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Remote land survey

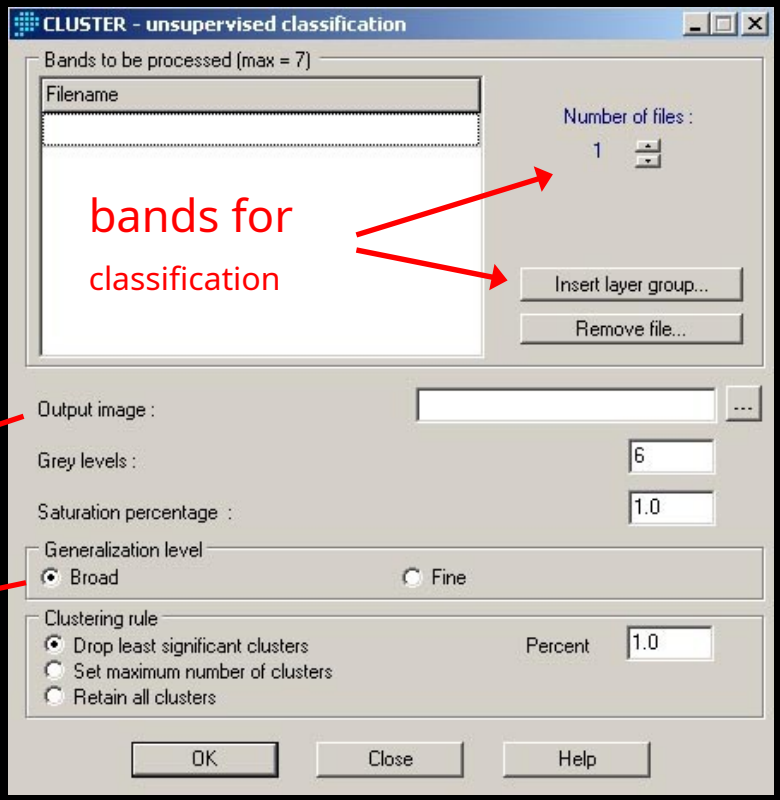
Image classification

Unguided classification in IDRISI

Module**CLUSTER**

(Image Processing / Hard Classifiers)

- uses the technique of histogram peaks



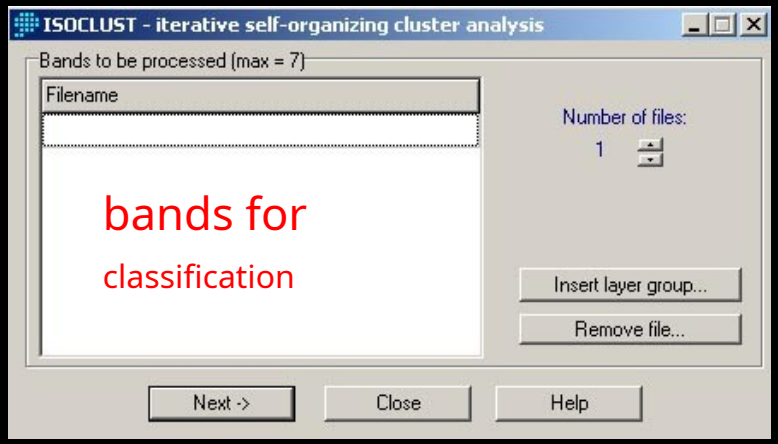
resulting image

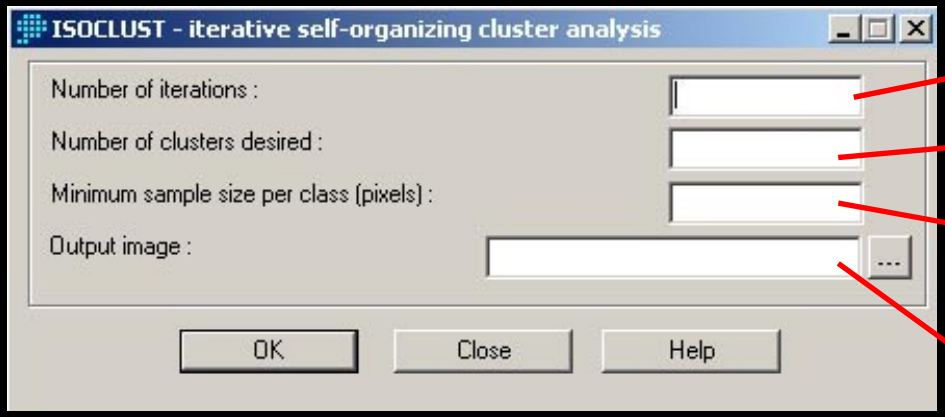
choice of algorithm:
broad (prominent peaks only) fine (all peaks)

Module**ISOCLUST**

(Image Processing / Hard Classifiers)

- ISODATA algorithm concept
- uses minimal to classify
  pixels into classes
  spectral distance





number of calculation iterations number

of clusters (classes) to create

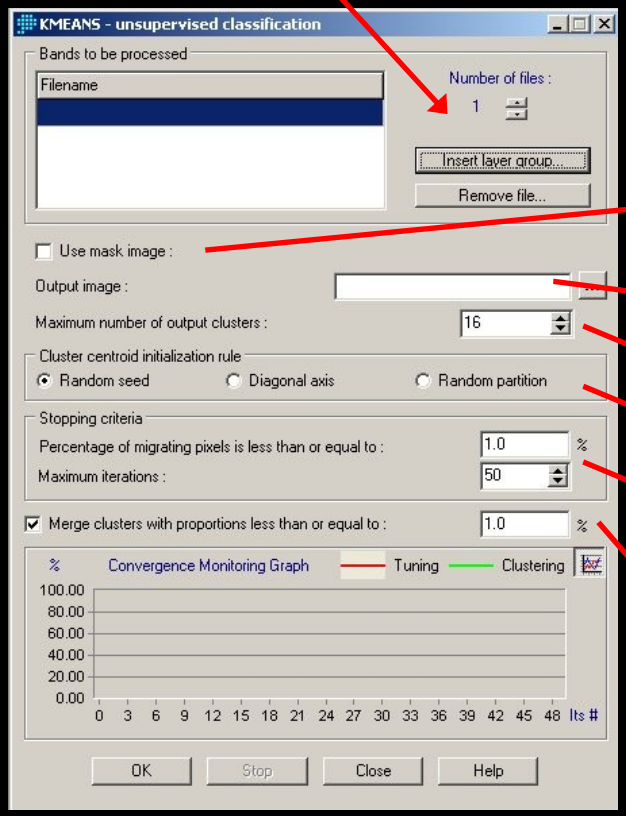
minimum number of training pixels

resulting image

Module**KMEANS**

(Image Processing / Hard Classifiers)

bands for classification



mask

- calculation of the average vectors of the clusters and their comparison with the classified pixels

resulting image

the number of clusters (clusters, classes) to create

the method of distribution of the initial clusters

process termination criteria

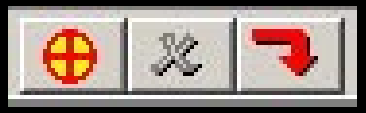
- max % of migrating pixels
- max. number of iterations

choosing to merge clusters below the threshold

Managed classification in IDRISI

- Creation of training sets

  digitizing from the screen

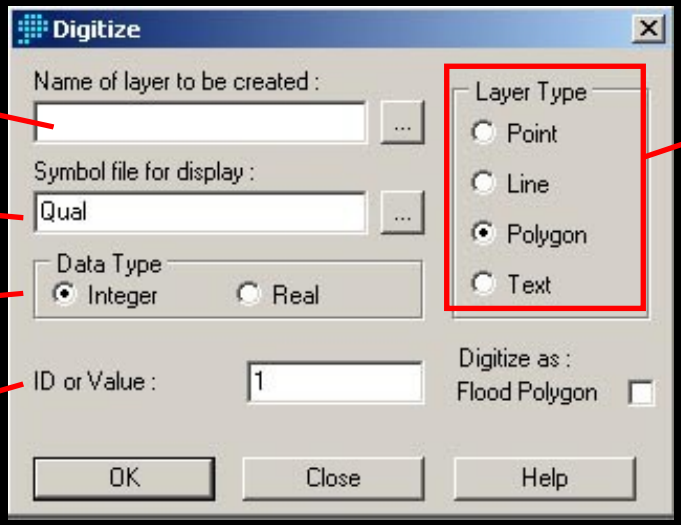


name created vector layers

display palette

data type (integer/real)

element identification value

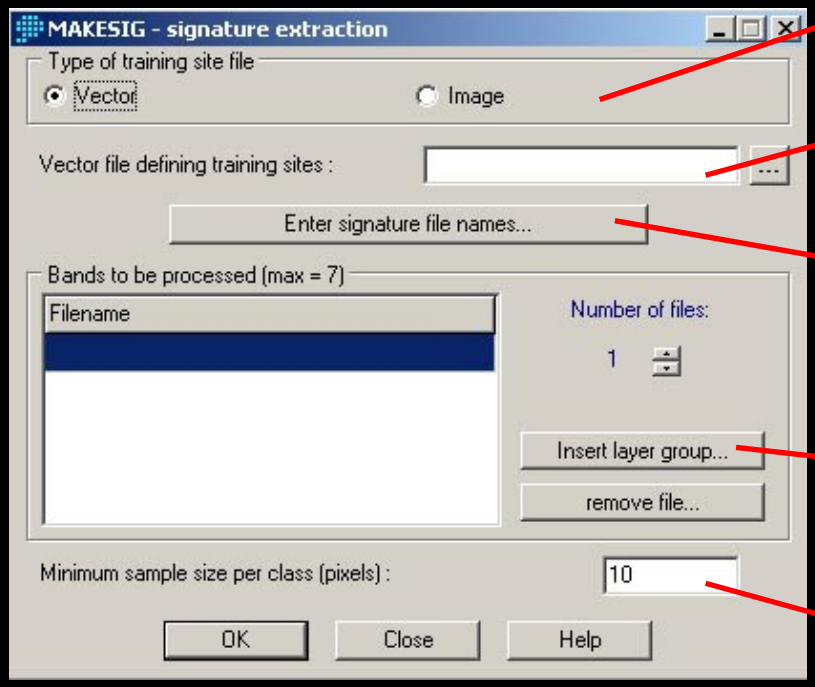


vector type

with multiple polygons for one class, all these polygons need to be assigned the same ID

- creation of signatures– module MAKESIG

  (Image Processing / Signature Development)



the type of file defining the training set and its name

naming of individual signatures (classes)

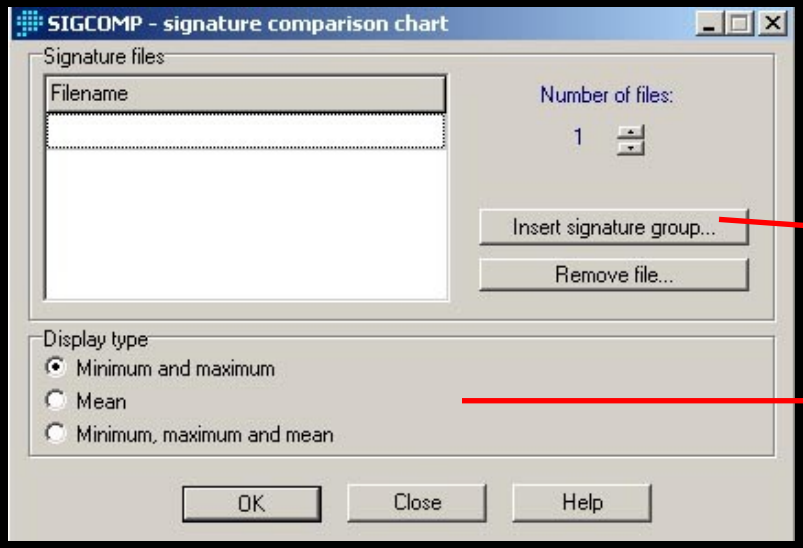
insertion of bands from which signatures are to be calculated

the minimum number of training pixels for each class

Comparison of signatures

Idris module SIGCOMP

(Image Processing / Signature Development)



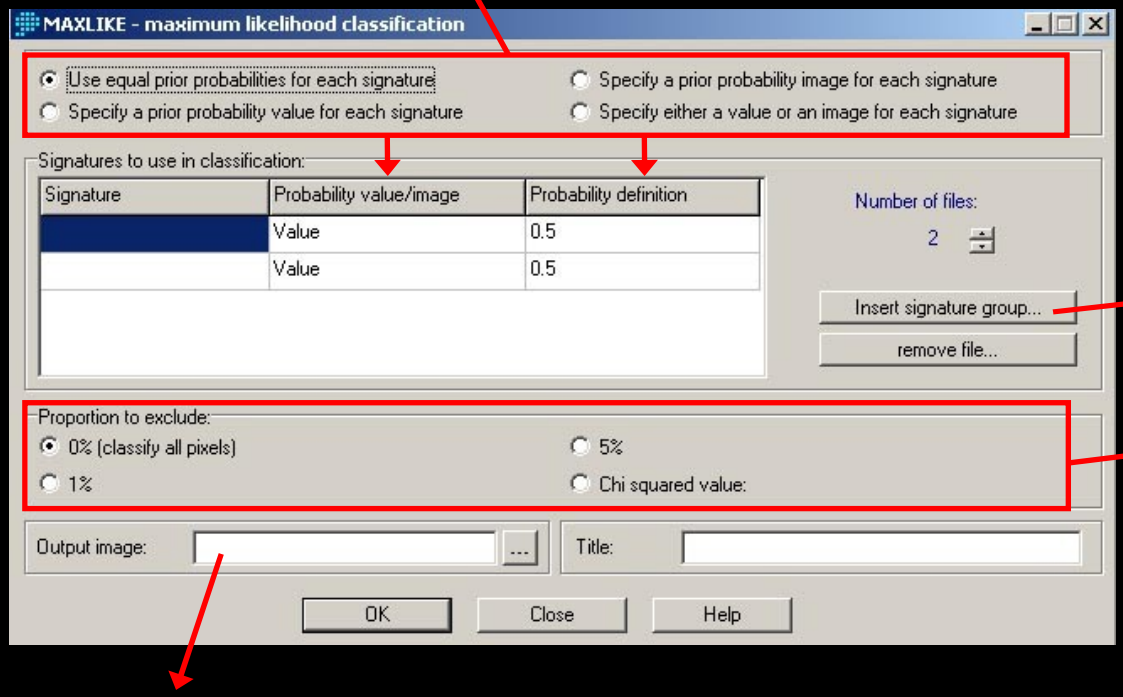
inserting a signature file

choice of graph type

Histogram of signatures - module HISTO

Idris module MAXLIKE

options for a priori setting of probabilities for each class



insertion groups signatures

determination of % pixels, which can remain not classified

the name of the resulting file

Other classification modules in IDRISI

- PIPED– rectangle classifier
- MINDIST– minimum distance classifier

- Soft classifiers
  - they do not create a definitive classification of pixels into classes
  - the result is several images (according to the number of signatures) showing the probabilities of each pixel belonging to each class
  - Idrisi modules:BAYCLASS,BELCLASS

Literature

- Eastman, JR 2009: Idrisi TAIGA Guide to GIS and Image Processing, Clark Labs, Worcester, MA

Remote land survey

Classification accuracy

Rating classification

- Error matrix– compares the relationship between reference data and classification results for all classes

- Kappa coefficient– compares the resulting classification with the classification created by a purely random process of assigning pixels to classes

  a value of 0.9 means that we have avoided 90% of the errors that would have been caused by random assignment

Error matrix

- errors of omission(omission error) - "forest" pixels are classified elsewhere (columns)

- errors from incorrect classification(commission error) - pixels representing a different surface (lines) are included in the "forest" class

- accuracy from the user's point of view(user's accuracy) - the probability with which a pixel assigned to a certain class actually represents it

- accuracy from the point of view of the processor(producer's accuracy)

  = number of correct ears. pixels / number of pixels used for testing the given class

Calculation of the error matrix

- average accuracy

  classification of all classes:

  110+90+55+30 / 301 = 95%

		Reference data				
Classification	class	forest	field	water	houses	Σ
	forest	110	0	5	0	115
	field	10	90	0	0	100
	water	0	0	55	0	55
	houses	1	0	0	30	31
	Σ	121	90	60	30	301

Error of omission

- =11/121= 9%

- sum of pixels in the column off the main diagonal / number of reference data pixels

		Reference data				
Classification	class	forest	field	water	houses	Σ
	forest	110	0	5	0	115
	field	**10**	90	0	0	100
	water	0	0	55	0	55
	houses	**1**	0	0	30	31
	Σ	**121**	90	60	30	301

Misclassification error

- =5/121= 4%

- sum of pixels in the row outside the main diagonal / number of reference data pixels

		Reference data				
Classification	class	forest	field	water	houses	Σ
	forest	110	0	**5**	0	115
	field	10	90	0	0	100
	water	0	0	55	0	55
	houses	1	0	0	30	31
	Σ	**121**	90	60	30	301

Accuracy from the user's point of view

- =110/115= 96%

- number of correctly classified pixels / total number of pixels assigned to the class

		Reference data				
Classification	class	forest	field	water	houses	Σ
	forest	**110**	0	5	0	**115**
	field	10	90	0	0	100
	water	0	0	55	0	55
	houses	1	0	0	30	31
	Σ	121	90	60	30	301

Accuracy from the point of view of the processor

- =110/121= 91%
- number of correct spikes. pixels / number of pixels used for testing the given class

	Reference data				
Classification	class	forest	field	water	houses	Σ
	forest	**110**	0	5	0	115
	field	10	90	0	0	100
	water	0	0	55	0	55
	houses	1	0	0	30	31
	Σ	**121**	90	60	30	301

Literature

- Campbell, JB 1996: Introduction to Remote Sensing, Taylor and Francis, London
- Dobrovolný, P. 1998: Remote sensing of the Earth, digital image processing, Masaryk University, Brno