Spatial Indicators for European Nature Conservation
SPIN - Spatial Indicators for European Nature Conservation
Habitat mapping approaches
Hierarchical scale concept and approved EO data sets

Adressed scale levels

Regional scale
1:200 000 – 1:50.000
HR EO-data ~ 30m res.
Landsat TM/ETM, SPOT4...

Subregional scale level
1:50 000 – 1:25 000
HR/VHR EO data ~ 30-10m res.
Landsat TM/ETM ASTER,
SPOT4...

Local scale level
1:10 000 bis 1:5 000
VHR EO data < 5m res.
IKONOS, QUICKBIRD, HRSC aerial photos

Field investigation
<1:1.000
Advanced Classification Approaches

- Knowledge based classification
- Object based classification
- Case based reasoning
- Kernel based classification

Integration of:
- Expert knowledge
- Homogenous landscape objects instead of pixels
- Context or neighbourhood information
- Ancillary data sets

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### Applied classification approaches

<table>
<thead>
<tr>
<th>Classification Methods</th>
<th>Scale issues / Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Based Classification</td>
<td></td>
</tr>
<tr>
<td>French test site</td>
<td>Sub-regional scale (1: 25 000)</td>
</tr>
<tr>
<td>Greek test site</td>
<td>Local and sub-regional scale (from 1: 5 000 to 1: 50 000)</td>
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<tr>
<td>Cased Based Reasoning</td>
<td></td>
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<tr>
<td>Estonian test site</td>
<td>Local scale (1: 10 000)</td>
</tr>
<tr>
<td>Object Based Approach</td>
<td></td>
</tr>
<tr>
<td>Wenger Moor Austrian test site</td>
<td>Local scale (resolution = 0.37m)</td>
</tr>
<tr>
<td>Schleswig-Holstein German test site</td>
<td>Between regional scale (from 1: 100 000 to 1: 200 000, sub-regional scale (from 1: 50 000 to 1: 25 000) and local scale (1: 10 000)</td>
</tr>
<tr>
<td>English test site</td>
<td>Local scale (1: 2 000)</td>
</tr>
<tr>
<td>Kernel Classification</td>
<td></td>
</tr>
<tr>
<td>Greek test site</td>
<td>Local scale (1: 10 000)</td>
</tr>
<tr>
<td>English test site</td>
<td>Local scale (1: 1 500)</td>
</tr>
<tr>
<td>Slovenian test site</td>
<td>Local scale (1: 10 000)</td>
</tr>
<tr>
<td>French test site</td>
<td>Local scale (1: 25 000) – Not operational</td>
</tr>
</tbody>
</table>
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Classification map 1990 EUNIS I
EUNIS I Habitats
- Agricultural habitats
- Coastal Ume and sand
- Constructed habitats
- Grassland habitats
- Inland surface water habitats
- Marine Water habitats
- Mine, bog and fen
- Unvegetated habitats
- Woodland habitats

Classification map 2001 EUNIS I
EUNIS I Habitats
- Agricultural habitats
- Coastal Ume and sand
- Constructed habitats
- Grassland habitats
- Inland surface water habitats
- Marine Water habitats
- Mine, bog and fen
- Unvegetated habitats
- Woodland habitats

Classification map 1990 EUNIS extended
EUNIS extended
- Agricultural habitats
- Coastal (dune and sand)
- Coniferous
- Constructed
- Deciduous
- Industrial sites
- Infrastructure
- Inland surface water habitats
- Inland unvegetated habitats
- Lithal sediments (saltmarsh)
- Marine habitats
- Meic Grassland (meadows, pasture
- Meic grassland (unmanaged/rewet)
- Meadow
- Marsh
- Mixed use
- Sedge and reed beds / Swamp wood
- Urban vegetation
- Valley mine/ Transition mines
- Waste deposits

Classification map 2001 EUNIS extended
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EUNIS
- D5.2
- E1.5
- E2.2
- E3.4
- F3.2
- F9.2
- G1
- G3
- G5.6
- J

METADATA:
Map type: Enhanced Kernel Based Reclassification Land Cover Map
Nomenclature: EUNIS
Satellite Data: IKONOS-2, Pan-1m, MS-4m, 14/10/2001
Geodata: Ground Truth Dataset (aerial stereo-interpretation), Digital Elevation Model
demoprodct_WP3500.doc

WP 3500: Demo Map Product
Very High Resolution Classification
EUNIS Nomenclature

Enhanced Kernel Based Reclassification
Pivka Valley at Postojna Test Area
Fall 2001

Scale 1: 25000
State Coordinate System D48
Gauss - Krueger Projection

Slovenian Forestry Institute

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Comparsion of monitoring techniques

HRSC 2001  semi-automated airborne (4m)

BNTK 1990  visual interpretation of CIR

field mapping

FFH 2001

Classes
- Bog Molina Group
- Reeds
- Bog Swamp
- Wet Grassland
- Bog Woods and shrubs
- Managed Grassland
- Extensive Grassland
- Tree Lines and Groups
- Forest
- Arable
- Water
- Urban Green
<table>
<thead>
<tr>
<th>Criteria/Task</th>
<th>Standard mapping approaches</th>
<th>Remote Sensing based classification approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Field mapping</td>
<td>VHR spatial res. &lt; 5m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Object oriented</td>
</tr>
<tr>
<td>Geometric accuracy</td>
<td>+</td>
<td>++/+-</td>
</tr>
<tr>
<td>Spatial resolution</td>
<td>++</td>
<td>++/+</td>
</tr>
<tr>
<td>Spectral/-content resolution</td>
<td>++</td>
<td>++/0</td>
</tr>
<tr>
<td>Temporal resolution</td>
<td>--</td>
<td>+</td>
</tr>
<tr>
<td>Further digital processing</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Area covered</td>
<td>--</td>
<td>-</td>
</tr>
<tr>
<td>Methodology development</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Costs</td>
<td>--</td>
<td>0</td>
</tr>
<tr>
<td>Monitoring of species</td>
<td>++</td>
<td>0</td>
</tr>
<tr>
<td>Monitoring of habitats</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Monitoring of large areas</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Aptness for landscape planning at scales $\leq 1:5000$</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Aptness for landscape planning at scales $\leq 1:25000$</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Aptness for landscape planning at scales $\leq 1:100,000$</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
PCA Change Detection: Integration in ERDAS Imagine

PC 1: stable image features

PC 2: change, no change + noise

Histogram PC1

Histogram PC2

Input File Date 1 (*.img)

test1.img

Input File Date 2 (*.img)

test2.img

Process Layer List 1

1,2,3,4,5,6

Process Layer List 2

1,2,3,4,5,6

Index output (*.img)

outputfuzzyindex.img

Index Stack output (*.img)

outputindexstack.img

Fuzzy Rule

AND

OR

XOR

Create Index Stack

OK

Cancel

Subset Definition:

Intersection (default)

From Inquire Box

UL X: 3434948.00

UL Y: 6070969.00

LR X: 3512138.00

LR Y: 6046179.00

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General Change Probability
- High general
- Specific WetDiff Change Prob.
  - very High vH
  - High H
  - medium High mH

Class to Class Change
Grassland TO
- Mire, bog and fen
- Agricultural
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- Spin - Spin - Spin - Spin

Year of water retention realisation:
- 1980
- 1982/83
- 1983/84
- 1995/96
- 2001

Change detection analysis:
- Proliferation of wetness
- Minor increase of wetness
- Bog - no vegetation change
- Grassland to fallow land
- Water - no vegetation change
- Mowed grassland - no vegetation change

Verein für Naturschutz und Landschaftspflege
- Mittelmas Nordhessland e.V. (Rabeler) 2002
Table 4. Comparison of three change detection methods: vegetation maps in field campaigns, change detection analysis with Landsat data and interpretation of CIR-aerial photographs

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Change analysis of vegetation maps&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Change detection method by Weiers, Wissen, Bock, and Schade (2001) applied to Landsat data</th>
<th>Visual interpretation of CIR-aerial photographs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position accuracy</td>
<td>0</td>
<td>0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>+</td>
</tr>
<tr>
<td>Geometric resolution</td>
<td>+</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>Radiometric resolution</td>
<td>–</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Temporal resolution</td>
<td>–</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>Covering of the monitoring area</td>
<td>–</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Detecting of vegetation changes</td>
<td>+</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>Detecting of other changes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Water content in soils/plants</td>
<td>0&lt;sup&gt;c&lt;/sup&gt;</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>2) Mowing</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Digital analysis, editing</td>
<td>–</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Temporal effort&lt;sup&gt;d&lt;/sup&gt;</td>
<td>–</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Financial effort&lt;sup&gt;d&lt;/sup&gt;</td>
<td>–</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Best application for:</td>
<td>Monitoring exact changes of single plants or composite of plant communities in small areas</td>
<td>Detecting of large area changes, changes of water content in soils/plants or mowing change</td>
<td>Detecting vegetation changes at biotope level</td>
</tr>
</tbody>
</table>

Note: +, good; 0, moderate; –, insufficient.

<sup>a</sup>The position of survey quadrants is best marked using a GPS, since orientation in bogs is very difficult.

<sup>b</sup>The position accuracy is exact, but the low geometric resolution reduces the position accuracy on small study areas.

<sup>c</sup>The water content in soils can be detected indirectly by indicator values or direct by complex laboratory analysis.

<sup>d</sup>Temporal and financial effort include all necessary worksteps to receive a satisfactory result. Some of these worksteps are, e.g. the field campaign, the production of an aerial photograph, ordering the data, digitising and the analysis of the data.
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www.spin-project.org

SPIN Demo CD
Email to: Michael.Bock@dlr.de