometric Functions
 - Data Type Conversion Functions
 - Relational Operators
 - Many Other Mathematical Expressions

- Correlograms
- Display Statistics:
 - Minimum, Maximum, Mean, Standard Deviation
- Image Statistics:
 - Band Minimum, Maximum, Mean, Standard Deviation, Eigenvalues, Eigenvectors, Covariance, Correlation Matrices
- Output Matrix Stats to Image Files:
 - Covariance Matrix
 - Correlation Matrix
 - Eigenvectors
- Semivariograms

Image Classification

- Accuracy Assessment
- AIRSAR Scattering Mechanism Classifier
- Automatic Legends for Classified Images
- Change Detection, Thematic and Grayscale Images
- Classification Preview
- Class Statistics
- Classification Image from ROIs
- Decision Trees
- Density Slicing
- Interactive User-Defined Rule Classifier
- Receiver Operating Characteristic (ROC) Curves:
 - Find Optimal Classification Thresholds
 - Decrease False Classifications
 - Separate Classification Thresholds for Each Class
- Supervised Classifications:
 - Binary Encoding
 - Parallelepiped
 - Mahalanobis Distance
 - Minimum Distance
 - Maximum Likelihood
 - Neural Network
 - Spectral Angle Mapper (SAM)
 - Support Vector Machine (SVM)
 - TERCAT (Terrain Categorization)
 - Change Detection - PCA
 - Change Detection - Subtraction
- Training Data From:
 - Regions of Interest
 - Pixel Spectra
 - Library Spectra
- Unsupervised Classifications:
 - K-means
 - Isodata
- Vegetation Guided Workflows
 - Fire Fuel Load
 - Agricultural Stress
 - Forest Health

Post Classification Tools

- Accuracy Assessment:
 - Kappa Coefficient
 - Confusion Matrix
- Classification to Vector
- Class Statistics
- Interactive Class Overlay Tool
- Reassign Class Colors, Names
- Spatial Functions:
 - Buffer Zones Around Classes
 - Clump, Sieve, Combine
 - Majority & Minority Analysis
 - Segmentation Image

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Stratified Random Point Generation

Topographic Analysis

Associate DEM with Image

Calculate Slope and Aspect Images

Calculate Shaded Relief Image

Create DEM From Vector Elevation Contours

Hillshade (Shaded Relief Combined with RGB Image)

Line-of-Sight (Viewshed) Analysis

Rasterize Point Data

Topographic Measures:

- Convexity
- Plan Convexity
- Longitudinal Convexity
- Cross Sectional convexity
- Minimum Curvature
- Maximum Curvature

Three-Dimensional Visualization

Topographic Feature Extraction (Classification):

- Ridge, Channel, Plane, Peak, Pit

3-D SurfaceView

Animated 360° Visualization

Associate DEM With Image

Change View Interactively Using Mouse

Create Fly-Through Sequence:

- Interpolate Between User Selected Views
- Follow Annotation Line

Custom Background Color

Drape Image Over 3-D Surface

Output Fly-Through Sequence:

- MPEG, VRML 2.0

Overlay Vectors, Regions Of Interest

Set Vertical Exaggeration

Smooth Image, DEM

Annotation and Map Composition

Automatic Contour Labeling

Automatic Legends for Classified Images,

Scale Bars, and Color Ramps Text,

Polygons, Polylines, Points, Symbols

Burn-in or Overlay Annotations

Cartographic Symbols

Contour Lines from DEM, Other Images

Create Reusable Map Templates

Grid Lines: Pixel, Lat/Long &/or Map Grids

Inset Images (e.g., Logos) or Vector Plots

Interactive Map Composition Using Image Displays

Interactively Reposition Annotation and Map Elements

Interactive Plot Scaling

Rotated Map Projections

Save & Restore All Parameters

TrueType Fonts (Plus Add Your Own)

User Definable Arrows, Declination Diagrams (True, Grid and Magnetic North)

Vector Overlays

Radar Functionality

Adaptive (Speckle Reduction) Filters:

- Frost
- Enhanced Frost
- Gamma

• Kuan

• Lee

• Enhanced Lee

• Local Sigma

• Bit Error

Antenna Pattern Correction

AIRSAR Scattering Mechanism Classifier

CEOS Tape Reading

Convert integrated TOPSAR to:

- C-band VV data
- Correlation image
- Digital Elevation Model (DEM)
- Incident Angle image
- L- and P-band polarimetric AIRSAR Data Display and Analyze Radar Data Using Standard ENVI tools

Edge Enhancement Filters

Import ASAR, ERS, JERS, RADARSAT, AIR-

SAR, TOPSAR, SIR-C/X-SAR

Incident Angle Images

Multi-Look SIR-C Data

Pedestal Height Images

Phase Difference Images

Polarization Signatures from ROIs & Single

Pixels

RADARSAT Level 2 Endorsement

Sigma nought and Beta nought from ERS,

Radarsat

Slant-to-Ground Range Conversion

Synthetic Color Image

Synthesize Images from Compressed,

Complex Scattering Matrix Data

Texture Measures

View CEOS Headers

General Interface & Operation

8- and 24-Bit Color, Multiple Displays

Access to IDL Functions*

Add Custom Routines to Menu

Batch Recording, Queuing, and Playback

Build Scripts for Common Functions*

Command Line Use of ENVI Routines *

Context-Sensitive Mouse Descriptions

Cursor Coordinates (Pixel & Map) , Data

Values, and Elevations

Direct Link to GPS Devices (Real-time Input)

Edit ENVI Header Information

Efficient Memory Management

Extensive Preferences Settings

Geo-Browser Image Selection from Graphical

Index Map

Logical Menu-Based GUI (Graphical User

Interface)

Multi-Processor Aware Algorithms

Platform-Independent Operation

Recursive Directory Scanning for Files

Support for Files Greater than 2GB

User-Configurable Menus & Buttons

Modules

ENVI Certified NITF Module

- ENVI Certified NITF Module with TFRD

ENVI DEM Extraction Module for Stereo

Images

ENVI FLAASH Module for Atmospheric

Correction

ENVI Feature Extraction Module

SARscape Family of Modules for ENVI

Documentation

Context-Sensitive Help

Module Documentation

On-line, Hyperlinked Documentation

Printed Documentation

Programmer's Guide (with Examples)

Training Manuals

Tutorials & Sample Data

User's Guide

* Only available in ENVI+IDL.

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This document reflects the functionality in the ENVI interface. The ENVI Zoom interface provides a subset of this functionality with additional display features. For more information about ENVI Zoom please visit www.ittvis.com/envizoom.