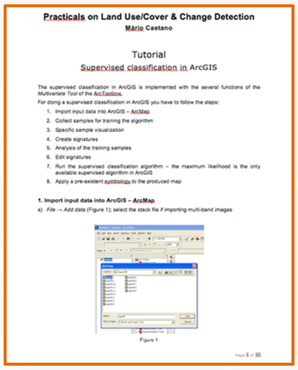
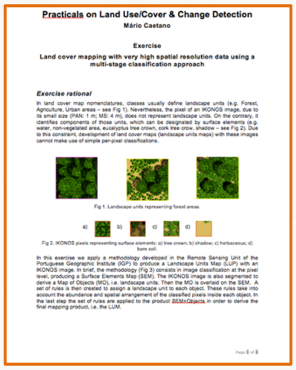
Practicals on Land Use/Cover & Change Detection D4P1b

Mário Caetano


Practicals on Land Use/Cover & Change Detection
Mário Caetano
Tutorial
Basics for image visualization and processing in ArcGIS


Practicals on Land Use/Cover & Change Detection
Mário Caetano
Tutorial
Supervised classification in ArcGIS


Practicals on Land Use/Cover & Change Detection
Mário Caetano
Exercise
Land cover mapping with very high spatial resolution data using a multi-stage classification approach

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Code	Class name	Description
1	Urban / Bare soil	Areas with < 10% trees and with > 70% of bare soil
2	Sparse vegetation	Areas with < 10% trees and with 30% - 70% of bare soil
3	Cropland	Areas with < 10% trees and with > 70% of herbaceous vegetation
4	Other natural vegetation	Areas with < 10% trees and that are not Urban / Bare soil, Sparse vegetation and Cropland
5	Broadleaf forest	Areas with >30% trees in which >70% are of the broadleaf type
6	Needleaf forest	Areas with >30% trees in which >70% are of the needleleaf type
7	Mixed forest	Areas with >30% trees in which both broadleaf and needleleaf types are between 30% - 70%
8	Agro-forestry	Areas with 10% - 30% trees and with > 50% of herbaceous vegetation
9	Transitional-woodland forest	Areas with 10% - 30% trees and with < 50% of herbaceous vegetation
10	Water	Areas that are in their major part constituted by water

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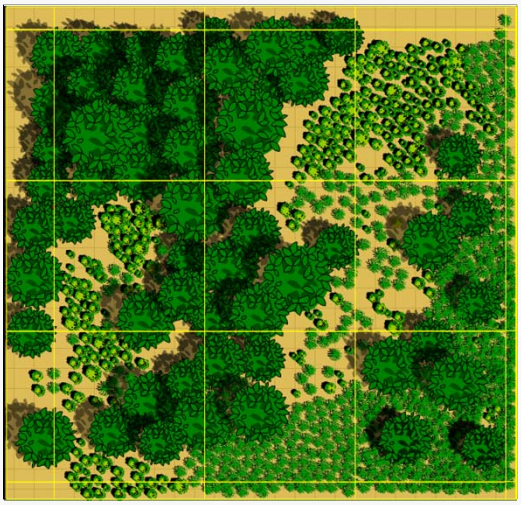
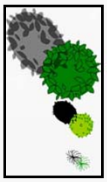
Map of landscape units





Tree

Shrub

Herbaceous veg.

Pixel 30 m (e.g. Landsat)

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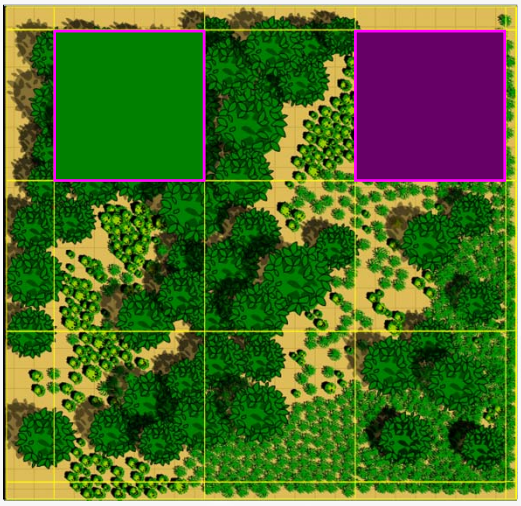
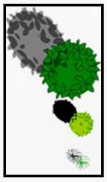


Map of landscape units

Forest

Shrubland



Tree

Shrub

Herbaceous veg.

Pixel 30 m (e.g. Landsat)

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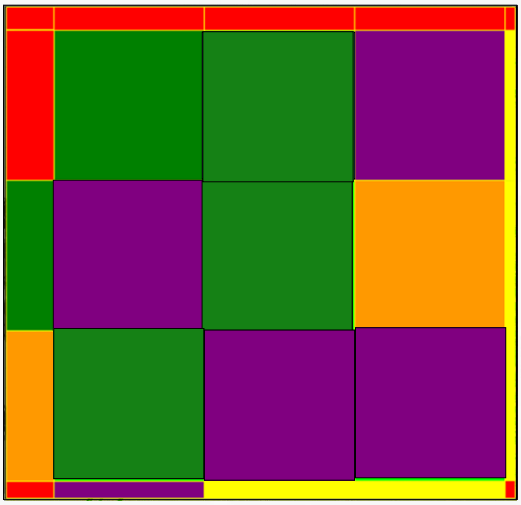
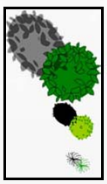


Map of landscape units

Forest

Shrubland



Tree

Shrub

Herbaceous veg.

Pixel 30 m (e.g. Landsat)

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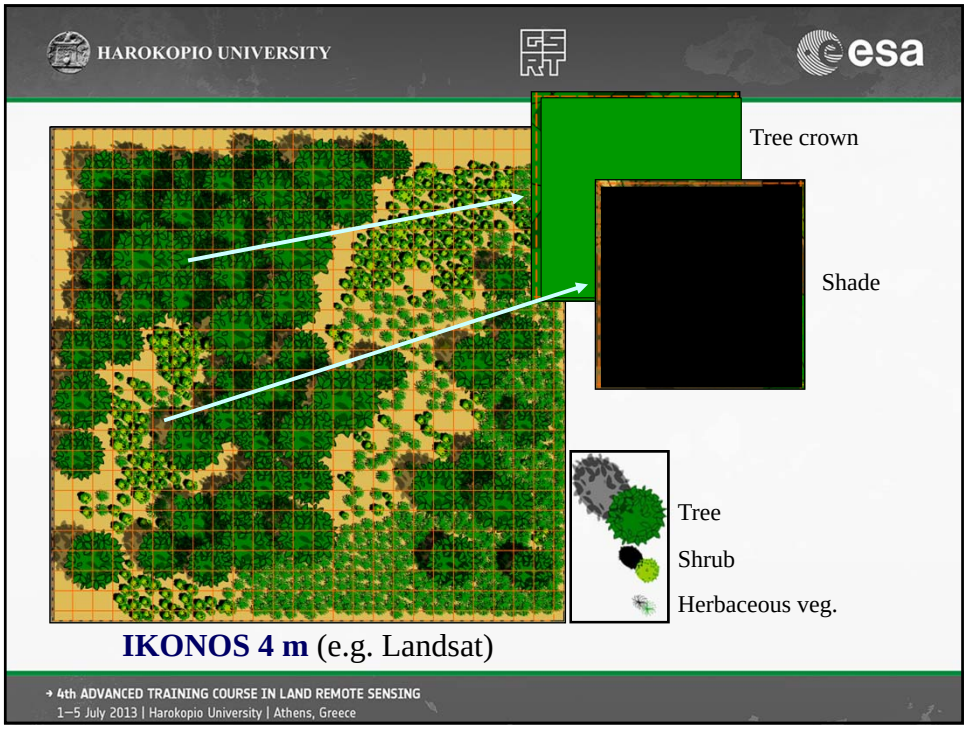
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esa
Tree crown
Shade
Tree
Shrub
Herbaceous veg.
IKONOS 4 m (e.g. Landsat)
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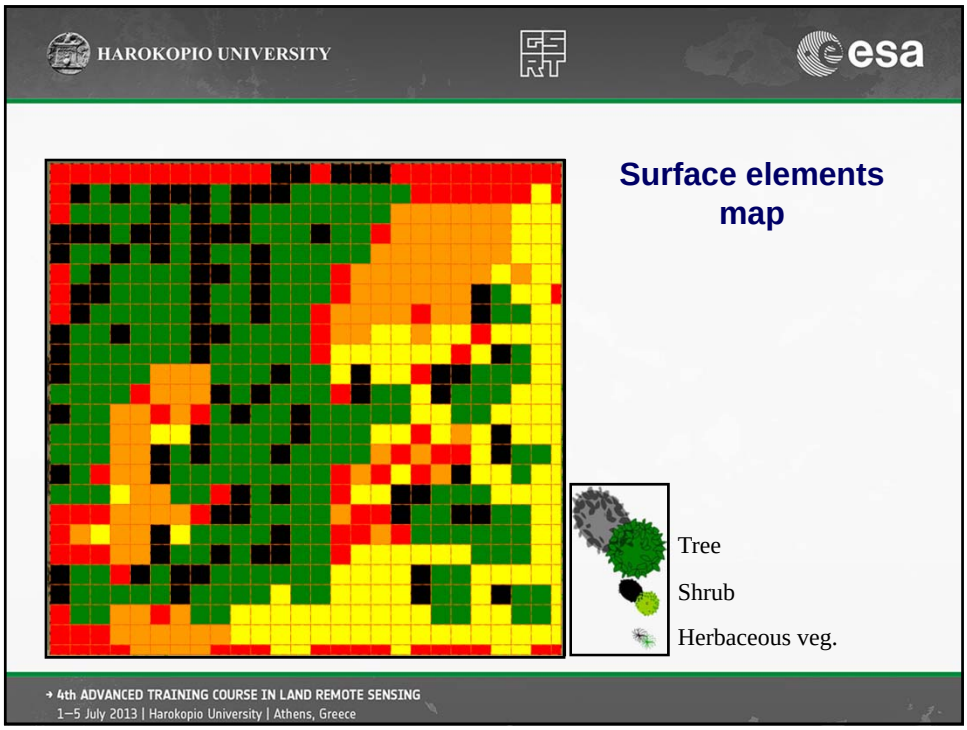
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esa
Surface elements map
Tree
Shrub
Herbaceous veg.
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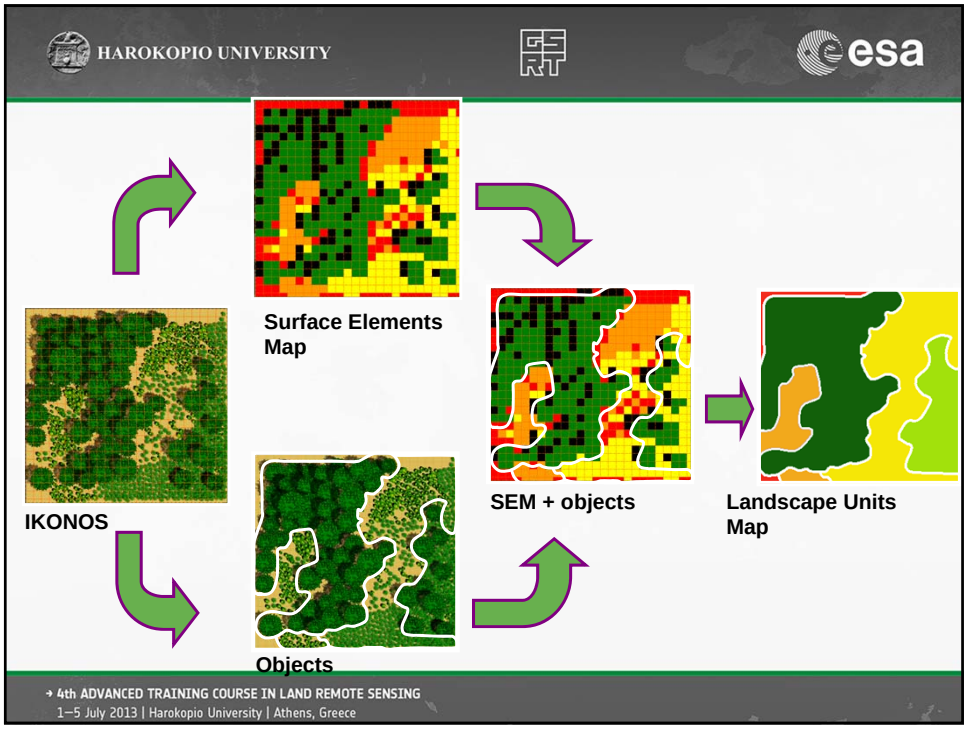
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esa
Surface Elements Map
IKONOS
Objects
SEM + objects
Landscape Units Map
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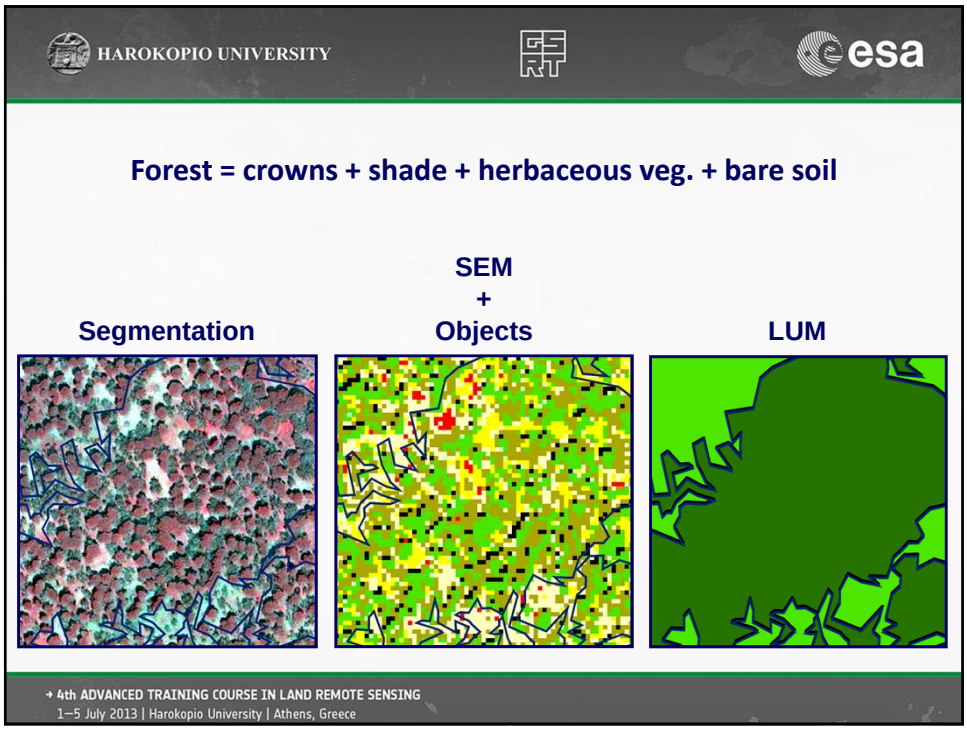
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esa
Forest = crowns + shade + herbaceous veg. + bare soil
Segmentation
SEM + Objects
LUM
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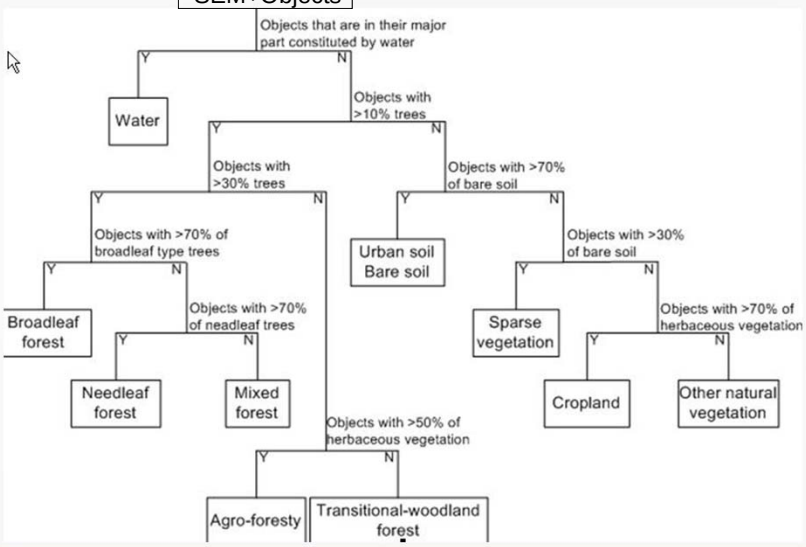
esa

SEM+Objects



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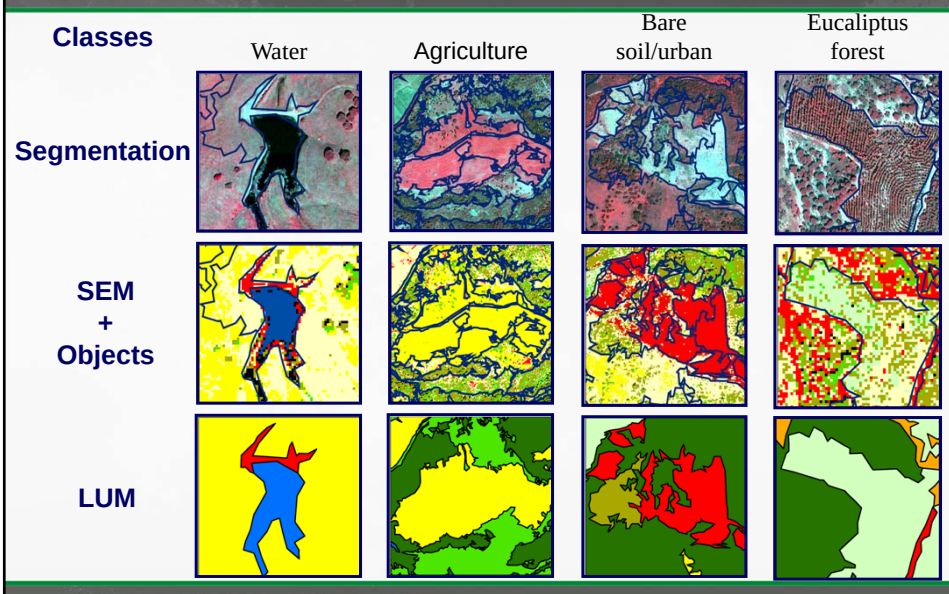
esa



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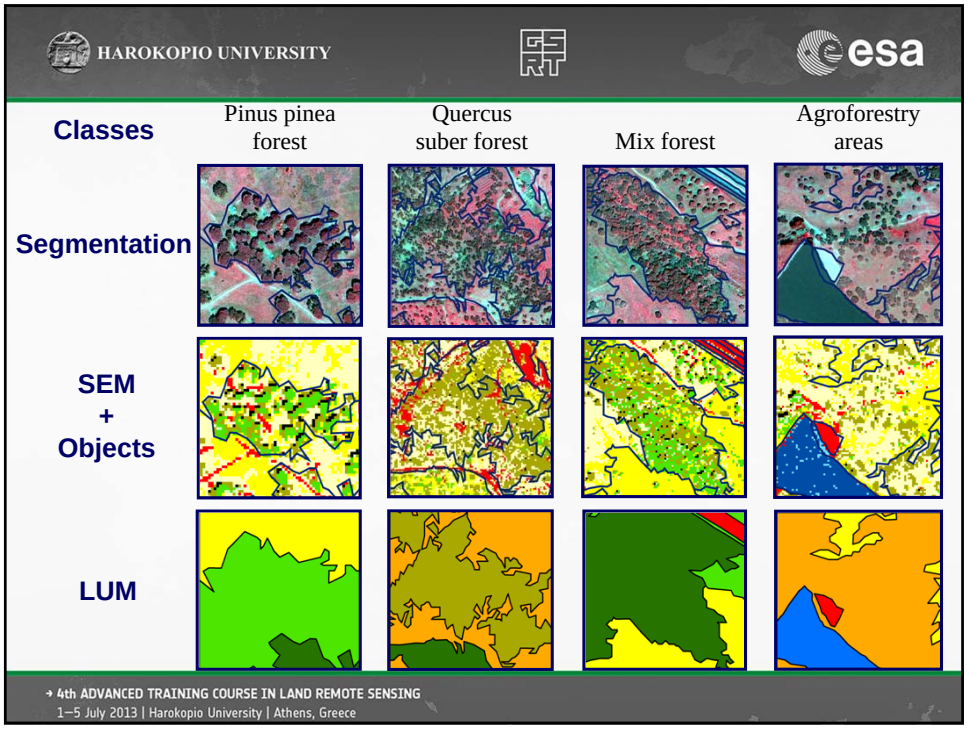
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esa
Classes
Pinus pinea forest
Quercus suber forest
Mix forest
Agroforestry areas
Segmentation
SEM + Objects
LUM
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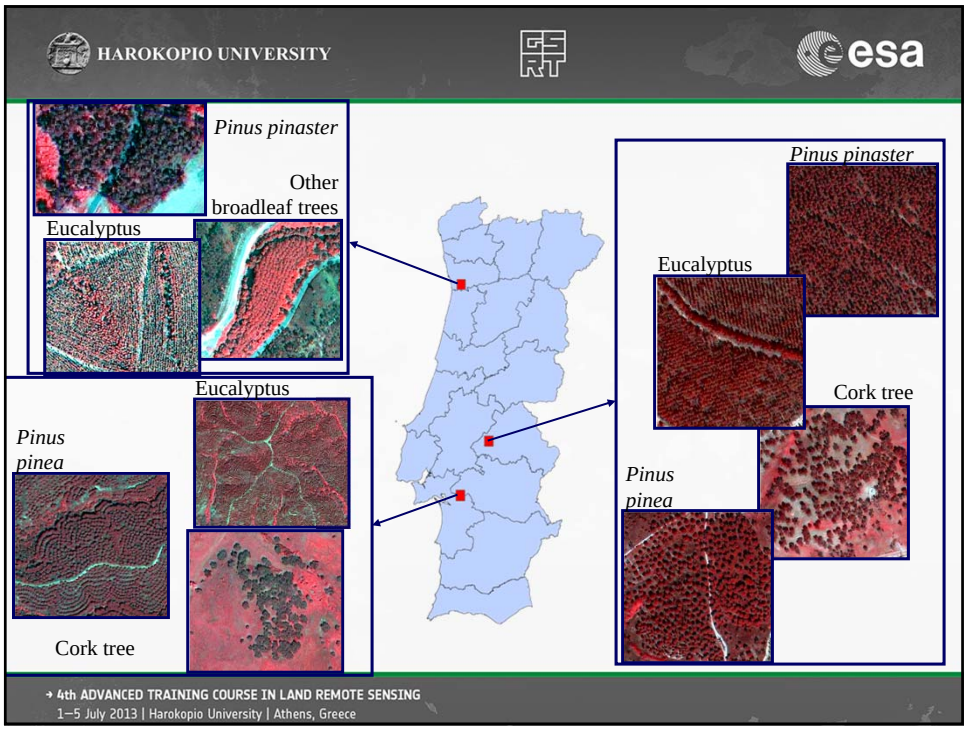
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esa
Pinus pinaster
Other broadleaf trees
Eucalyptus
Eucalyptus
Pinus pinea
Cork tree
Pinus pinaster
Eucalyptus
Cork tree
Pinus pinea
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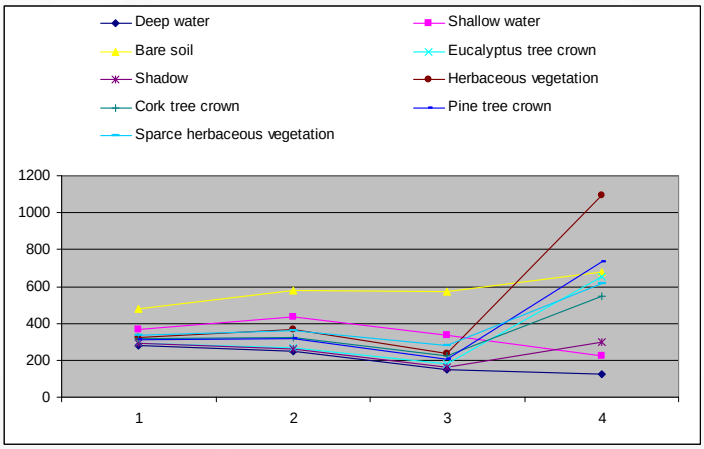
Spectral class means IKONOS



The mixed pixel problem

The problem of mixed pixels exist in coarse and fine resolution images:

In course resolution images the mixed pixels are mainly due to co-existence in the same pixel of different classes.

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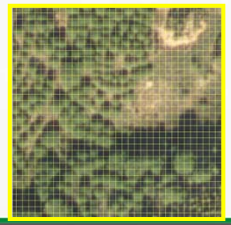
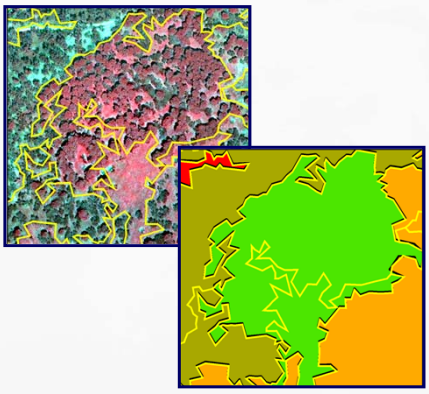
In fine resolution images the mixed pixels are mainly due to co-existence in the same pixel of different components (e.g., houses, trees).

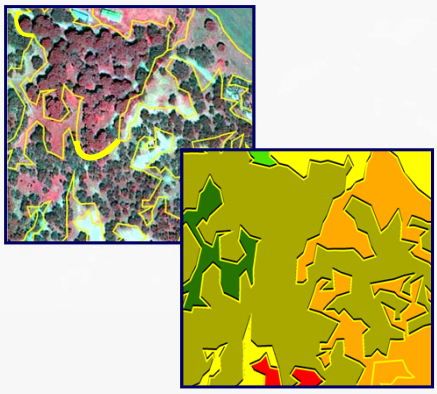


IKONOS

Meaningful segmentation



Meaningless segmentation



Thematic information extraction from satellite images

1. Definition of the mapping approach *
2. Geographical stratification
3. Image segmentation
4. Feature identification and selection *
5. Classification *
6. Ancillary data integration
7. Post-classification processing
8. Accuracy assessment *

* mandatory

Sample ID (ID)	Surface element – your decision	Surface element – our decision
12		7 - Cork tree crown
13		3 - Bare soil
104		9 - Sparse herbaceous vegetation
151		5 - Shadow
254		1 - Deep water
614		8 - Pine tree crown
630		4 - Eucalyptus crown
713		6 - Herbaceous vegetation

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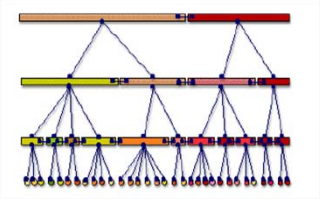
3. Image segmentation

A type of segmentation that is very common is the **multi-resolution segmentation**, because of its ability to deal with the range of scales within a single image.



Super-objects

Sub-objects

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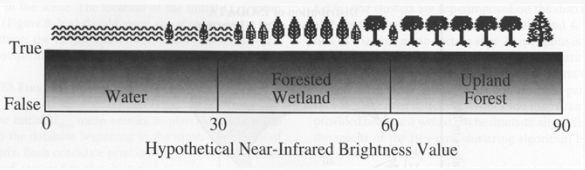
6. Classification

Hard classification



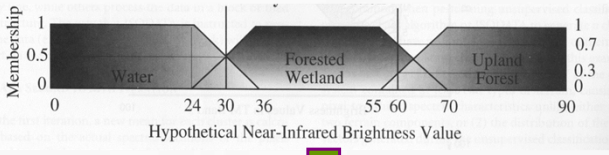
Decision rules

0 – 30 -> Water

30 - 60 -> Forest wetland

60 - 90 -> Upland forest

Fuzzy classification



Decision rules are defined as membership functions for each class.

Membership functions allocates to each pixel a real value between 0 and 1, i.e. membership grade.

But, how can we represent the sub-pixel information?

Source: Jensen (1996)