Classification of tree species from remote sensing temporal series

Jean-Philippe Denux
Context and users

Forest cover mapping

Research and teaching context, various users:
- Researchers, Students, End users
- Forestry specialists with GIS skills and basic image processing knowledge
- « Windows » and low programming skills

Forest cover is a particular part of landcover.
- Studied objects: from tree to landscapes
- Legend: species, mixed, landscape, forest/non forest
- Forest cover and use

Forest cover is an input layer GIS analysis (forestry, environment, economy...)
Images processing and analysis

1. Preprocessing: preparation of a database of remote sensing images (various sensors, format…)  
   ENVI, SNAP

2. Processing: transformation of the data (satellite measurement to qualitative or quantitative data)  
   ENVI, OTB

3. Analysis: extraction of thematic information about forest and natural vegetation  
   GIS

Image processing and GIS sofwares:
- Orfeo toolbox
- Monteverdi
- SNAP Toolbox
- ENVI
- ArcGIS
- QGIS

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Forest changes:

Image processing course
for Peruvian Ministries of Environment and Agriculture

Sentinel 2: **Object-based** image analysis (OBIA)
Landsat series: Pixel **classification** (forest/non forest)
Images:
- LT5 TM, LE7 ETM, LC8 OLI y P, 1996 to 2016
- S2A MSI, 2015 and 2016

Using GUI

Database Display Analysis

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Forest cover of the Pyrénées mountains

Research context:
Observatoire pyrénéen du changement climatique (OPCC)
PhD Emmanuelle Cano

Modis Images
Time series from 2000
16 days synthesis,
23 images/year

NDVI cycles

Phenological information -> species distinction

Preprocessing, data extraction
Forest cover

Best practices for classification

• Sampling
• Features selection
• Algorithm

Kappa values improvement thank to feature selection

Batch DOS, results are in the log file!
Forest cover

Temporal stability

Temporal consistency:
Taking into account various classification for a time series

- Frequency: how many years a pixel is classified like the reference
- Variety: how many different classes are assigned to a pixel

GIS analysis

OTB results
Conclusion and outlooks: Orfeo toolbox

**Strengths**

- Up-to-date and advanced image processing tools
- Free
- Easy batch processing (DOS, Python)
- Various file format
- (integration with QGIS)

**Weaknesses**

- Weak documentation
- Lack of tutorials
- Parameters can be difficult to adjust

- SNAP toolbox: tutorial, graph, batch
  -> for preprocessing

- Monteverdi vs QGIS

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Thank you attention ....

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