

Geography 403
Lecture 6
Introduction to Windows and
Image Processing with TerrSet/IDRISI

Needs: Lect_403_6.ppt, Yosemite and SPOT-Milwaukee data sets

Key Terms and Concepts

Basic Operations in WINDOWS

Access to TerrSet/IDRISI Program and Basic Program Operation

Raster and Vector Data Representation

Pre-Processing (especially RESAMPLE and FILTER, for spatial filtering)

Enhancing Data for Display (HISTO and STRETCH)

Processing Data for Classification (ASSIGN/RECLASS and PCA)

Unsupervised (CLUSTER) and Supervised Classification

(MAKESIG/PIPED/MINDIST/MAXLIKE)

A. Windows System and Operation Overview

- PP1
1. Naming convention (first.second)
 2. Directory and sub-directory structure
 - a. Root and branches
 3. Point and click with the mouse
 - a. Single and double clicking, right clicking
 4. Opening multiple applications in “windows”
 5. Windows Desktop and Explorer
 - a. Copy files from one device to another
 - b. Select files
 - c. Drag and drop files to an application

B. Resources on the Internet and “How to locate R.S. data for a study”

1. Browser-operation and Net Searches for sites
2. MDS web page (<https://sites.uwm.edu/mds>)
 - a. Weather section (<https://people.uwm.edu/mds/weather-servers/>)
 - b. Imagery section (<https://people.uwm.edu/mds/imagery-sources/>)
3. EROS main page (<https://eros.usgs.gov/>)
4. USGS Earthshots main page (<https://earthshots.usgs.gov/earthshots/>)
5. JPL home page (<https://www.jpl.nasa.gov/>) and NASA home page (<https://www.nasa.gov/>)

C. TerrSet/IDRISI Program Information

1. IDRISI home page (<https://clarklabs.org/>)
2. On-line manual and tutorials included with program
3. TerrSet/IDRISI ACCESS AND USE IN MIT 353 (and virtual lab)
 - a. Enter you ePantherID and password as instructed on the screen to login to the PC (already done when using the virtual lab).

- b. The TerrSet/IDRISI program is in program list within the “start menu”.
- c. In File Explorer, check that the C:\temp\Geog403 folder exists and is empty. If not, create it.
- d. In order to get exercise files from the class OneDrive folder:
 - i. Go to the “Lab files (.zip)” section of the class lecture Canvas page (all the way at the bottom) and select the .zip file for the desired exercise.
 - ii. Download the selected .zip file, using “Save As” into the C:\temp\Geog403 folder.
 - iii. After you unzip the .zip file, you should now have access to the files for the exercise you wanted to work on in the C:\temp\Geog403 sub-folder.
- e. In TerrSet, open “TerrSet Explorer” click on the “Projects” tab, and then click on the name of the working folder until it is highlighted. Now Click on the “three dots”. The “Browse for Folder” function should appear. Move to the C:\temp\Geog403 folder and click “OK”. You are now setup to have C:\temp\Geog403 serve as your “working folder” in TerrSet/IDRISI.
- f. Be sure to save your work (to some other location) between different computer sessions.

D. Data representation

- PP2
1. Raster, every area given a value (contrast with vector)
 - a. Column (sample) and row (line) coordinates
 - b. Upper left is 0,0
 - c. Real geographic coordinates possible
 2. Data formats
 1. File formats (ASCII, binary, packed binary) binary means one or zero
 2. File number representation (integer-2x, byte-1x[2⁸ or 256], or real-4x, explain size difference) each power of 2 a “place” in base 2
 3. Program “control” the **TERRSET EXPLORER, COLLECTION EDITOR and USER PREFERENCE** modules
 - a. Running from icon or menu lists
 - b. “double clicking” and other ways to get input options
 4. Program “viewing” the **DISPLAY** module
 - a. Zooming in and out with magnify and window functions (maximize display option), and “linked zoom”
 - b. Autoscaling option for raw images--what does it do?
 - c. Symbol workshop for editing and creating palettes and symbol files
 - i. RGB values
 - d. Position information--cursor inquiry mode
 - e. Composer--add “layers”, change properties, save and print (as .bmp or .map files)
 - f. On-Screen digitizing--demonstrate

E. Pre-processing Techniques

- PP3
1. Geometric correction (add “map-like accuracy”)
 - a. “rubber-sheet” image with ground control points (**RESAMPLE**--more later)
 2. Radiometric correction (account for illumination variations--**RADIANCE** for LANDSAT)
 3. Spatial as opposed to spectral Filters (**FILTER** command)
 - a. Uses a “window” that passes through file like 3x3 pixels
 - b. Different weighting schemes are used to produce desired effects
 4. low-pass filtering (remove small variations--“smoothing”)
 - a. Noise filtering
 - b. Averaging
 5. high-pass filtering (increase small variations)
 - a. Edge enhancement

F. Enhancing data for display (ONLY!!)

- PP4
1. **HISTO** module for showing the distribution of data values (normal curve?)
 2. **STRETCH** module for improving contrast (don’t use for further processing, for visual enhancement only!)
 - a. Linear option
 - b. Linear with saturation option
 - c. Histogram equalization option (equal number in each class)

G. Simple Image manipulation

- PP5
1. **SCALAR** module (change values of one image)
 2. **OVERLAY** module (combine information from two images)
 - a. Band ratios, simple form of something like the NDVI
 3. **EDIT**--used to create aux. ASCII text files (values files, etc.)
 4. “**IMAGE CALCULATOR**”

H. Processing Data for classification

- PP6
1. **ASSIGN** (specific numbers, if not stated its 0) and **RECLASS** (ranges, leaves unnamed unchanged) image manipulation
 1. **COMPOSITE** module
 2. Unsupervised classification (group, then ID)
 - a. **CLUSTER** module (uses 3-D histogram peak selection)
 3. Principal Components analysis (**PCA** module)
 - a. Method of "packing" information into fewer bands
 - b. Produces "uncorrelated" image bands

4. Supervised classification (ID some, use to group rest)
 - PP7 a. Scatter diagram, visual assessment
 - b. “training sites”, use on-screen digitizing to produce vector files identifying areas of homogeneous examples of each cover type (polygon area)
 - c. **MAKESIG** module for producing "spectral signatures"
 - PP8 d. **PIPED** module (uses max-min range, least accurate)
(called Parallelepiped in text)
 - PP9 e. **MINDIST** module (uses distance from means)
(called Minimum-Distance-to-Means in text)
 - PP10 f. **MAXLIKE** module (uses probability function from means)
(called Gaussian Maximum Likelihood in text)
 - PP11 5. Enhanced Classification options (“hard” versus “soft” classifiers)
 - a. “fuzzy” classification
 - b. “hybrid” classification