LSGI522 Spatial Data Acquisition

Practical 3 – Remote Sensing

N.P. This information is a guide only. What you see on your computer monitor and the information you enter may very well be different to that which is shown here.

Exercise (1)

Image to Map Registration

Aims

In doing this exercise you should achieve the following:

1. Register an image to a map coordinate system (geo-reference of an image)
2. Perform a supervised classification through training different sets of data

Materials

A. Dataset

1. **Tsingyi.ers (**SPOT image dataset**)**
2. **11NWA.erv, 10NEB.erv, 7SWC.erv, 6SED.erv** (ER Mapper Vector files (.erv) of roads from HK Lands Department)
3. **road_kl.erv (**ER Mapper Vector files of roads in Kowloon and northern HK Island**)**
   - **All data can be downloaded from:**

     https://connectpolyu-my.sharepoint.com/:f:/g/personal/18045096r_connect_polyu_hk/EslyQR9umUlFvyNbpoR28WQBuUUyZSVJPB8kVmZ1mlCcjw?e=EUgjDu)

B. Software

1. Erdas Ermapper 2016 (https://www.hexagongeospatial.com/products/power-portfolio/other-producer-products/er-mapper)

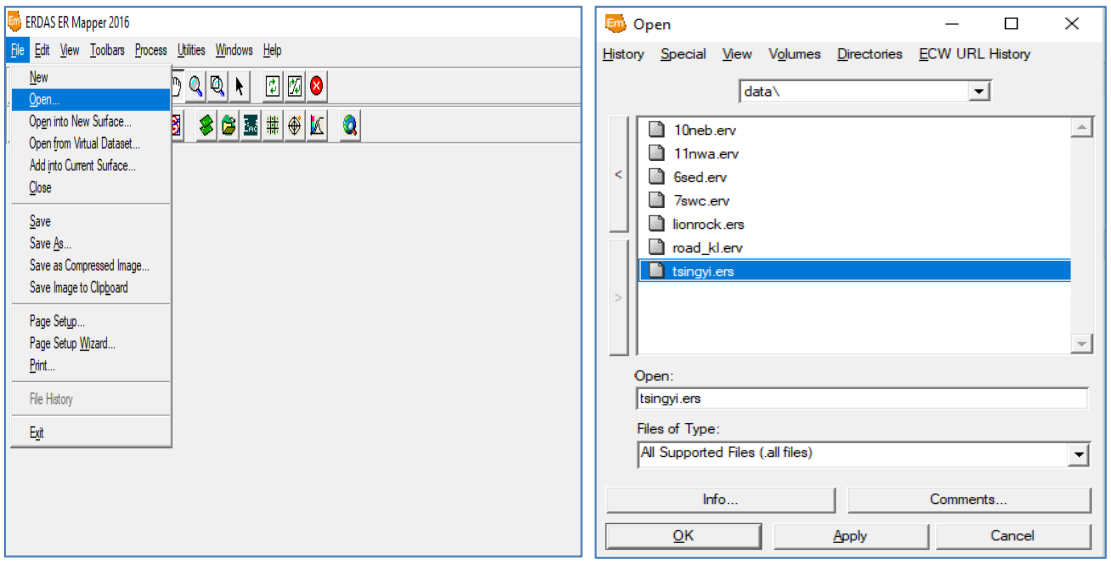
C. Tutorials

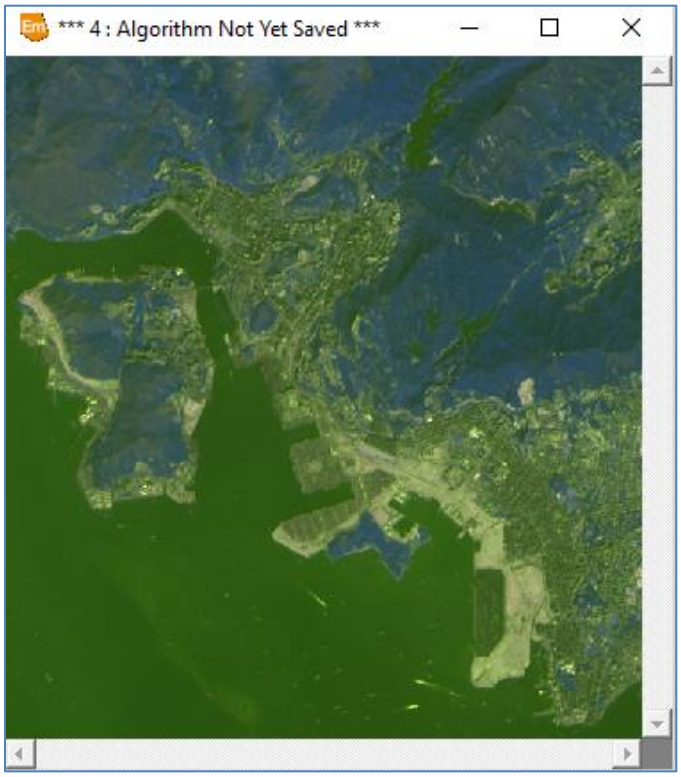
- User guide for Erdas Ermapper 2016

Methodology

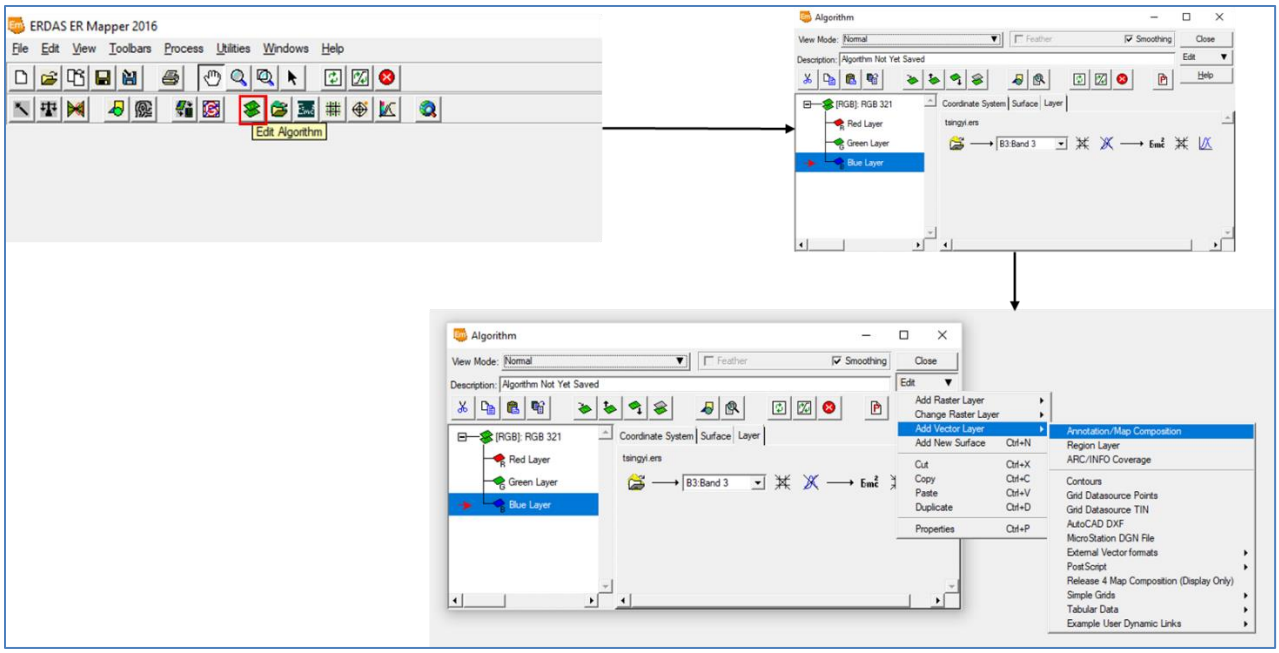
Please conduct the following tasks following the provided instructions.

1. **File → Open → Volumes → Choose the correct directory for the data → Choose "tsingyi.ers".** Then press OK. A satellite image is shown on the pop-up window.

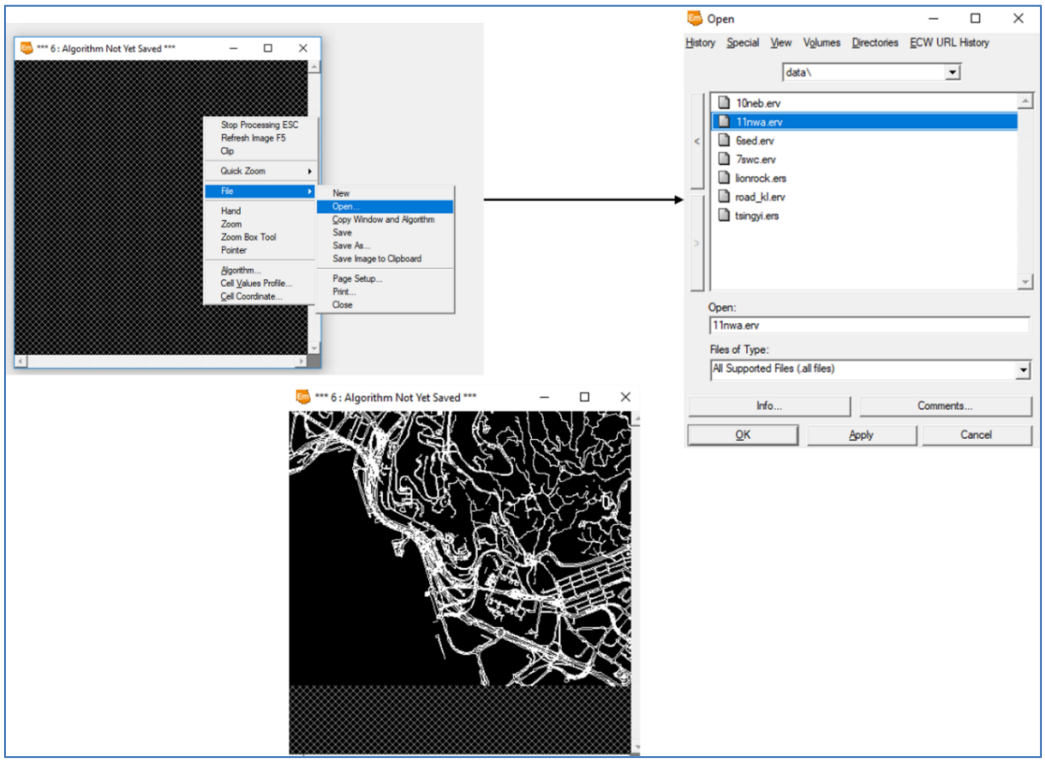




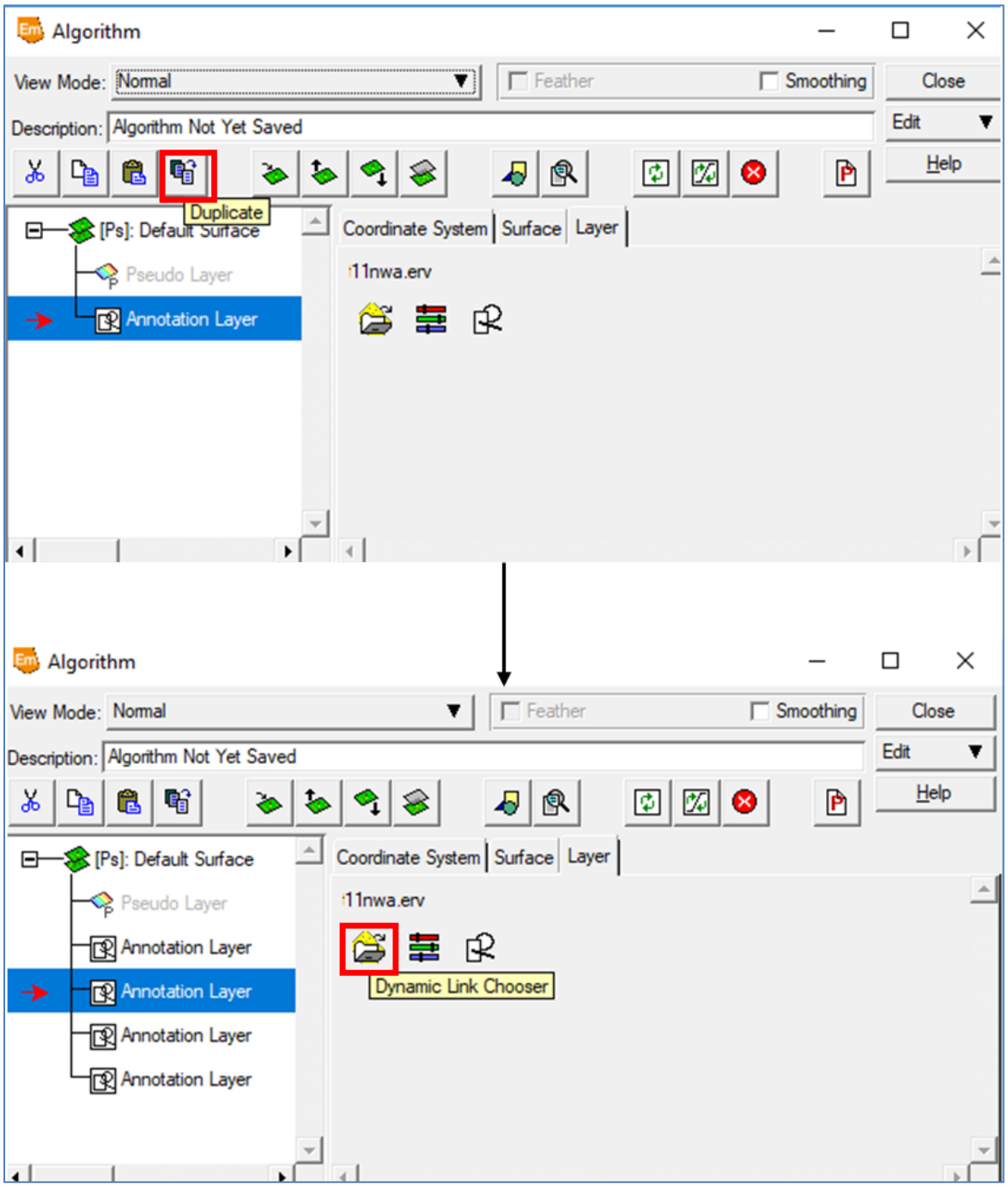
2. Press **Edit Algorithm**  button and press **Edit Add Vector Layer→ Annotation/Map Composition**



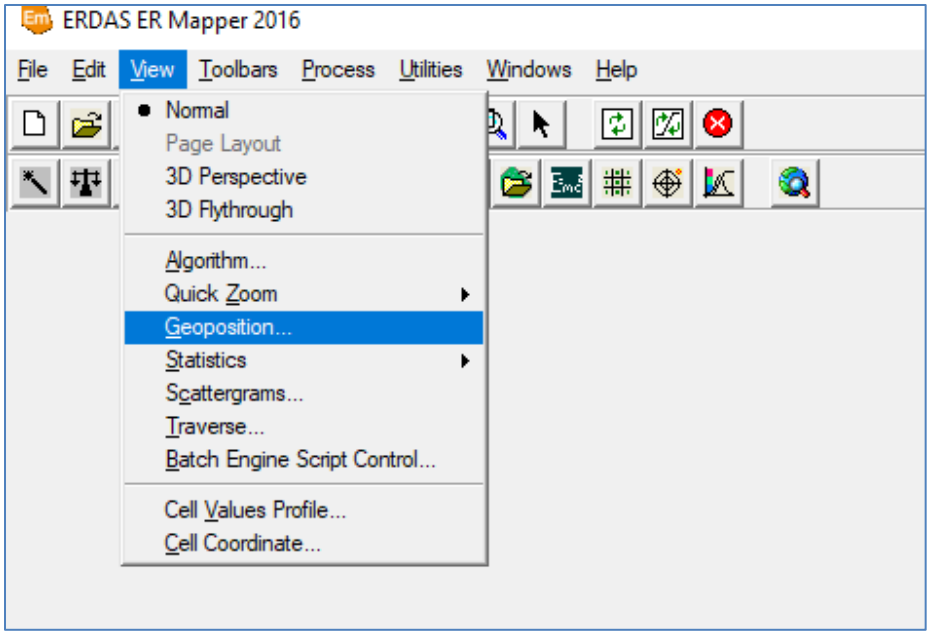
3. **Windows New Windows.** Load the ErMapper vector file <u>11NWA.erv</u> to the selected layer.

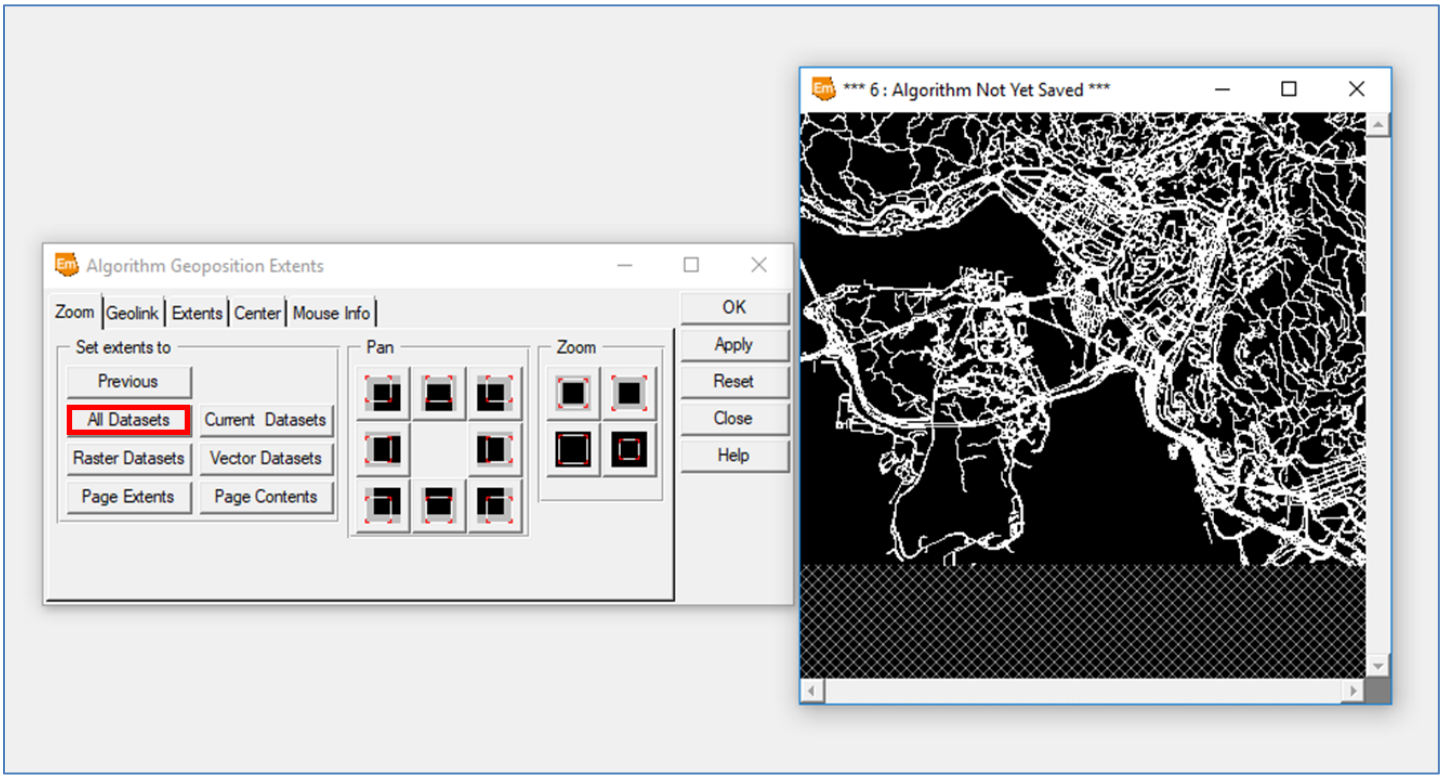


4. Add 3 more Vector layers by clicking the **Duplicate** button  , select them individually and load into them the other 3 vector files.

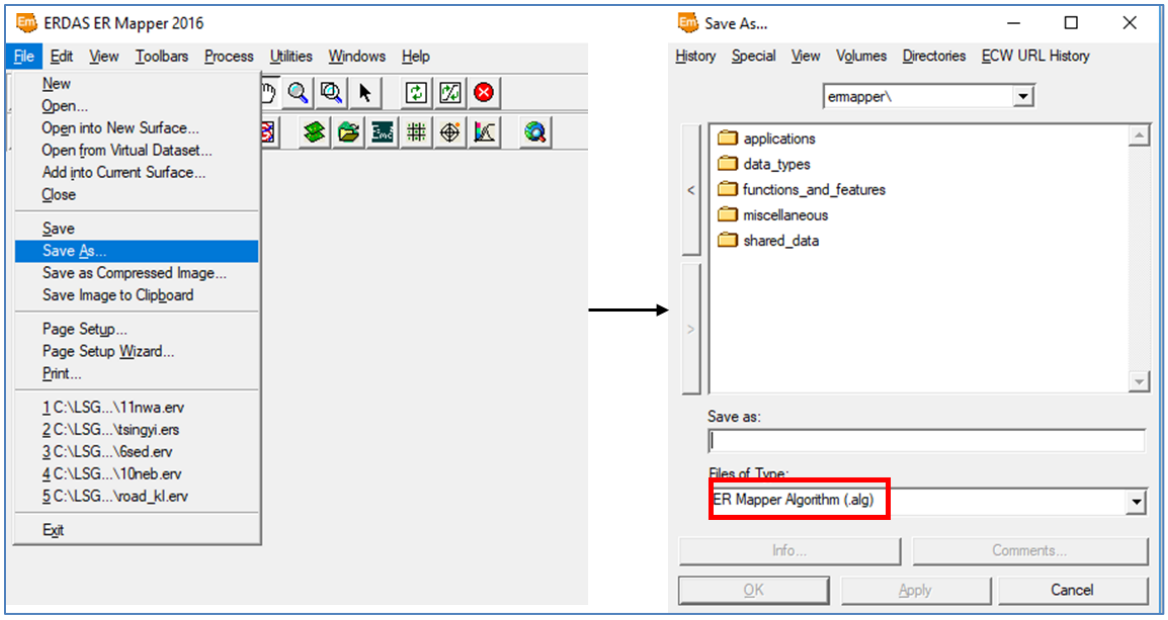


5. Under **View → Geoposition**, select **Zoom to All Datasets.** Check that all four maps are loaded. Press **All Datasets** to zoom to all data

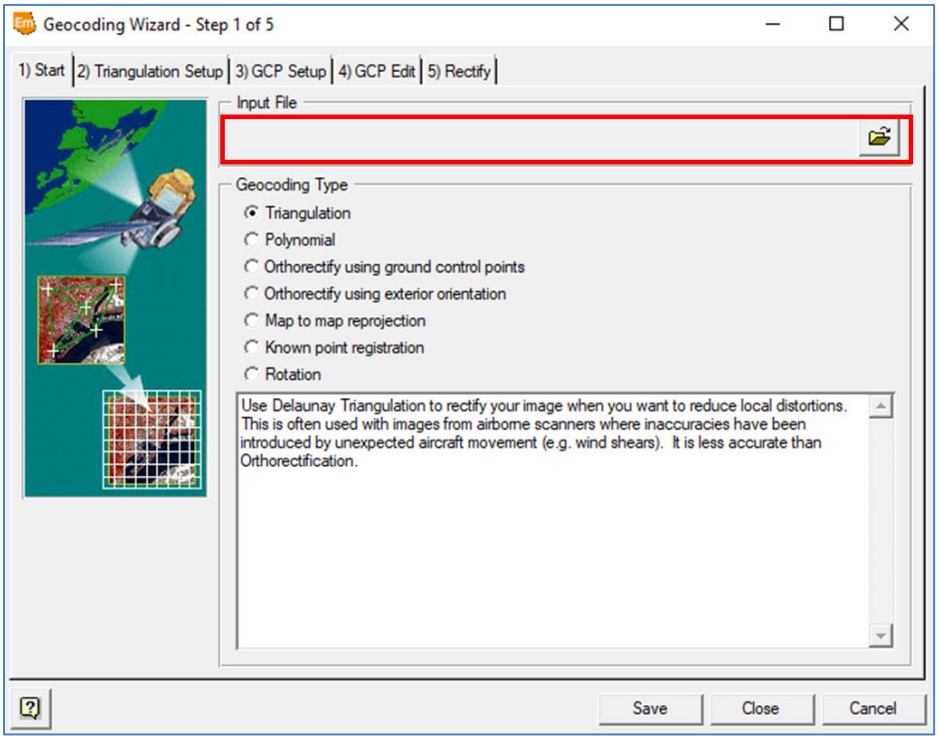




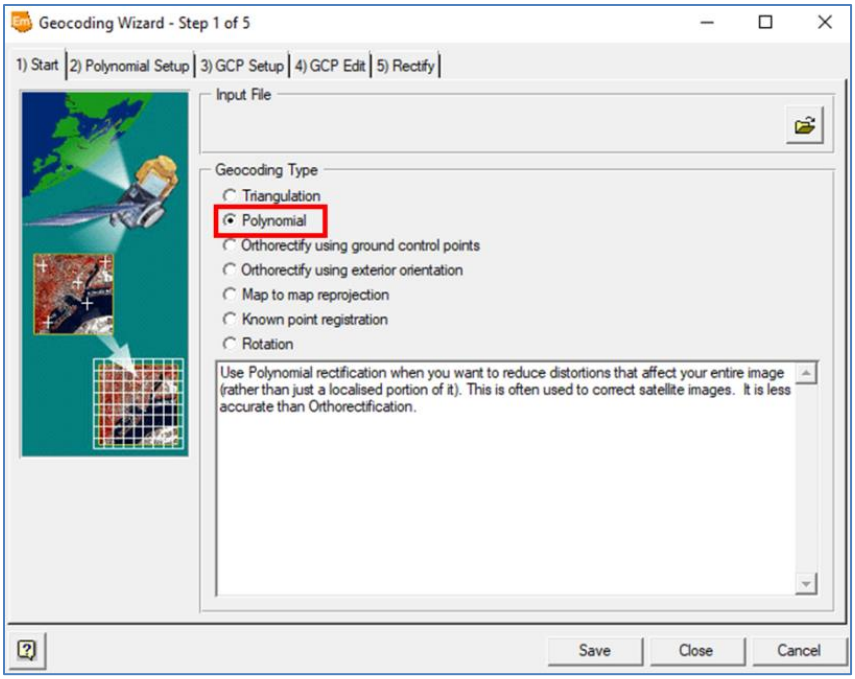
6. Under **File → Save As,** save the roads map composition as an **<u>Algorithm</u>** (**.alg) to your own directory



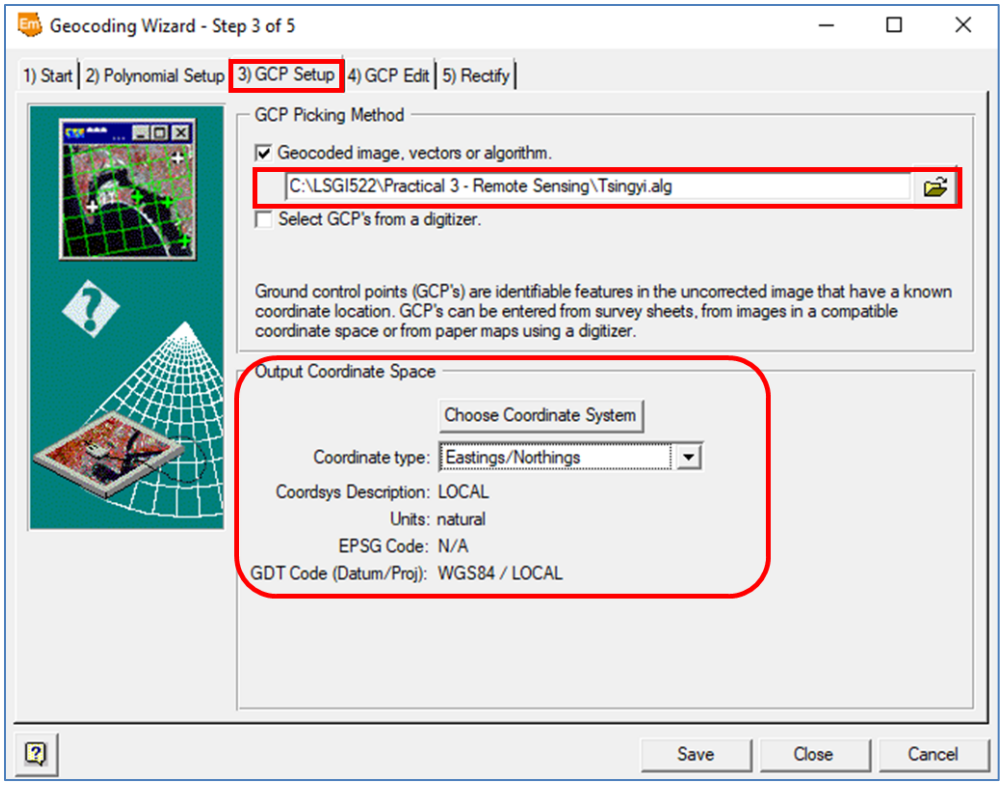
7. On the main menu, select **Process → Geocoding Wizard**  , and enter the <u>input image</u> to be corrected (i.e. *Tsingyi.ers*)



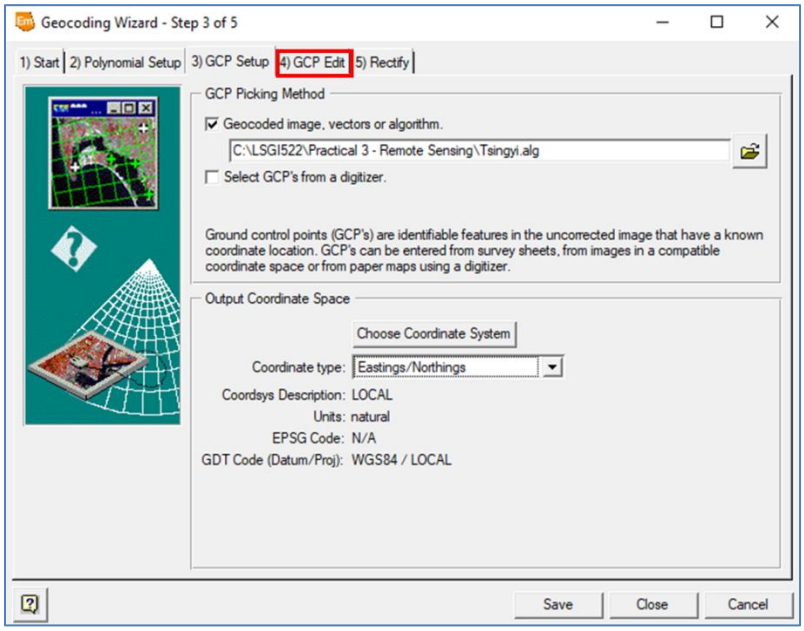
8. Choose **Polynomial registration**. This is a fairly simple type of correction as there are no scale distortions across a single SPOT image, as there are with air photos.

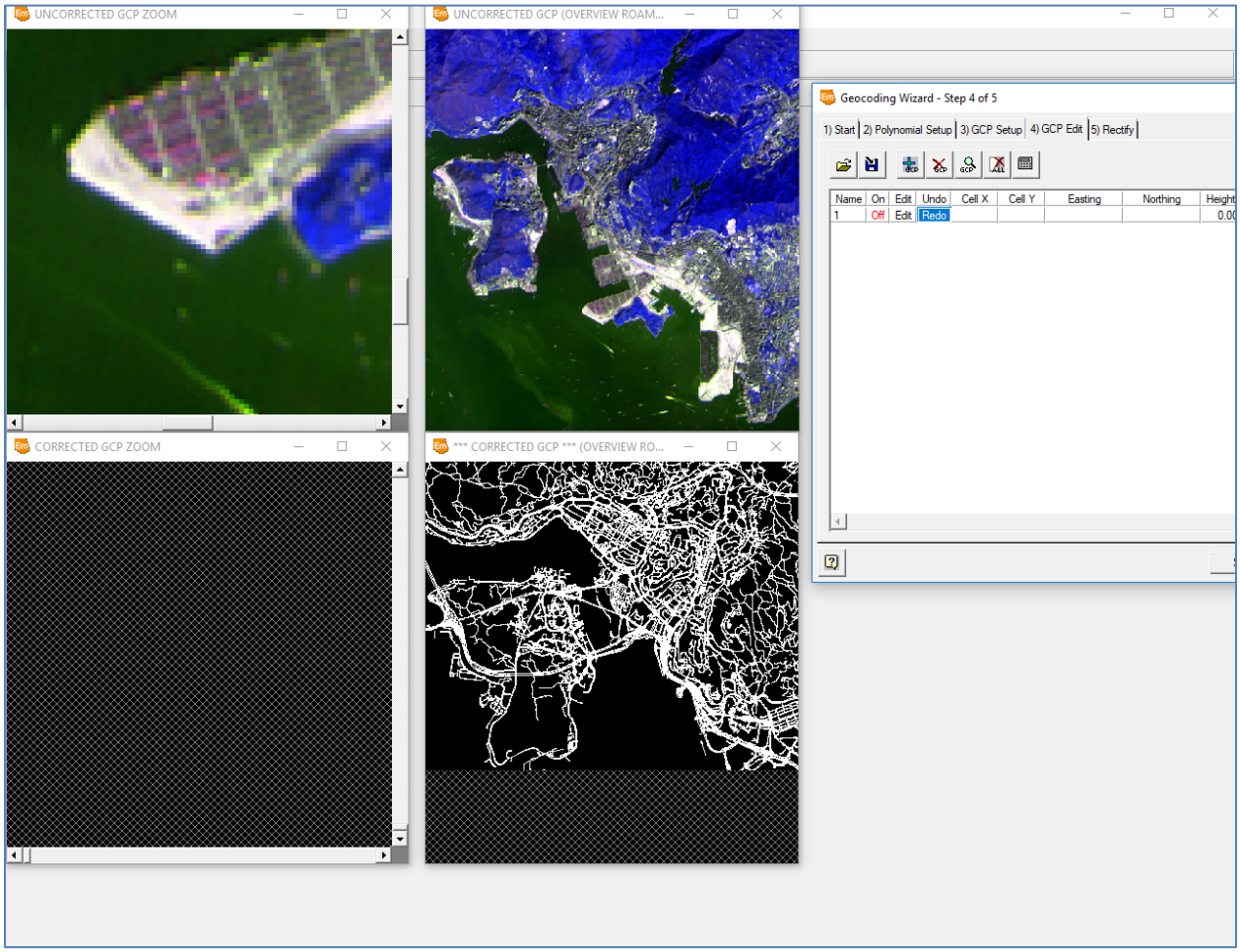


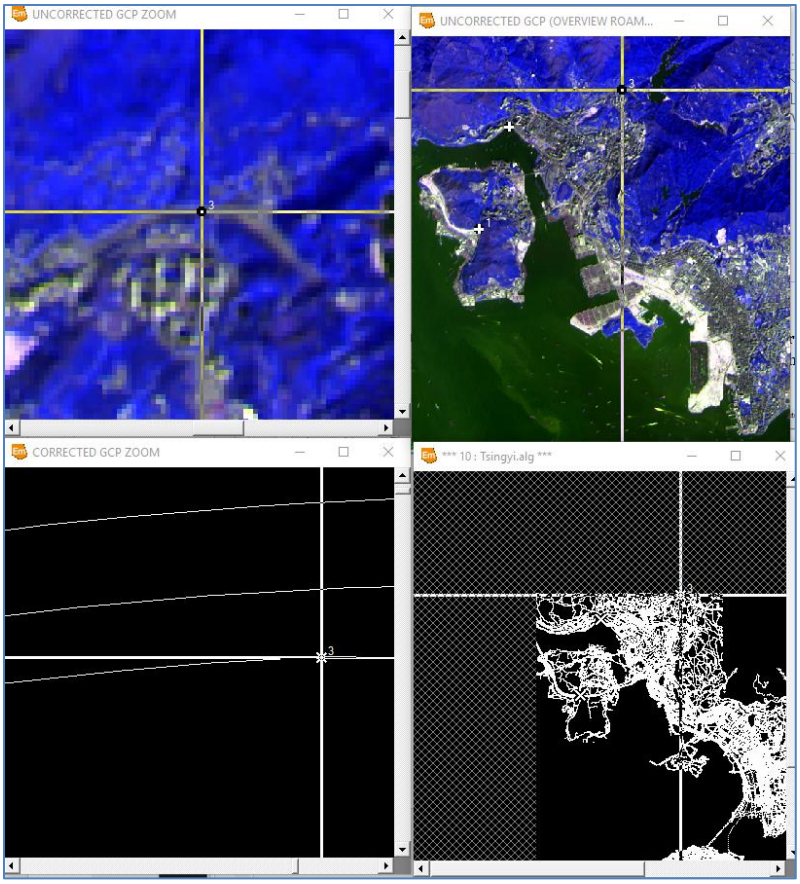
9. Click on **GCP Setup**. Your picking method is **Geocoded image, Vectors or Algorithm**, so enter the <u>algorithm of roads</u> that you just saved
10. Your output coordinate space will be given.

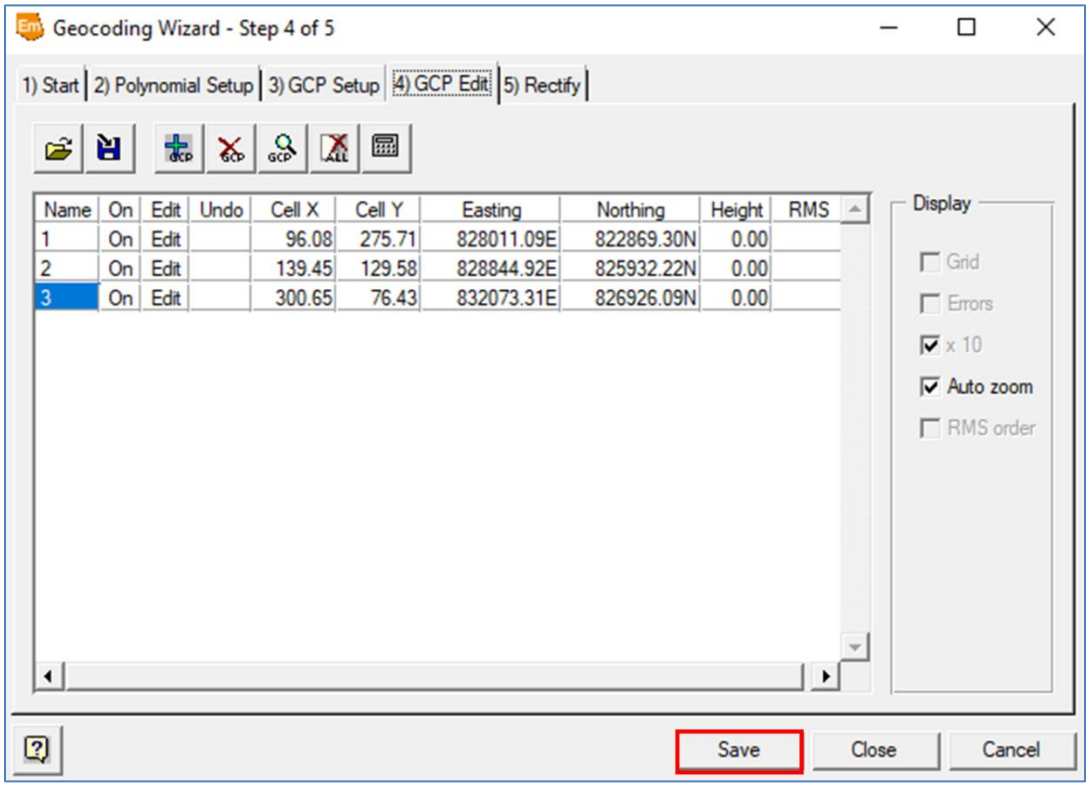


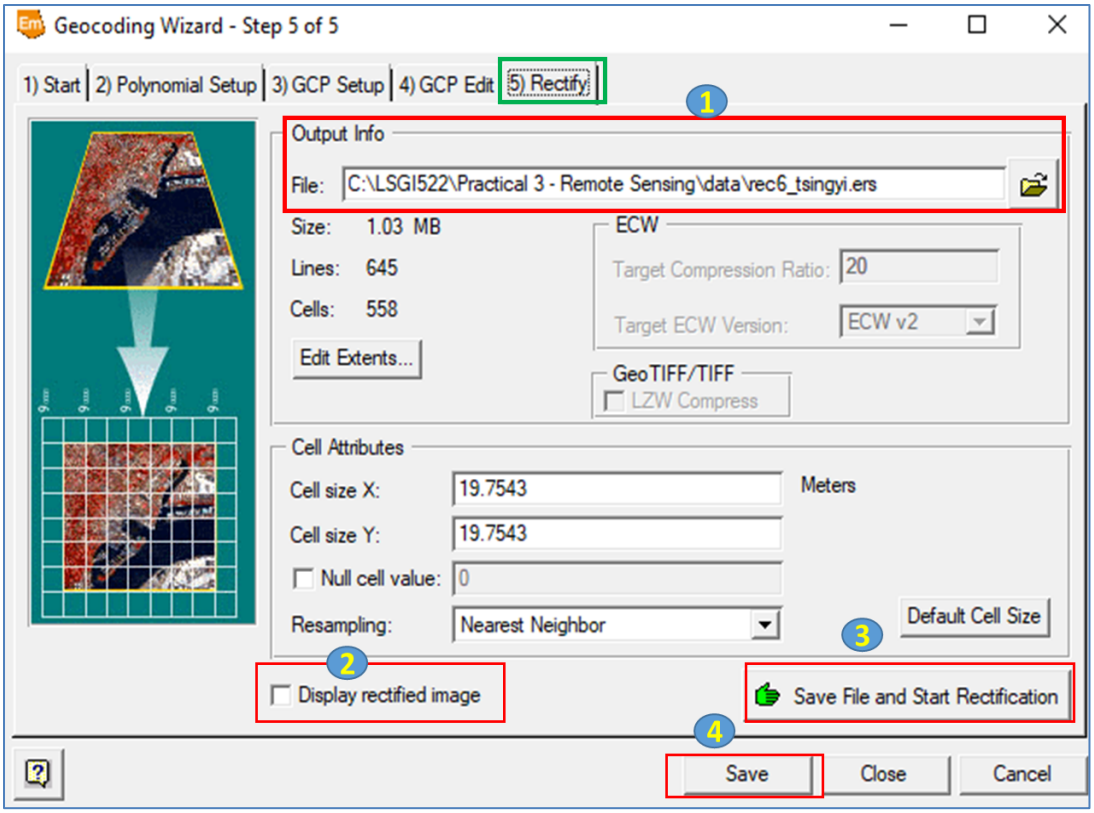
11. Click on **GCP Edit**

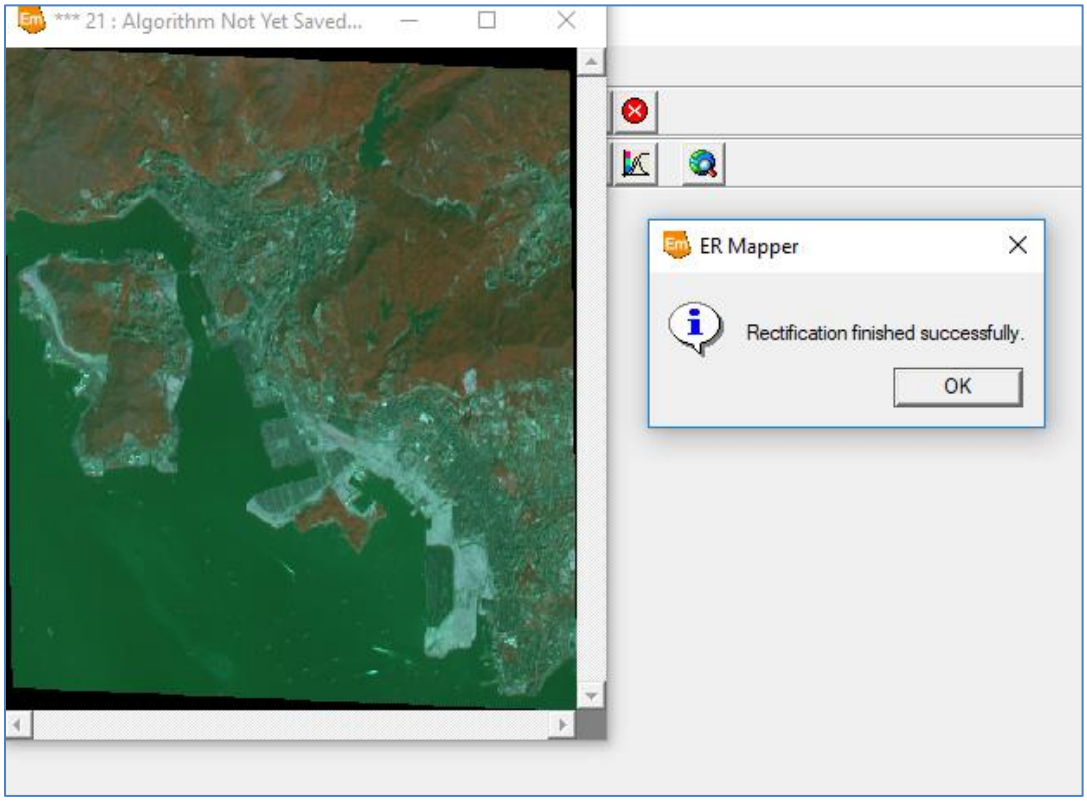





UNCORRECTED GCP ZOOM
UNCORRECTED GCP (OVERVIEW ROAM...
CORRECTED GCP ZOOM
*** 10 : Tsingyi.alg ***


Geocoding Wizard - Step 4 of 5
1) Start
2) Polynomial Setup
3) GCP Setup
4) GCP Edit
5) Rectify
Name On Edit Undo Cell X Cell Y Easting Northing Height RMS
1 On Edit 96.08 275.71 828011.09E 822869.30N 0.00
2 On Edit 139.45 129.58 828844.92E 825932.22N 0.00
3 On Edit 300.65 76.43 832073.31E 826926.09N 0.00
Display
Grid
Errors
x 10
Auto zoom
RMS order
Save
Close
Cancel


Geocoding Wizard - Step 5 of 5
1) Start
2) Polynomial Setup
3) GCP Setup
4) GCP Edit
5) Rectify
1
Output Info
File: C:\LSGI522\Practical 3 - Remote Sensing\data\rec6_tsingyi.ers
Size: 1.03 MB
Lines: 645
Cells: 558
Edit Extents...
ECW
Target Compression Ratio: 20
Target ECW Version: ECW v2
GeoTIFF/TIFF
LZW Compress
Cell Attributes
Cell size X: 19.7543
Cell size Y: 19.7543
Meters
Null cell value: 0
Resampling: Nearest Neighbor
Default Cell Size
2
Display rectified image
3
Save File and Start Rectification
4
Save
Close
Cancel


*** 21 : Algorithm Not Yet Saved...
ER Mapper
Rectification finished successfully.
OK

Procedures in ArcGIS

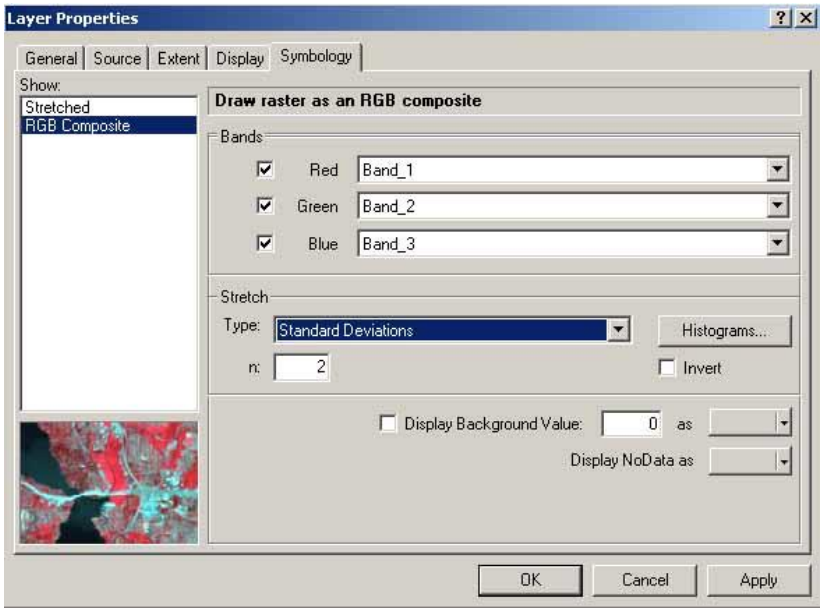
Go into **ArcGIS → ArcMap**

1. Under **File**, on the main menu, select **Add Data**

2. You can now add the rectified image as an Image Theme.

3. Choose the .ers file which you saved in ER Mapper.

4. Select this ers image, then **Right Click**, go to **Properties → Symbology**, choose the appropriate bands for Red Green Blue channels, and then select Stretch Type as **Standard Deviations**, this is the color equalization and same as that in ER Mapper.



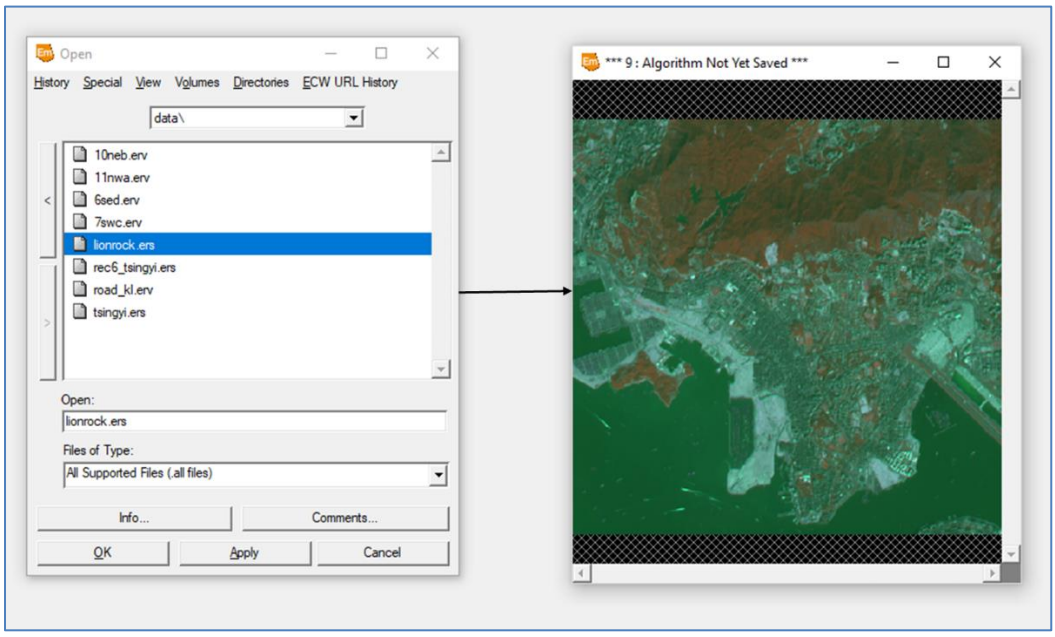
6. Load the road vector layers road_kl.erv and change the line colors to yellow and white by clicking on the **Symbol Selector** of the layer

7. Examine the performance of rectified image by comparing with the reference vector layers.

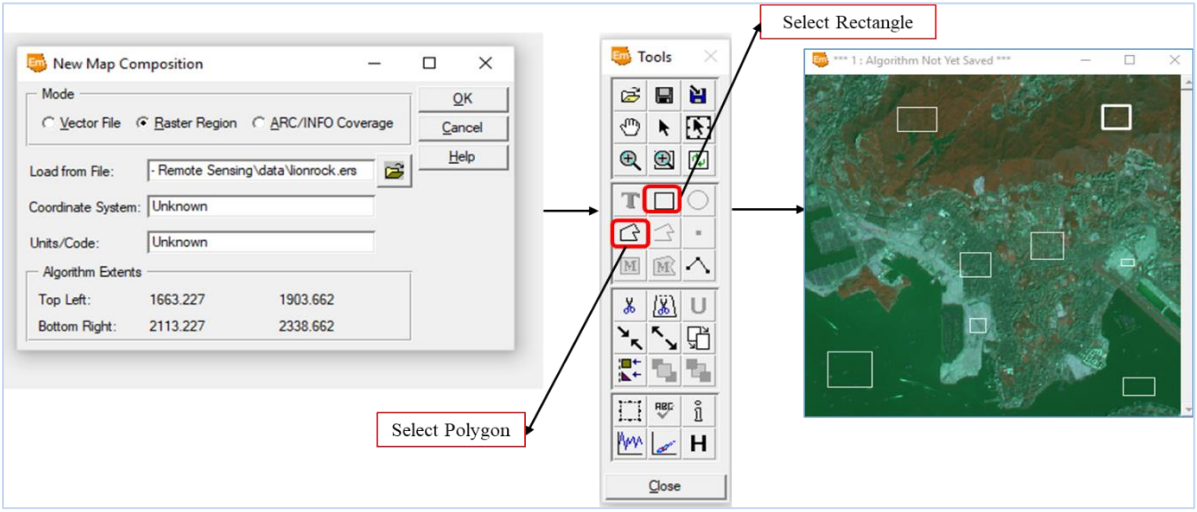
Exercise (2)

Supervised Classification

1. Open a color display algorithm and load the lionrock.ers dataset



2. From the Edit menu, select Edit/Create Regions (draw vector polygons to define several feature classes in the image as raster regions)



3. Click on the '**Region Layer**' layer to select it, then click the **Open Color Chooser button** to choose a color on the Algorithm window for your training polygons to be defined. Click OK.

A) <u>Define a region to represent the first feature type</u>

I. Take extra care as you digitize the regions making sure that you do not create small, 'invisible polygons' by clicking more than once, except when you want to close the polygon (do this by two sharp clicks – only two!). Name your regions as  you define them (using the **Edit Object Attributes button**). Make sure that all polygons of the same feature class have the same name, as the name becomes the text attribute of the feature type. Any misspelling will be recognized as a different class.

II. Continue to define all classes in the image in the same way,

III. Save the regions to your LIONROCK.ERS dataset using the Save button on the Tools palette dialog. When asked to confirm the overwriting, click OK to proceed. The next dialog indicates that all your training regions were added to the dataset header. Click Close to close it.

Now the region outlines, and names are saved to the header file (.ers) of the LIONROCK dataset. You can now calculate statistics for the pixels in each region.

IV. Click Close on the Tools palette to close it.

V. Close ALL the windows (including the algorithm window for image display) except the ERMapper Main Menu.

B) Calculate statistics for the training regions

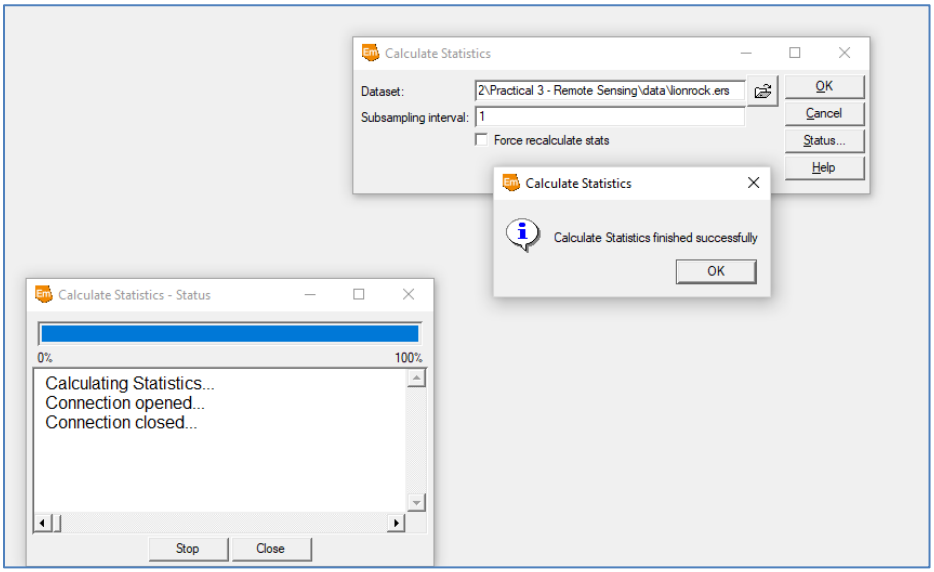
I. From the Process menu, select Calculate Statistics.

The LIONROCK dataset should be chosen by default because it is the dataset used in the current algorithm.

II. Select the Force Recalculate Stats option (to calculate statistics again in case they have previously been calculated). Change the default subsampling interval of 4 to 1.

III. Click OK to start the statistics calculation.

IV. When the calculation is finished, click Close and Cancel on the two menus respectively

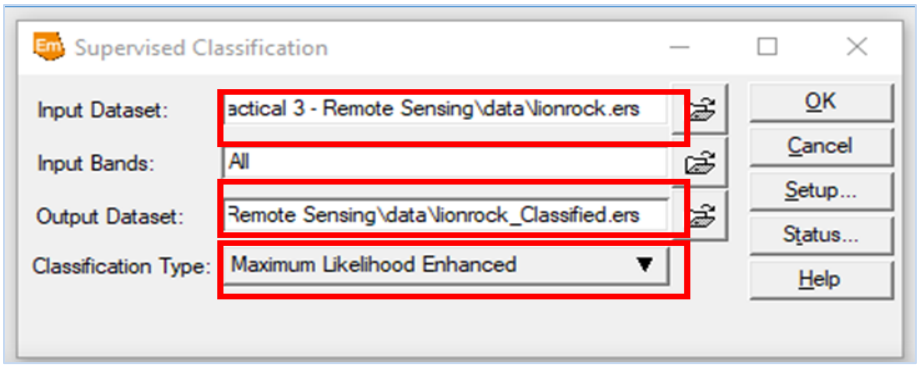


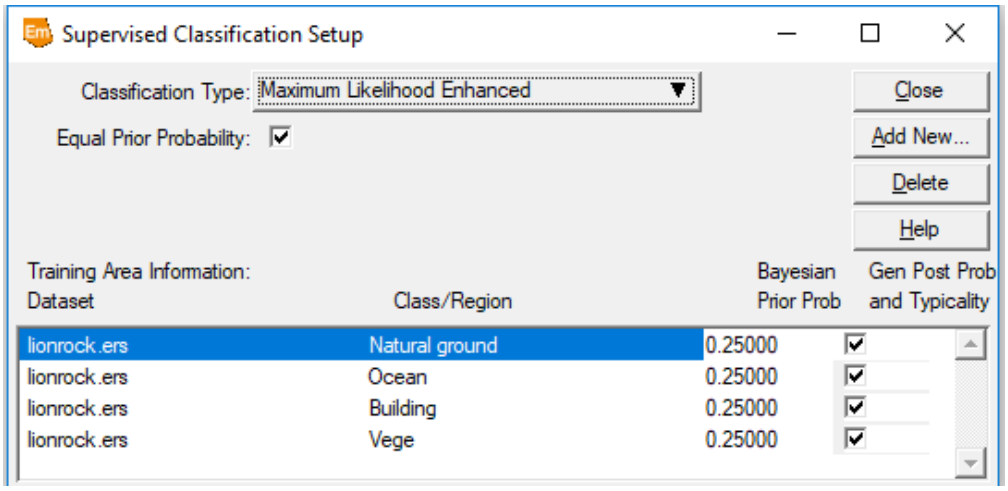
C) Classifying the image

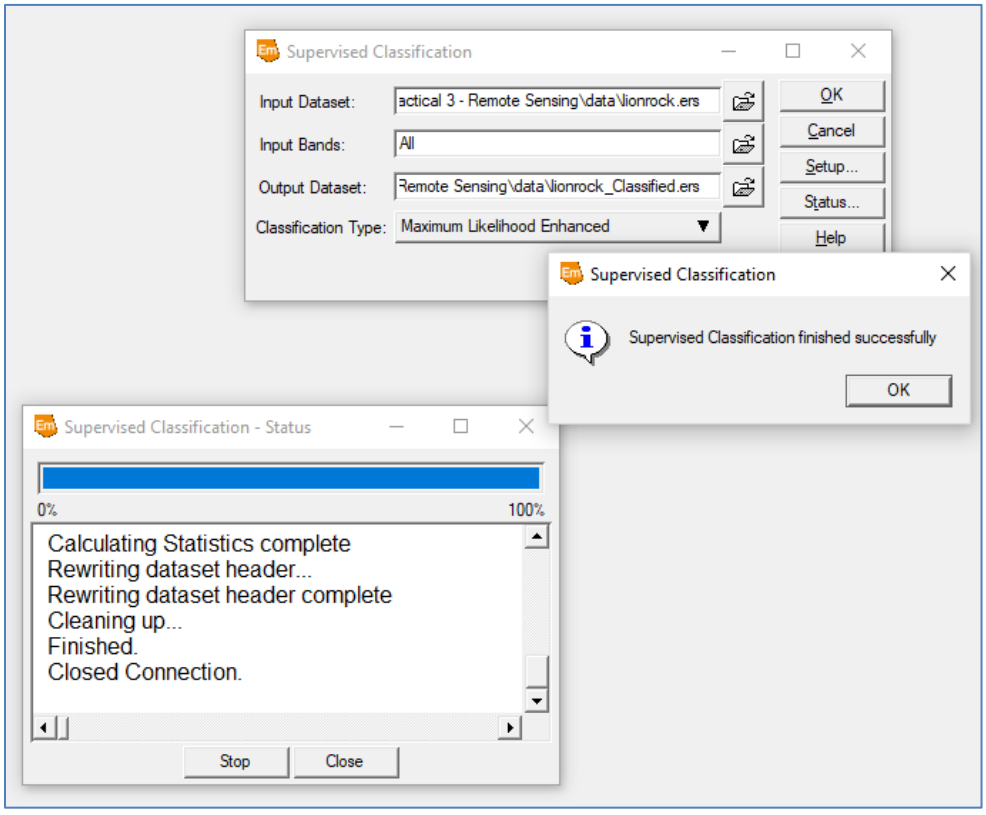
Training region statistics can now be used to perform a Supervised Classification on the entire image that assigns each pixel to one of the **"n"** feature classes you defined.

I. From the Process menu, select **Classification**, then select **Supervised Classification**.

N.P: Each group should try at least two different classifiers


Supervised Classification
Input Dataset:
actical 3 - Remote Sensing\data\lionrock.ers
Input Bands:
All
Output Dataset:
Remote Sensing\data\lionrock_Classified.ers
Classification Type:
Maximum Likelihood Enhanced
OK
Cancel
Setup...
Status...
Help


Supervised Classification Setup
Classification Type:
Maximum Likelihood Enhanced
Equal Prior Probability:
Close
Add New...
Delete
Help
Training Area Information:
Dataset
Class/Region
Bayesian Prior Prob
Gen Post Prob and Typicality
lionrock.ers Natural ground 0.25000
lionrock.ers Ocean 0.25000
lionrock.ers Building 0.25000
lionrock.ers Vege 0.25000


Supervised Classification
Input Dataset:
actical 3 - Remote Sensing\data\lionrock.ers
Input Bands:
All
Output Dataset:
Remote Sensing\data\lionrock_Classified.ers
Classification Type:
Maximum Likelihood Enhanced
OK
Cancel
Setup...
Status...
Help
Supervised Classification
Supervised Classification finished successfully
OK
Supervised Classification - Status
0%
100%
Calculating Statistics complete
Rewriting dataset header...
Rewriting dataset header complete
Cleaning up...
Finished.
Closed Connection.
Stop
Close

D) Displaying the classification

I. First close all files/algorithms, then click on the View | Algorithm for Image window button.

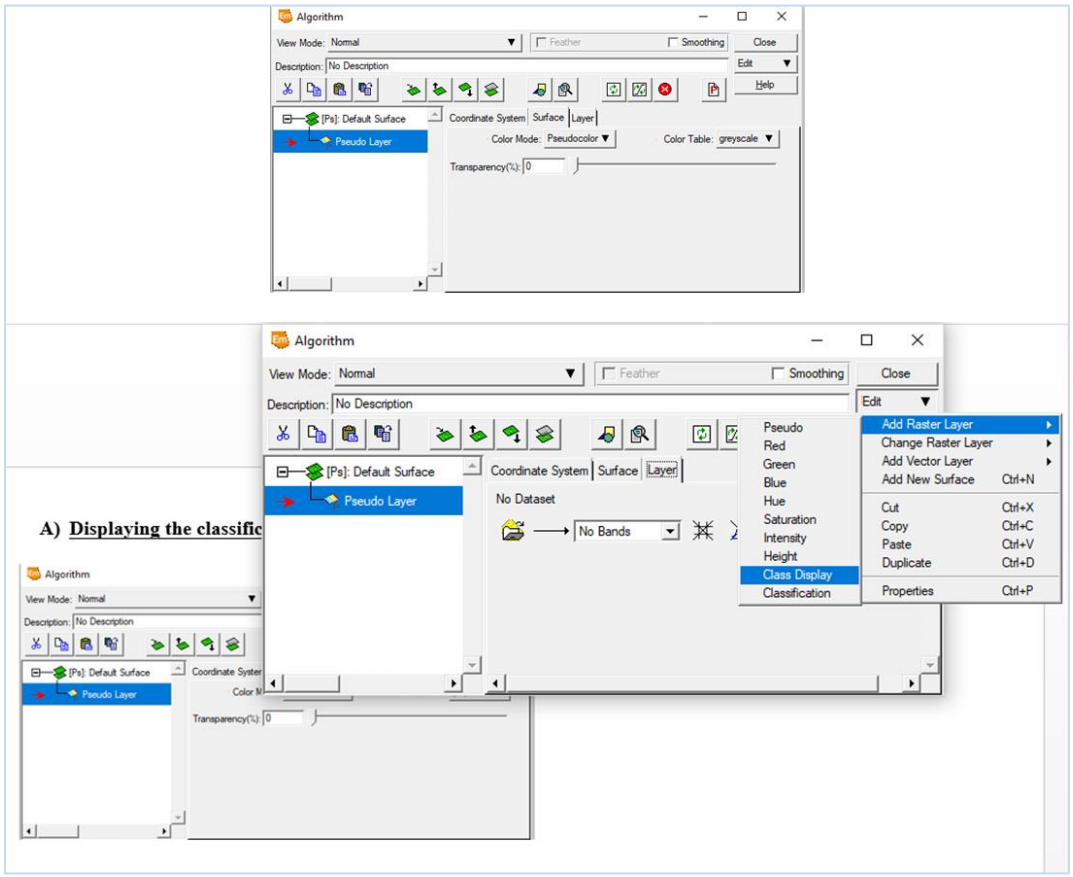
II. Click on **Surface** and choose **Colour mode as Pseudocolour and Colour table as Greyscale**. Switch back to 'Layer'.

III. Click on the **Load a Dataset** button and load your classified image (lionrock_classified.ers)

Your classified image will be displayed in grey scale, but you need to set Limits to Actual on the Transform dialogue, in order to see it!.

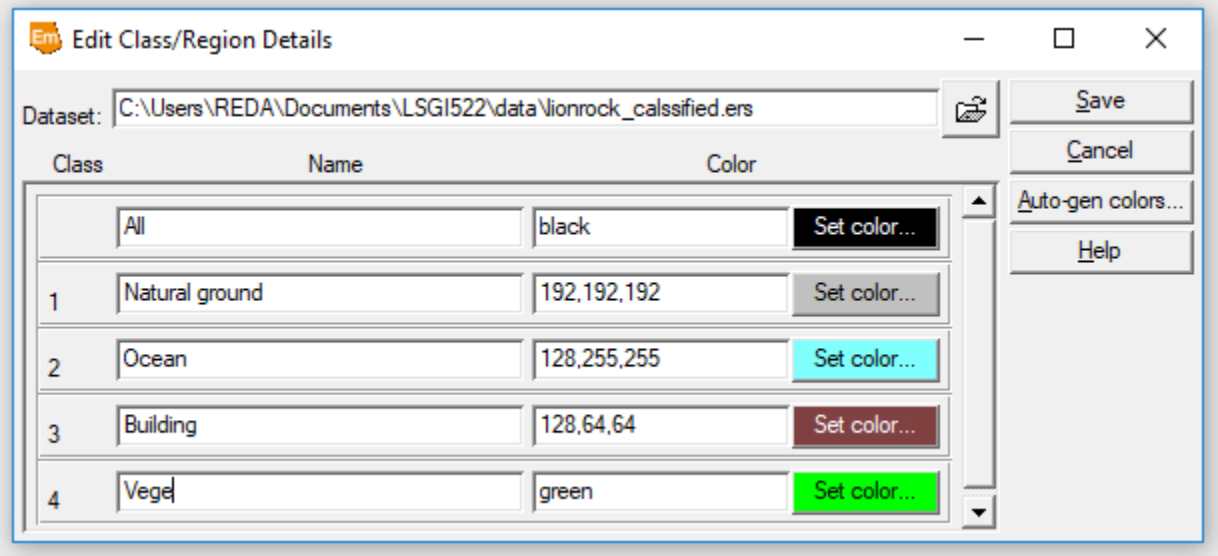
IV. Examine the classified pixel values using View, Cell values profile. Values should not exceed the number of classes you defined. Close all windows except Main Menu.

V. Open the Algorithm for image window and under **Edit, choose Add Raster Layer** and select **Class Display**.

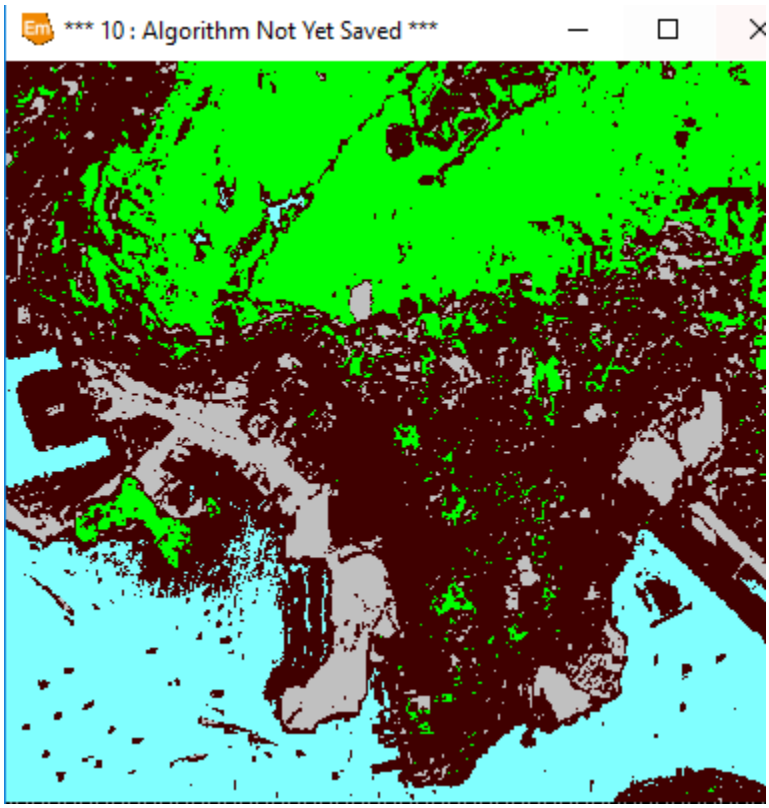


VI. Under **Load Dataset**, read in your classified image.

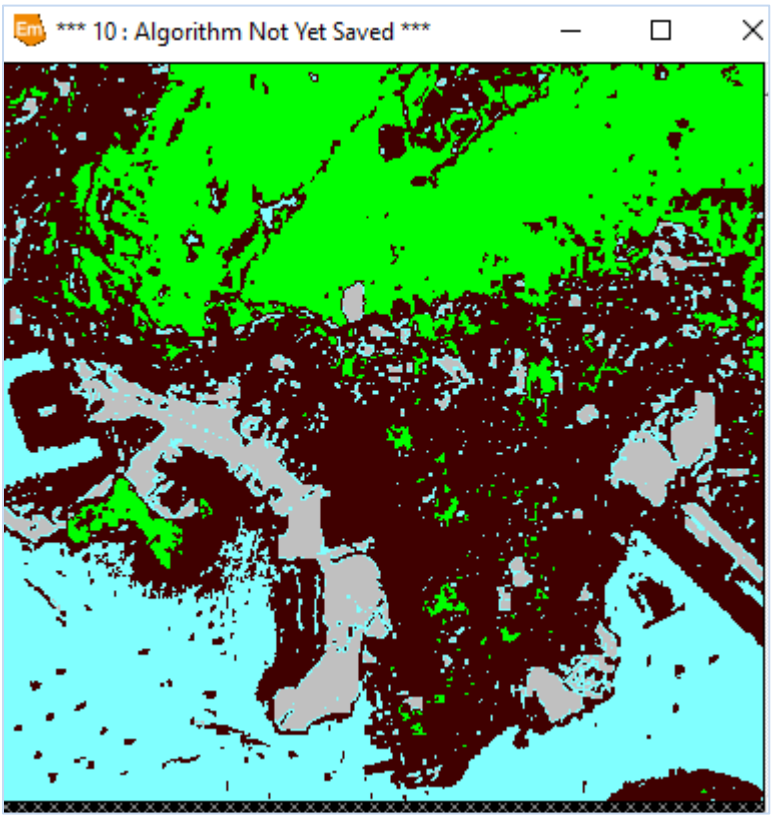
VII. On the **ErMapper main menu**, select **Edit**…**Class Region Color and Name**.



VIII. Make sure your classified image is in the file selection window, then select **colours** for each class. Save this **colour** scheme (it will save to the image header) then read your image in again under **Load Dataset**.



IX. Finally, make your classified more map-like by using a Modal (majority) filter. Click on the **Edit Filter** button on the Process Diagram.



Submission

Each student is required to submit a zipped file (named with your student number e.g., 1800xx1g.zip) that contains:

1. The algorithm files and a step by step images for the image to map registration process.
2. Images include the training samples (at least two sample for each class) and the classification results
3. A report of 20 pages maximum that accurately describes:
    a. The representative screenshots in each step
    b. The evaluation of the rectified image with the vector map on ArcMap
    c. A discussion about the results (image to map registration remarks and the effect of changing the classifier on the classification results)

The report must reflect what you have learned in this practical may be re-assessed in the final exam.

4. The zipped report should be sent to (fekry.khaliel@connect.polyu.hk) before the submission deadline.

Submission deadline: 27th October 2020

Contact: fekry.khaliel@connect.polyu.hk

Room: **ZN617**