Multispectral Classification

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Supervised Classification

- A sufficient number of pixels for each surface class must be delineated in order to ensure that a representative sample is obtained for each class.
- The training areas for any one class should not be concentrated in one part of the image but should encompass the entire scene. The histograms for training areas should be unimodal and confirm to a normal distribution (Campbell 1996)
- The training areas should be as separate and uniquely representative as possible, otherwise a substantial Overlap between classes may occur and pixels will be misclassified.
- Some times it may not be possible to ensure that classes are discrete because they may have similar reflectance characteristics in the bands that are being classified. In such a situation it may be preferable to merge the training sites and consider them as a single class.
- It may be preferable to isolate an individual class and this is simply achieved by assigning a value of zero to all other classes.
- Only three bands were used in the example though in practice more bands are usually employed.

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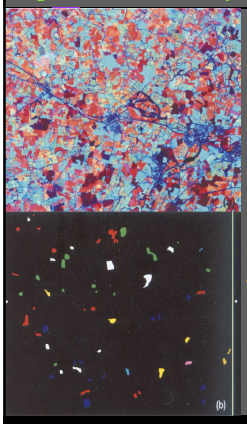
Supervised Classification



FCC

R-TM4
G-TM5
B-TM3

Training areas for supervised classification

(background image blacked out)

Colour	Land class	% of image
Pink	water	0.07
Pale blue	oil seed rape	0.12
Green	late crops	30.21
White	bare soil	12.4
Yellow	urban/industry	7.2
Blue	forest/early crops	8.54
Red	pasture	18.63
Black	unclassified	22.83

	Mean	Standard deviation
Training area: water		
TM 3	18.6	1.5
TM 4	13.5	4.7
TM 5	8.9	4.1
Training area: oil seed rape		
TM 3	62	7.4
TM 4	150	2.6
TM 4	67	2.7
Training area: late crops		
TM 3	24.7	1.3
TM 4	123.2	8.5
TM 5	86.3	3.9
Training area: bare soil		
TM 3	53.6	11.7
TM 4	82.3	14.2
TM 5	119.5	13.1
Training area: urban/industry		
TM 3	35.4	4.9
TM 4	58.8	11.3
TM 5	65.5	7.4
Training area: forest/early crops		
TM 3	20.4	1.5
TM 4	92.6	9.3
TM 5	47.9	7.1
Training area: pasture		
TM 3	20.7	1.1
TM 4	142	7.6
TM 5	68	6.2

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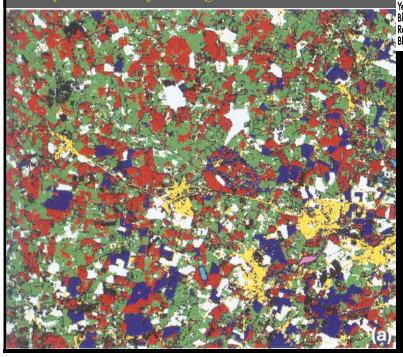
Supervised Classification

Supervised classification (MLE) representation: Density sliced classified image



Look-up Table (LUT)

Colour	Land class	% of image
Pink	water	0.07
Pale blue	oil seed rape	0.12
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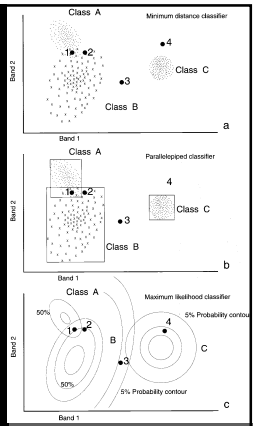
Supervised Classification Algorithms

- Minimum Distance to Mean (nearest neighbour) Classifier
  - Every pixel is assigned a class based on its distance from the mean of each class
- Parallelepiped (or box) Classifier
  - Size of the box is decided based on SD
  - Pixels outside the box are not assigned to any class
  - Pixels falling in more than one box may be left unclassified
- Maximum Likelihood Classifier
  - Assumes a normal distribution for the training areas
  - Probability contours are created around each training area and a pixel assigned to a class depending upon the value of the probability contours that encompass it
  - The maximum likelihood classifier is generally considered to be the most powerful but is also considered the most computer intensive
  - Using this algorithm, pixel 1 belongs to class A, pixel 2 to class B and pixel 4 to class C. Pixel 3 has a higher probability of belonging to class B than class C.



Representation of Classification Algorithms

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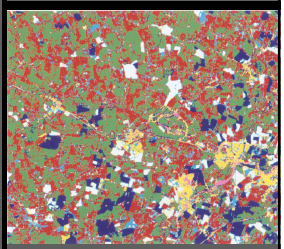
Unsupervised Classification

- Unsupervised classification is a technique that groups the pixels into clusters based upon the distribution of the digital numbers in the image.
- An unsupervised classification program, such as ISODATA clustering, requires following
  - Maximum number of classes
  - Maximum number of iterations
  - Threshold value
- An unsupervised classification operates in an iterative fashion.
- Initially it assigns arbitrary means to the classes and allocates each pixel in the image to the class mean to which it is closest.
- New class means are then calculated and each pixel is then again compared to the new class means.
- This procedure is repeated over number of iterations.
- Pixels move between clusters following each iteration until threshold is reached.
- A threshold of 0.98 means that the program terminates when less than 2% of the pixels move between adjacent iterations.
- The classes produced from unsupervised classification are spectral classes and may not correlate exactly with 'information classes' as determined by supervised classification.



Density sliced image using unsupervised classification process

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