Hands on Remote Sensing and GIS

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Summary of Exercises

This manual contains details about following exercises:

- Image Importing
- Toposheet Rectification / Image Registration
- Classification

– All exercises will be done on ERDAS Imagine 8.4 or 8.5.

– In the Image Processing exercise, toposheet scanning, toposheet rectification, image rectification, extracting study area and supervised classification for obtaining land use map for the study area will be done.

– Data for the exercise are stored in following directories: **C:\training**

Exercise: Image Processing (ERDAS)

1. Scan a topo sheet on the scanner and save as tif-file.
2. Open tif file in the ERDAS Imaging software. (Select file type as tif in ERDAS).
3. To fit the toposheet in the viewer, use right mouse button in the viewer and select fit image to window.
4. Geo-correct the toposheet with the help of Data Preparation process (Details in Annexure I).
5. This Geocoded toposheet will be used to correct satellite data.
6. Import satellite data from CD supplied from NRSC, Hyderabad (Details in Annexure II).
7. Geo-referenced the image/ *mosaic image* with geocoded toposheet (with the help of GCPs) (Details in Annexure III).
8. Using AOI mask the study boundary from the image to get the study area.
9. The extracted image can be classified using supervised classification (Details in Annexure IV).

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ANNEXURE I

Steps Involved in Georeferencing of Scanned Toposheets

1. Click the DATAPREP icon. This will display the data preparation popup menu.
2. Select Image Geometric Correction to open Set Geo Correction input file dialog box.
3. Select From Image File radio button. Click "input image file" icon to open "Input Image File" dialog box.
4. Change "File of Type" to TIFF (*.tif) and click OK. Click OK again.
5. The toposheet is displayed in the viewer and Geometric model dialog box is opened.
6. Select Polynomial and click OK.
7. Geo Correction Tools and Polynomial model properties dialog box appear. In Polynomial model properties click close.
8. GCP tool reference set up dialog box appears. Select Keyboard only radio button and click OK.
9. Reference map information dialog box appears.
10. Click on Add/change map projection to get Projection Choose dialog box.
11. Click on the Custom Tab and set the information on follows:

    Projection Type: Geographic (Lat/Lon)
    Spheroid Name: Everest 1956
    Datum : Indian (India, Nepal)

Click OK

12. In the Reference Map Information dialog box entered projection details are shown.
13. Click OK to get two windows, namely GCP tool and Magnifier window.

Note: You may see approximate statistics dialog box. Click OK three times.

14. In GCP Tool, Click Create GCP icon.
15. Take the mouse cursor into the viewer. You can see the cursor will turn as '+' in the viewer. Click at the selected GCP (in this case, at the intersection of latitude and longitude graticule).
16. In the Viewer GCP will be displayed and annotated as "GCP #1". X input & Y input values will be filled in the GCP tool Cell Array.
17. In the Cell Array, in X ref column, type value of longitude in degree (e.g. 77.75) and in Y ref column type value of latitude in degree (e.g. 30.5). Use space bar for entering minutes with degree (e.g. 77°45′ will be entered as 77 45, the value will be converted to 77.75 in terms of degree).
18. In GCP tool Click the first button (toggle fully automatic GCP editing mode) to make it OFF. The icon is used for predicting the points, which is not needed presently.
19. In the same way create other GCPs.

20. After creating save the points by clicking File/Save Input As and File/Save Reference As.
21. Reference points will be saved in the file (*.gcc)
22. Click on set automatic transformation matrix icon to calculate RMSE error which could be seen on top right of GCP tool.
23. Go to Geo correction Tools.
24. Select Display Model Properties icon (first icon)
25. Select Projection tab. Click Add/Change Projection.
26. Projection Chooser dialog box is opened.
27. Select Projection Type as polyconic, spheroid on Everest 1956, Datum as Indian (India, Nepal), longitude of central meridian as (longitude of centre point of area of interest i.e. 77:52:30 E), latitude of origin of projection as (Centre point i.e. 30:07:30 N), False Eastings at Central Meridian as 500000 and click OK.
28. Click OK.
29. Reference point reprojection warning dialog box is opened. Click yes. In Verify save on close dialog Click No
30. You will see the X ref and Y ref value will be changed to meter units in the GCP tool.
31. In Geo Correction Tools, select display resample image dialog icon.
32. Resample dialog box is opened.
33. In the output file, type the output file name, e.g. trect.img and click OK.
34. When the process is over click OK in the process bar.
35. Open the output file (trect.img) in a viewer.

36. You can verify the output file by clicking on Utility/inquiry cursor in the viewer. And place the cross hair on the known location and you can see the longitude and latitude values. In the top left cover list box change map to lat/lon. You can cross check this value with the known values which has to be very close to each other.

ANNEXURE II

Steps Involved in Importing Satellite Data

1. In ERDAS IMAGINE 8.5 panel, click Import icon to open Import/ Export dialog.
2. In Type dropdown list, select Generic Binary.
3. In Media, select File
4. In Input file, go to CDROM. Open Product1 folder and select imagery.L-3 file
5. Click OK
6. Enter output file name

Read number of scan line and pixels in the data file

7. Click Data View button.
8. Enter offset value as 180.
9. In the Keyboard, press Enter key.
10. The content of the Data View window is updated.
11. Note down first two values, e.g. 23984 and 6480. The values indicate number of data lines and number of pixels respectively. Data lines are related to number of scan lines as follows:

    Scan lines= Data lines/ number of bands
    In case of IRS LISS- II and III data
    Scan lines= Data lines/ 4
    e.g. scan lines= 23984/4= 5996

12. Close the window

Alternately, the number of line and pixels can be read from the cover of the CDROM supplied by NRSC.

Import the image data

13. Click OK, to open Import Generic Binary Data dialog.
14. Enter values, e.g.

File Header	540
Image Record Length	6480
Line Header Bytes	0
# Rows	5996
# Cols	6480
# Bands	4

15. Press Preview button
16. A preview image is imported
17. A Viewer is opened with Preview image displayed in the Viewer.
18. In the Viewer, use Utility- Inquire Box menu to open outline of an Inquire box in the Viewer
19. An Inquire Box window is also opened . In the window, ULX, LR X, ULY and LRY are displayed.
20. The box can be reshaped by dragging the sides or corners of the box.
21. In Import Generic Binary Data window, click Import Options button
22. An Import Options window is opened.
23. Click From Inquire Box button
24. ULX, LR X, ULY and LRY values are copied from the inquire box in the Viewer.
25. Press OK.
26. Press OK.
27. Press OK.
28. Close Inquire Box window
29. In the Viewer, open the imported image.

ANNEXURE III

Steps Involved in Georeferencing of Satellite Image

1. Click the DATAPREP icon. This will display the data preparation popup menu.
2. Select Image Geometric Correction to open Set Geo Correction input file dialog box.
3. Select From Image File radio button. Click "input image file" icon to open "Input Image File" dialog box.
4. The FCC is displayed in the viewer and Geometric model dialog box is opened.
5. Select Polynomial and click OK.
6. Geo Correction Tools and Polynomial model properties dialog box appear. In Polynomial model properties click close.
7. GCP tool reference set up dialog box appears. Select Image Layer (New Viewer) radio button the option and click OK.
8. Reference Image Layer dialog box appears. Select the image file name and press OK.
9. Reference Map Information dialog appears. Current reference image projection information is displayed in the window. Press OK to close the window.
10. Five windows, namely GCP tool, Geo Correction Tools, reference image and two Magnifier windows are opened.

Note: You may see approximate statistics dialog box. Click OK three times.

11. In GCP Tool, Click Create GCP icon.
12. Take the mouse cursor into the viewer. You can see the cursor will turn as '+' in the viewer. Click at the selected GCP in the input image viewer. Also click corresponding GCP in reference image viewer (displaying toposheet).
13. In the Viewer GCP will be displayed and annotated as "GCP #1". X input, Y input, X Ref. and Y Ref. values will be filled in the GCP tool Cell Array.
14. In GCP tool Click the first button (toggle fully automatic GCP editing mode) to make it ON (icon seen as depressed). The icon is used for predicting the points, which is needed presently.
15. In the same way create other GCPs. Total control point error could be less than 3 pixels (75 m).
16 After three points are input, if a new GCP is created in input image/ reference map window, the corresponding GCP in the reference map/ input image is automatically computed using available transformation matrix from existing GCPs and the computed GCP is placed in other viewer as well as X and Y values for that map/ image are placed in GCP tool window. The position of the GCP in the other window is corrected if needed manually by picking the GCP with
17. After creating save the points by clicking File/Save Input As and File/Save Reference

As.

18. Reference points will be saved in the file (*.gcc)
19. In Geo Correction Tools, select display resample image dialog icon.
20. Resample dialog box is opened.
21. In the output file, type the output file name, e.g. irect.img. Enter output cell size X and Y as 24 and 24 m and click OK.
22. When the process is over click OK in the process bar.
23. Open the output file (irect.img) in a viewer.
24. Display both the toposheet and image in a viewer. Use Utility- Swipe menu to verify the correctness of image geo correction.

ANNEXURE IV

Steps Involved in Supervised Classification

In this exercise supervised classification of IRS LISS-III images. The exercise will be used to classify the image in to classes, namely forest, crop, fallow, barren and sand.

In supervised classification, basic steps require selecting training sets from image, selecting band combinations to be used for classification and classifying the image.

1. Run ERDAS Imagine 8.5.
2. Set preferences for the session.

Selecting signatures

3. Go to the Viewer #1 window.
4. Click open layer button. In "select layers to add" dialog box, select file name e.g. 11feb97_rs.img.
5. In ERDAS IMAGINE 8.5 panel, Click Classifier icon to open Classifier popup menu.
6. Select Signature Editor menu to open a Signature Editor dialog box.
7. Go to Viewer#1 select menu AOI- Tools to open AOI tools.
8. In Viewer #1 use Zoom icon to zoom to a theme, e.g. flood.
9. In AOI tool box, select Create polygon AOI tool.

10 GO to Viewer#1.

11. Create a polygon for a theme, e.g. forest (click to create points in the polygon boundary and double click to close the polygon). The polygon remains selected. (To deselect a polygon click outside the polygon to deselect and to select a polygon click inside the polygon)
12. Go to the Signature Editor dialog box
13. Click Create new signature from AOI icon. This reads the signature from image and adds it to the signature editor as Signature # 1 by populating columns in the Signature Editor Cell Array.
14. Under Class Name column in the Cell Array Click to Class 1 and type new class name e.g. forest. From Keyboard press Enter.
15. Add more signatures using procedure described in steps 10 to 14.
16. Click Display Mean Plot Window icon to open Signature Mean Plot window.
17. Click Switch between single and multiple signature mode and then click Scale Chart to Fit Current Signatures icons to plot all the signatures in the Signature Mean Plot window.

18. Press Display Statistics icon to open Display Statistics window and view the statistics for the selected signature in the window.
19. Under column ">", click a Cell Array to make the signature the current signature (Symbol ">" appears at that Cell Array).
20. The Display Statistics changes to display the current signature.
21 Click Close button to close the Display Statistics window.

Supervised classification

22. In Signature Editor window, Click Edit- Layer selection menu to open Layers to select dialog.
23. Click layer # 1, and shift- click layer # 2 and 3 to select layers 1 to 3 to use in the classification.
24. Click Classify- Supervised menu to open Supervised Classification dialog box.
25. Enter output file name and press OK button. The image will be classified and thematic map will be stored in the output file.

Recode the thematic map

After classification, the thematic map contains several classes for each theme. Using recode operation, multiple classes for same theme are assigned one class value.

26. In ERDAS IMAGINE 8.5 panel, click Interpreter icon to open Image Interpreter popup menu.
27. Select GIS Analysis- Recode menu to open Recode dialog box.
28. Enter input and output file names.
29. Press Setup Recode button to open Thematic Recode window.
30. In the Thematic Recode table, enter recode values under New Value column, e.g. for thematic classes, namely forest, crop, fallow, barren and sand enter values 1 to 5 respectively. The Class Names can be seen by scrolling the table using scroll bar at the bottom of the table.
31. Press OK to close Recode dialog box.
32. Press OK to complete recode.

Compute area

33. Go to Viewer # 1.
34. Open the recoded image.
35. Open Attribute Editor.

36. Click a Color in the Cell Array and select New Color to Change color of a thematic class.
37. Use Edit- Add Class Name menu to add class names
38. Use Edit- Add Area Column menu and class areas. Class area is computed automatically using this operation for each thematic class.

Compare visually the classified map and FCC

39. Go to Viewer # 1
40. Open the image.
41. In Select Layer to ADD window click Raster Option tab
42. Remove check in the Check Box in front of Clear Display.
43. Use Utility- Swipe menu to swipe FCC over the classified map and compare the two.

Editing the thematic map

44. Use Raster- Tools menu to open Raster tool box
45. Select Create Polygon AOI tool.
46. In the Viewer, create an AOI.
47. Select Recode Area tool.
48. A Reocde table in opened.
49. Under New Value column in the table, enter recode values.
50. Click Apply button.
51. Repeat steps 45 to 50 for several areas.
52. Click Close button to close the Recode table.
53. Close Raster Tool Box.
54. In Viewer, use Close Top layer icon to close AOI layer.
55. Click No.
56. Use Close Top layer icon to close image.
57. Click Yes.
58 Click Yes. This will close the image and save the edit in the image.