
Remote Sensing Laboratory
Lab Assignment # 8

Unsupervised and Supervised Classifications

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1. Objective

to familiarize with unsupervised and supervised classifications using image processing software and multispectral data.

2. Data to be used:

- 1) pathum_etm : Landsat 7 ETM+, path 129 row 50, 7 December 2001
- 2) pathum_truth.roi : Growth data for accuracy assessment for classification of pathum_etm

- Dataset of Landsat 7 ETM⁺ data
- Topographic map

THAILAND scale 1: 50,000 /CHANGWAT NONTHABURI
Edition 2-RTSD Series L7017 Sheet 5136 IV, Indian datum
(Grid 1,000m.UTM; Zone 47, Projection Transverse Mercator)

3. Methodology

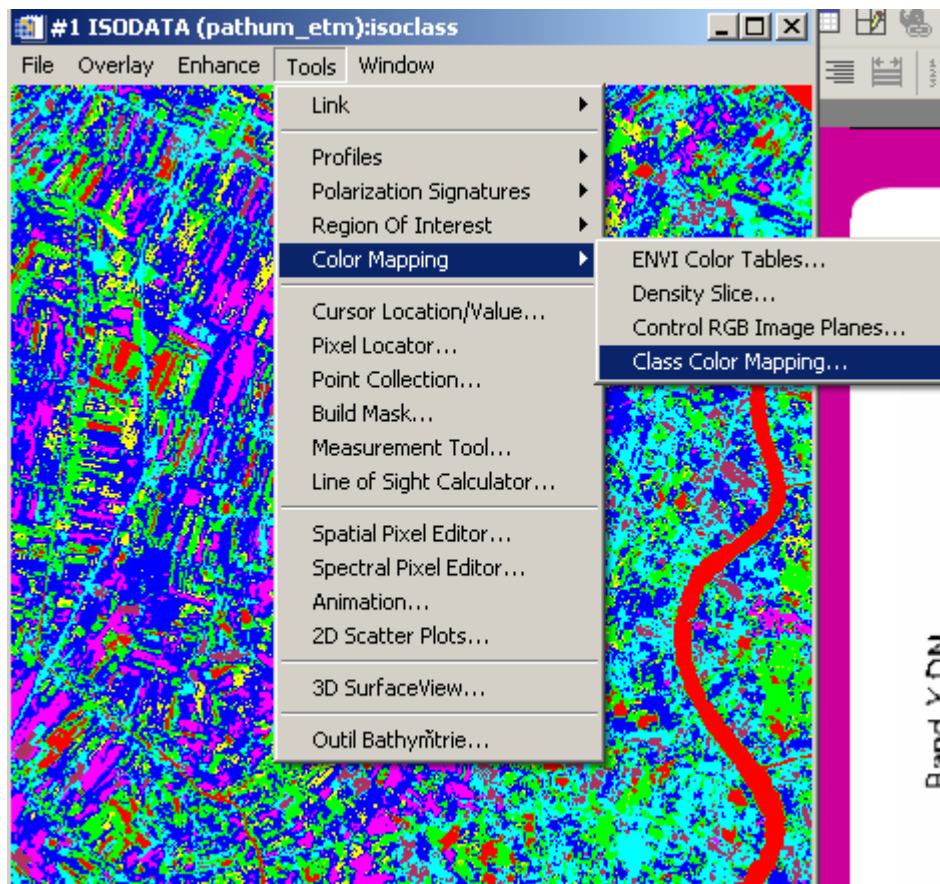
1. Run ENVI.

- A menu bar appears with options such as "File", "Basic Tools", and "Classification".

2. Open the image "pathum_etm".

3. Go to "Classification" in the main ENVI menu bar.

- Select "Unsupervised". Choose "IsoData".
- Select the pathum_etm file as the input file and hit "OK". A box will appear that lists parameters with the unsupervised classification by choosing different numbers of classes and has a blank space after "Enter Output Filename". Name your output file (something logical). Hit "OK".
- See class color mapping



- - Select the output file and choose "Gray Scale". Choose "New image" to keep the original color composite in an open window. Click on "Load Band".
 - The unsupervised classification will appear as a false color image.
 - Link the display windows to examine differences among the classifications and input dataset.
4. Go to "Classification" in the main ENVI menu bar.
- Select "Unsupervised". Choose "K-means".
 - Select the pathum_etm file as the input file and hit "OK" . A box will appear that lists parameters with the unsupervised classification by choosing different numbers of classes and has a blank space after "Enter Output Filename". Name your output file (something logical). Hit "OK".
- Link the display windows to examine differences among the classifications. You may want to link the k-means to the isodata.
- Now we will do a few classic supervised classifications. First, training areas (ROIs) must be identified.
5. Go to "Overlay" and then "Region of interest" from the main image window
- And select "Define region of interest" in the original image window menu bar. A box will appear that lists the available regions of interest. To define a region of interest, or training area, find an area on the image that you feel represents a distinct spectral class. For example, you may choose a spot in the river that is a specific color or you may choose a field.
 - Use the mouse to define on the image a polygon that incorporates characteristic pixels of the spot you chose.

- **Click on the left button of the mouse to mark the endpoints of sides of the polygon. To close the polygon, click on the right button. Finish the procedure by double-clicking on the right mouse button.** The polygon will be filled in with the color red. In the ROI tool box, the number of pixels incorporated in the red region will be listed.
- If you want to add pixels from another area of the image into the ROI, simply draw another polygon. The number of pixels in each ROI is listed.
- Click "Edit" in the ROI Tool box and then Edit ROI Parameters dialog box appears. Define name of this ROI in field of Name. Click "OK"

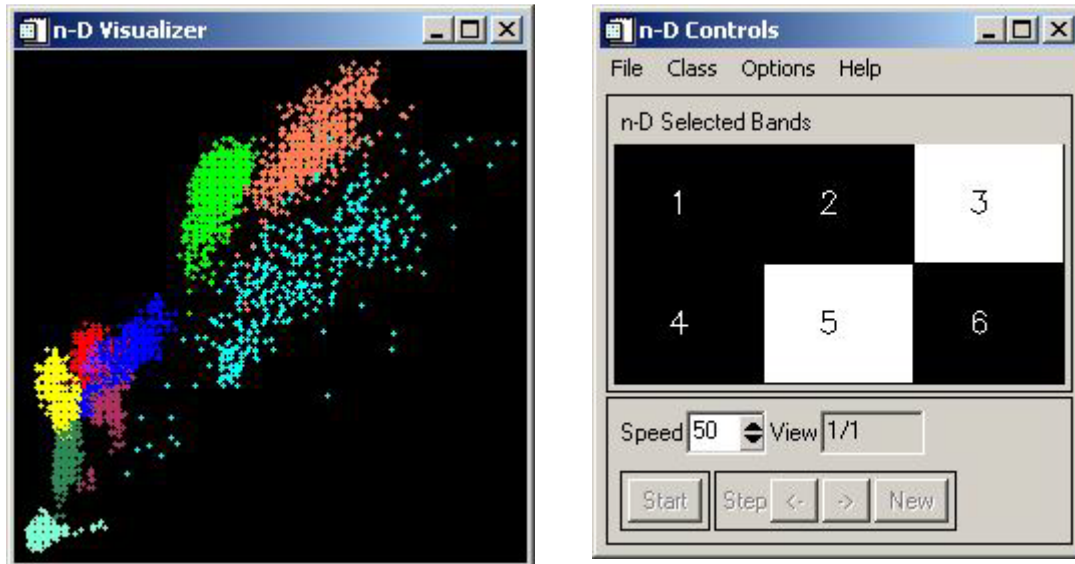
Table 1. Action to define ROI

ROI Mode	Action	Mouse Button	Interaction
Polygon, Polyline	Define endpoints	Left	Click or Press and drag
Polygon, Polyline	Remove last endpoint	Middle	Click
Polygon, Polyline	Close polygon; End polyline	Right	Click
Polygon, Polyline	Accept polygon or polyline	Right	Click
Polygon, Polyline	Delete entire polygon/polyline	Middle	Click on defined polygon/polyline
Point	Select point	Left	Click on pixel
Point	Delete point	Middle	Click on pixel
Point	Delete all points in ROI	Right	Click
Rectangle, Ellipse	Define shape	Left	Press and drag
Rectangle, Ellipse	Delete shape	Middle	Click within shape
Rectangle, Ellipse	Accept shape	Right	Click
Multi Part	Accept multi part ROI	Right	Click a third time

- Select additional regions of interest. Click "New Region" in the ROI Tool box and repeat the procedure outlined above. This time the color will be green. The next time, the color will be blue. Keep going until you are satisfied with the number of regions. Save your ROIs to a file.

6. Go to "Overlay>Region of interest". The "ROI Tool" dialog box will appear. (If it is already open, you don't need to do this step).

- Choose "File>Export ROIs to n-D Visualizer" and select the original "pathum_etm" image. The "n-D Visualizer Input ROIs" dialog box will appear.
- Select all the classes and click "OK". Two displays will open:
 - 1) the "n-D Visualizer" window and
 - 2) the "n-D Controls" dialog box.



- The first will be black and the second will have 6 numbers, each of which corresponds to a ETM+ band from the "pathum_etm" image. Move the white-cross hair in the "n-D Controls" window with the cursor and click on band 2. It will be highlighted. Click on band 3. A 2-D scatterplot will appear in the "n-D Visualizer" that shows the pixel values in bands 2 and 3 for your classes.
 - Experiment with other 2D scatterplots.
- Choose more than 2 bands. The control buttons at the bottom of the "n-D Controls" window now appear as black. Click "Start". The pixels in the "n-D Visualizer" will begin to rotate. The speed of the rotation can be controlled. To see where the axes of the plot are that correspond to the different bands, go to "Options>Axes:On".
- Select all 6 bands in the "n-D Controls" dialog box to examine all 6 bands at once.

From n-D Visualizer and compare the result of classification some area is still overlapped. Add two more class of : Grass and Wet Area (Because before this image was taken there was rain on left side of this image.) But if your old ROI include some Grass and Wet Area, you have to delete that area first. Then make the supervised classification with new ROI set.

We will examine the statistics associated with the classifications. Separate statistics, such as minimum value, maximum value, standard deviation, mean, and eigenvalue, histograms and average spectra are calculated for each class selected.

7. Go to "Classification" in the main ENVI menu bar. Select "Supervised".
 - Select "Maximum likelihood". Choose pathum_etm as the input file and hit "OK". A box will appear that specifies the parameters for the classification method you chose. The box will ask you to select the classes from regions. You will use the ROIs that you created. Choose "Select All Items".
 - The default for the probability threshold is that nothing is specified. All the pixels, therefore, are classified in the default image. Specify a probability threshold of 0.90.
 - Enter an output class filename. Make it logical. Also make sure that "No" is filled in for "Output Rule Images?".
 - Select the output file for the classification image to display as Gray Scale when the available bands list dialogue box appears. Make sure to load this as a new display if you do not want to overwrite an existing window. You can link this display to any of the other open displays for comparison.

Land cover class

1. Buildup area
2. Water body
3. Bareland
4. Orchard
5. Grassland
6. Paddy field
 - i. Land preparation
 - ii. Vegetative growth stage
 - iii. Reproductive growth stage
 - iv. Ripening growth stage

4. Result

- 4.1 Un-supervised classification
- 4.2 supervised classification:

5. Conclusion.

6. Reference: