CENTRE NATIONAL D'ÉTUDES SPATIALES

ORFEO Toolbox

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Outline

- **ORFEO Toolbox**
- **Research Activities**
- **Processing Chains**

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ORFEO Toolbox

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Orfeo Toolbox

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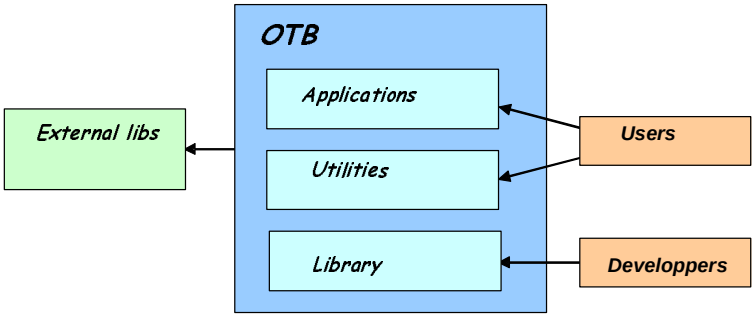
- **Framework: ORFEO Accompaniment Program**
- **Goals : make easier the development of new algorithms, their validation and capitalisation, fill the gap between researchers and ORFEO users.**
- **CNES is responsible for design and specification.**
- **Open source software for Image Processing labs, users and the industry.**
- **Contractor : Communications et Systèmes, CS**

OTB's Licence

- Free software as free speech, not free beer.
- If I write an application using OTB am I forced to distribute that application?
  - No. The license gives you the option to distribute your application if you want to. You do not have to exercise this option in the license.
- If I wanted to distribute an application using OTB what license would I need to use?
  - The CeCILL licence.
- I am a commercial user. Is there any restriction on the use of OTB?
  - OTB can be used internally ("in-house") without restriction, but only redistributed in other software that is under the CeCILL licence.

Orfeo Toolbox

- C++ library based on existing developments



Higher level languages: bindings

- Not all users like C++ programming
  - Higher level languages are more appealing
- Many users have legacy code in other languages
- Rapid prototyping with an interactive command line
- OTB will provide
  - Python + Java
  - IDL/ENVI add-ons

Orfeo Toolbox

- External libs :
  - ITK (segmentation, registration)
  - OSSIM (carto, ortho)
  - FLTK (GUI)
  - LibSVM (supervised learning and classification)
  - GDAL (IO for remote sensing formats)

Orfeo Toolbox : Roadmap

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- Version 2 (current):
  - IO (image, vector),
  - geometric corrections,
  - radiometric corrections,
  - registration,
  - filtering, segmentation and classification,
  - feature extraction (texture, lines, végétation indices),
  - basic change detection,
  - supervised learning,
  - spatial reasoning.
- Utilities
  - Quick look, ROI extraction, meta-data access
  - Ortho-rectification, cartographic projections, supervised classification

Other functionnalities and features

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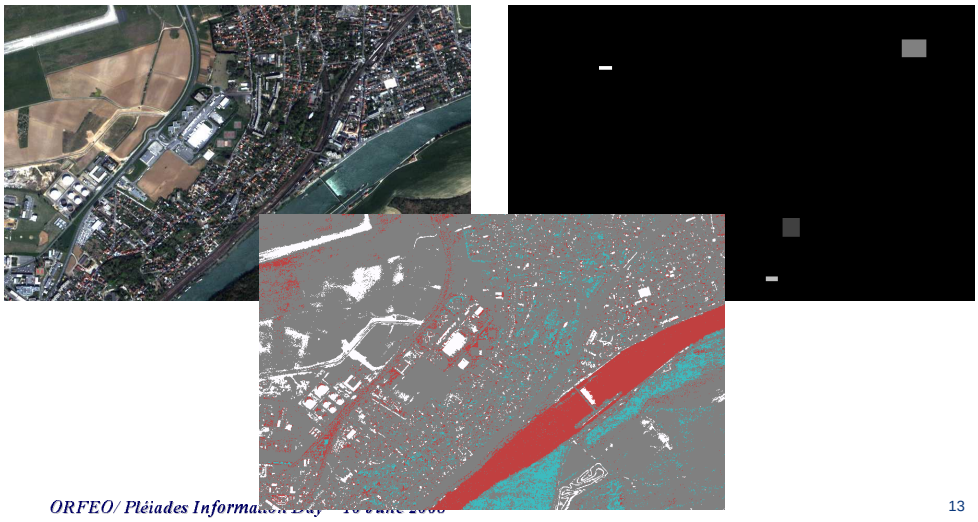
- Generic I/O
- Streaming, threading
- Synchronized pipeline (processing on demand)
- Type genericity (int, float, double, complex)
- Multi-platform

Examples of features

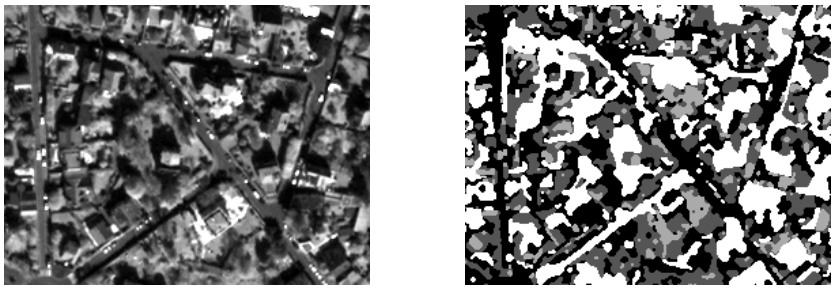
Main subjects

- **Geographical database update**
  - **Image to database registration**
  - **Image segmentation and classification**
  - **Change detection**
- **Object detection and recognition**
  - **Object counting (vehicles, buildings, etc.)**
  - **Object characterization**

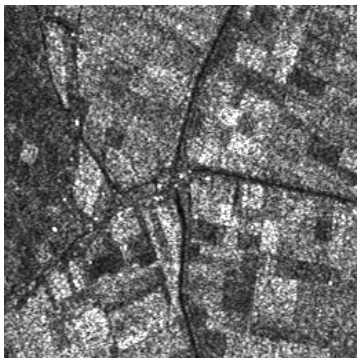
Supervised classification

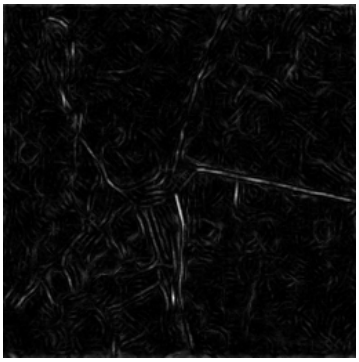


Markov random fields segmentation



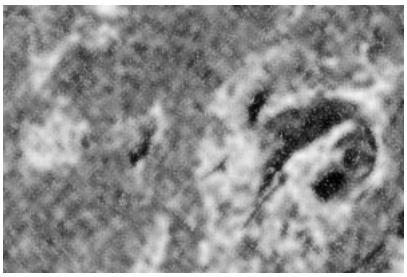
Line detection on SAR images



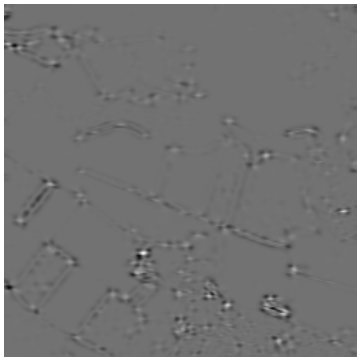


Perceptual alignment detection

Anti-speckle filtering



Salient point detection



Object segmentation

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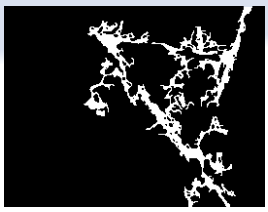

Change detection

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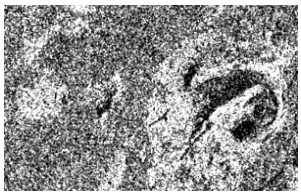
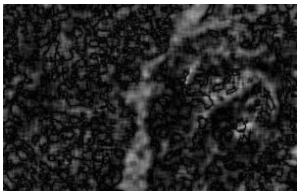
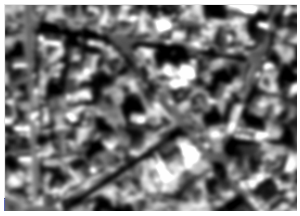
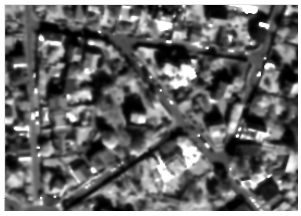


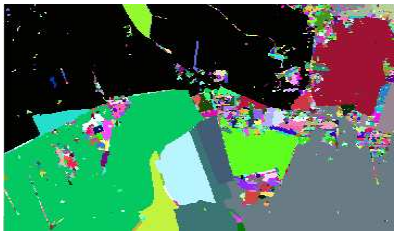


Denoising

Original | Blurring | Edge preserving

Watershed segmentation


Circle extraction

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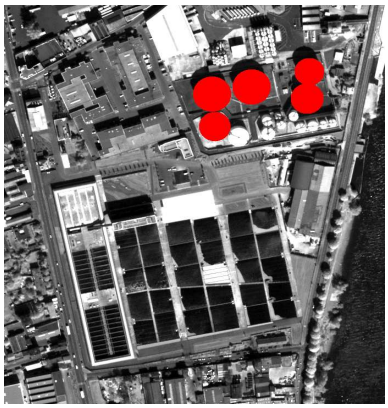

Line detection and extraction

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Object detection

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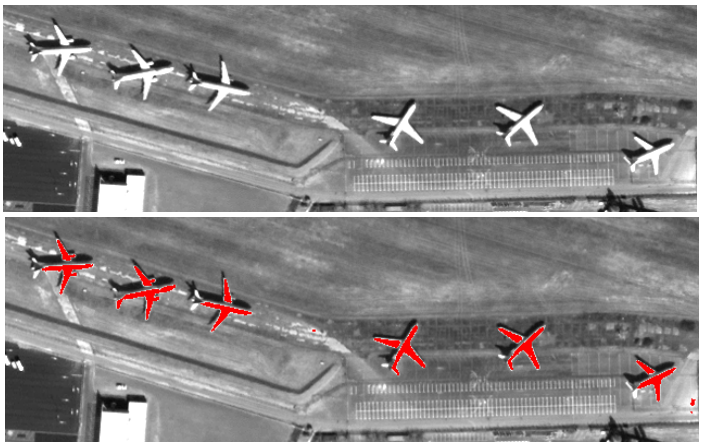
Reference



Planes

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Buildings

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Buildings

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Lakes

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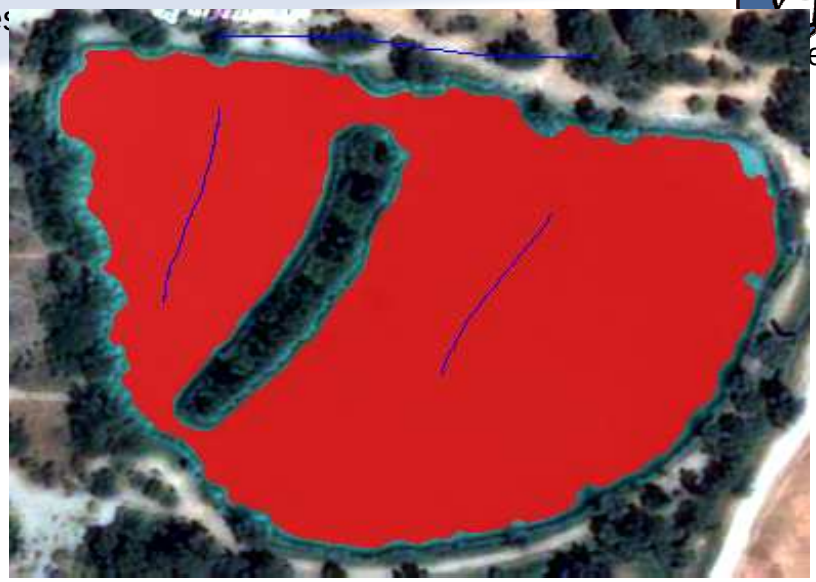
Lakes



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Swiming-pools

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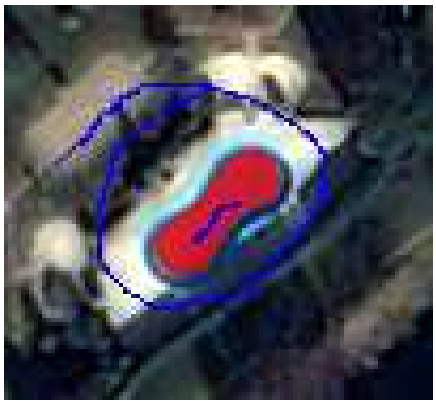

Agricultural plots

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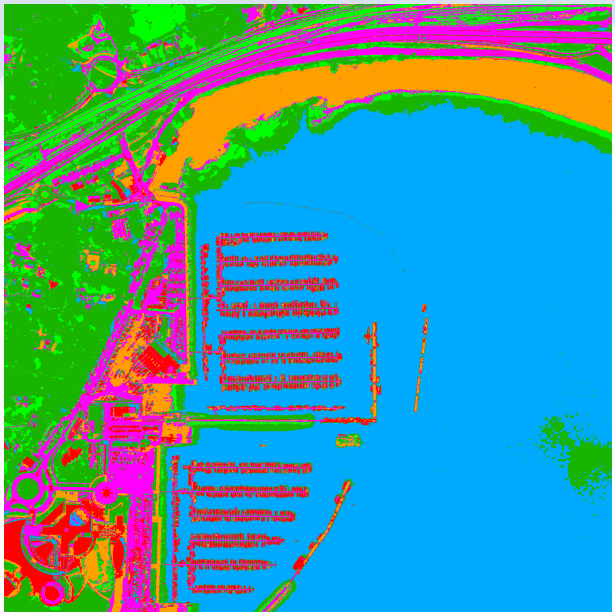

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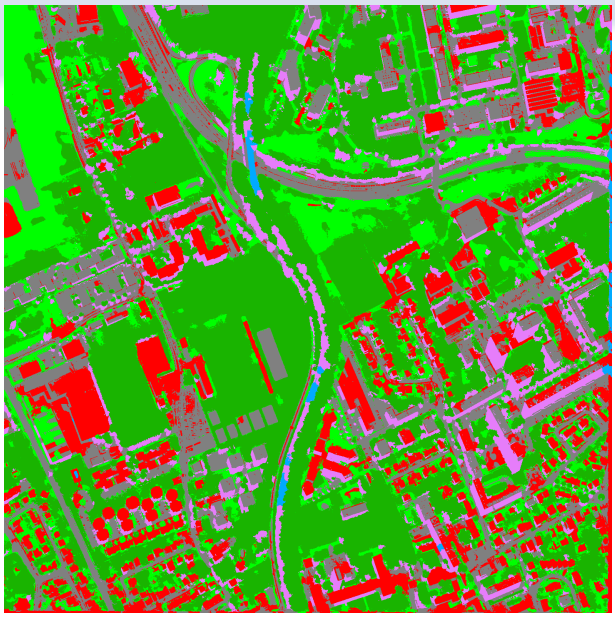

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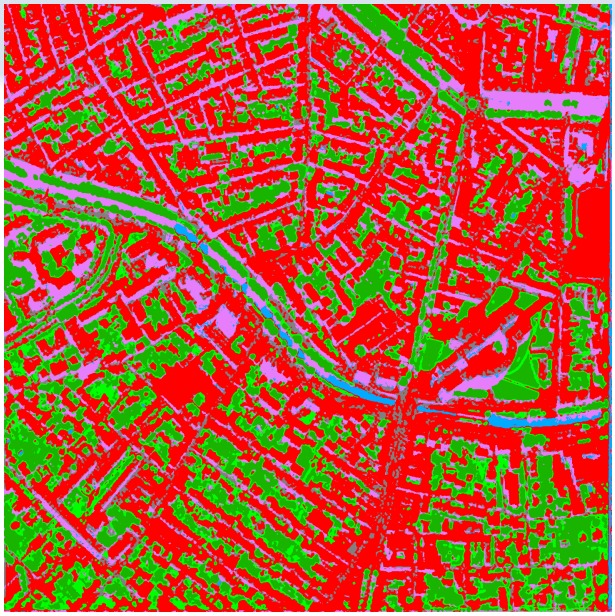

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OTB Applications

- Examples of complete software tools for specific tasks
- Command line
  - Quick-look, Ortho-rectification, ReadImageInformation, Supervised classification
- GUI
  - Road Extraction
  - Image Viewer
  - Interactive Change Detection
  - Interactive Image Registration

Image Viewer

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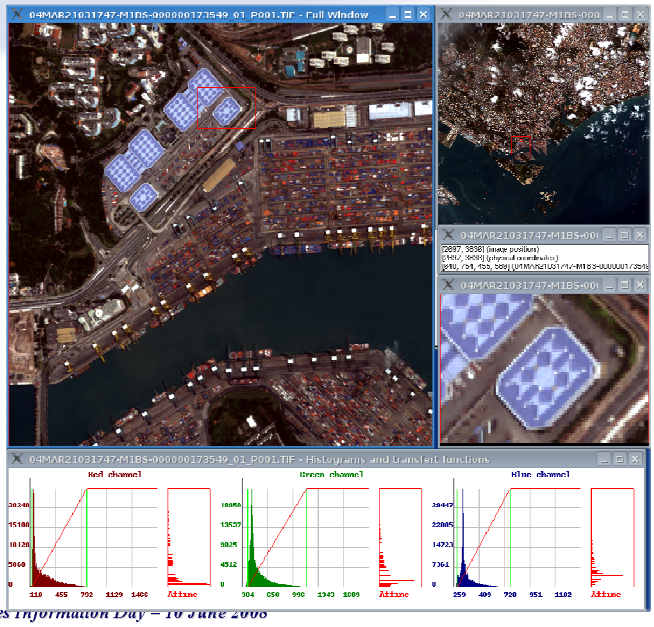

Interactive Change Detection

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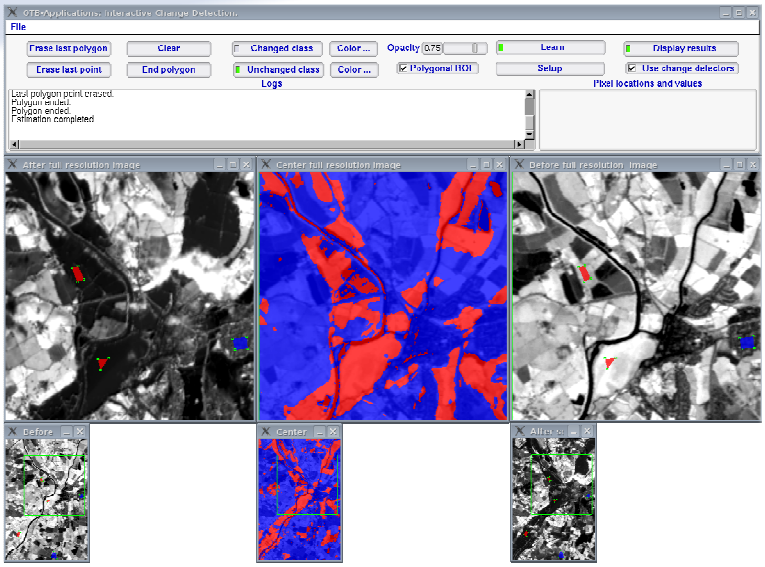

Road Extraction

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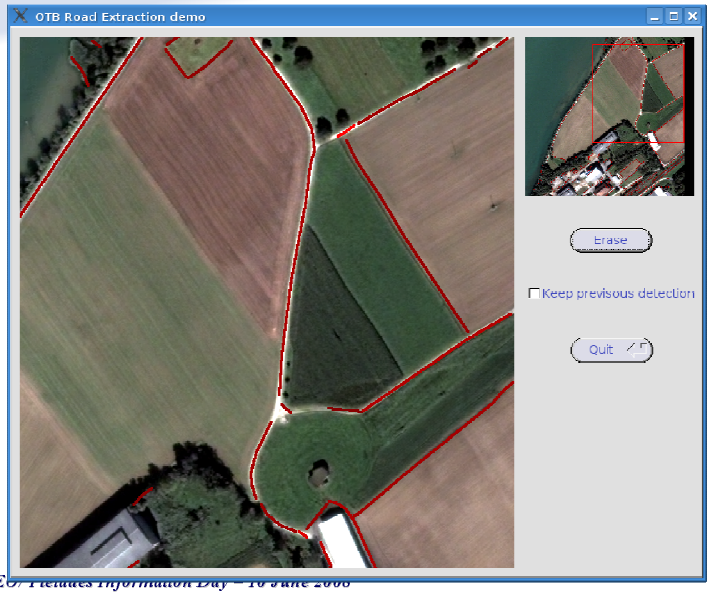

Interactive registration

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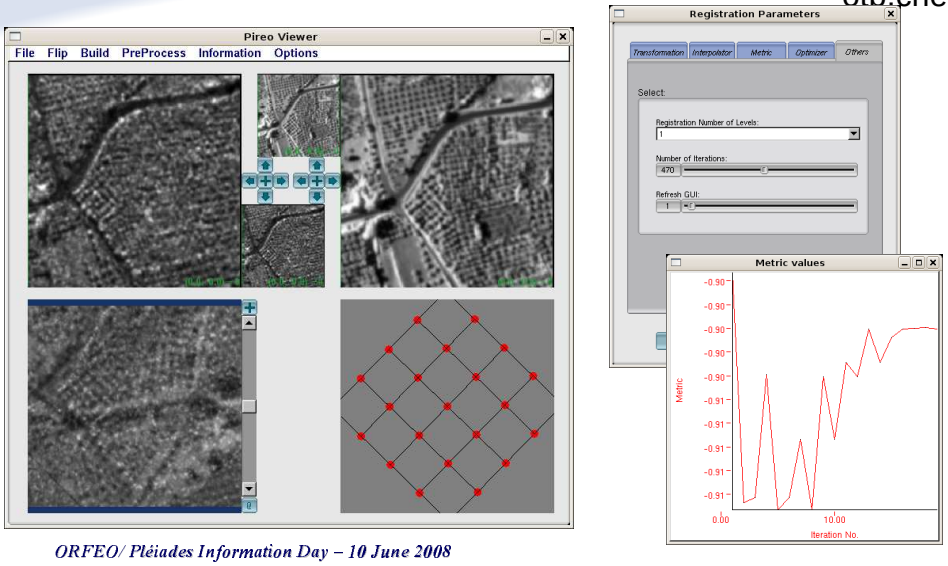
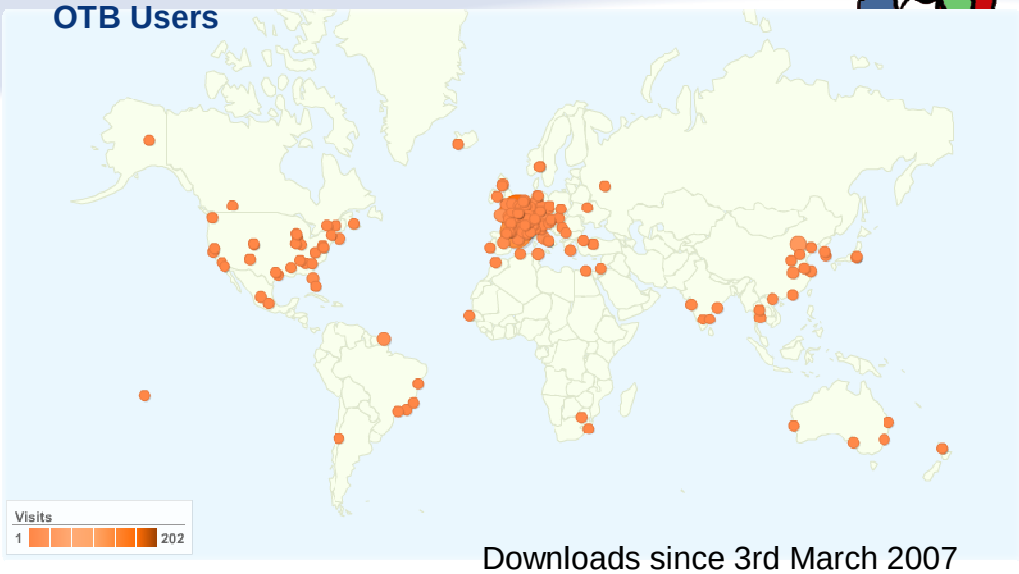
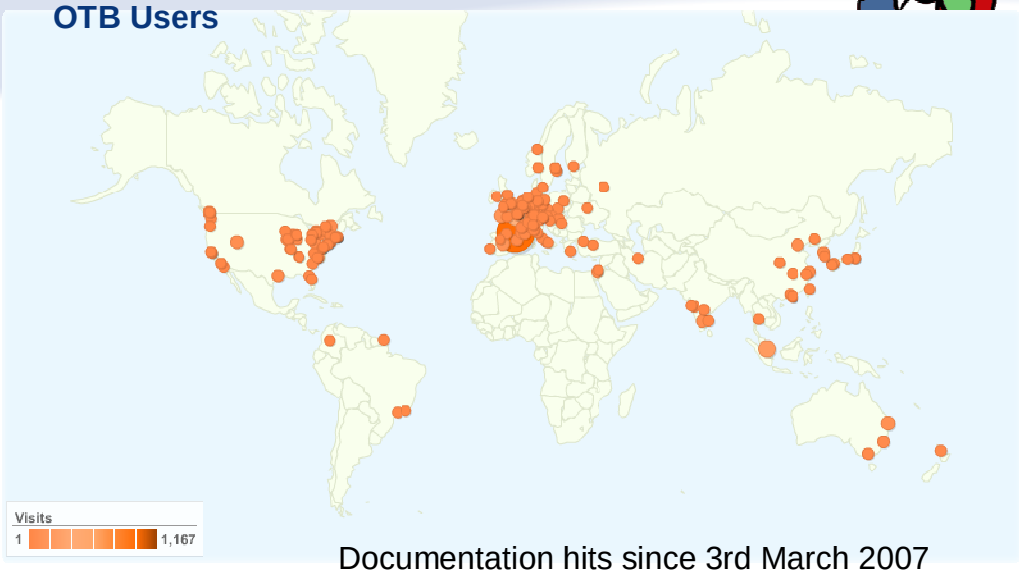


OTB Users



Downloads since 3rd March 2007

OTB Users



Documentation hits since 3rd March 2007

OTB Live CD

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- A bootable CD with
  - OTB source code and installed binaries
  - OTB Applications
  - Full API documentation and Software Guide
  - A fully operational and installable Linux system
  - Able to mount USB disks
- What for?
  - Test OTB without the need to compile
  - One-shot processing
  - Training courses
  - Easy OTB install (less than 30 min)
- Download: http://www.melaneum.com/OTB/otblive/
  - Or Google search: « otb live cd »

OTB Live CD - Booting

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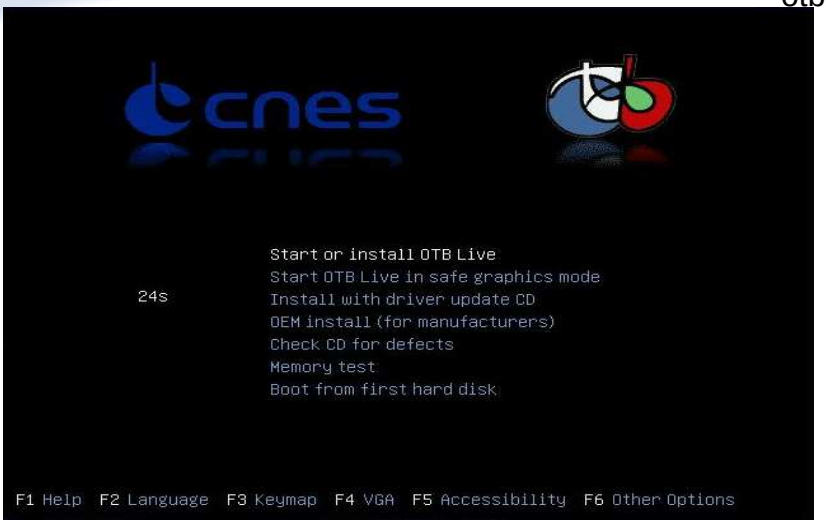

OTB Live CD - Booting

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OTB Live CD - Desktop

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OTB Live CD - Help

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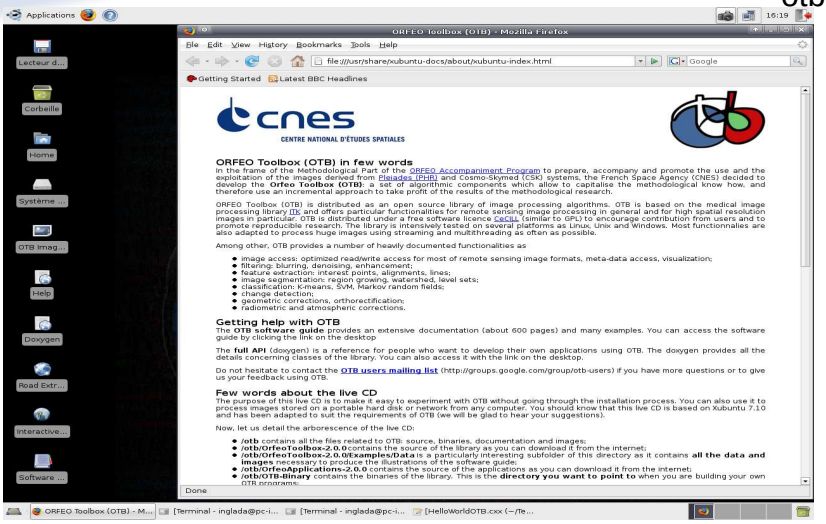

OTB Live CD - Applications

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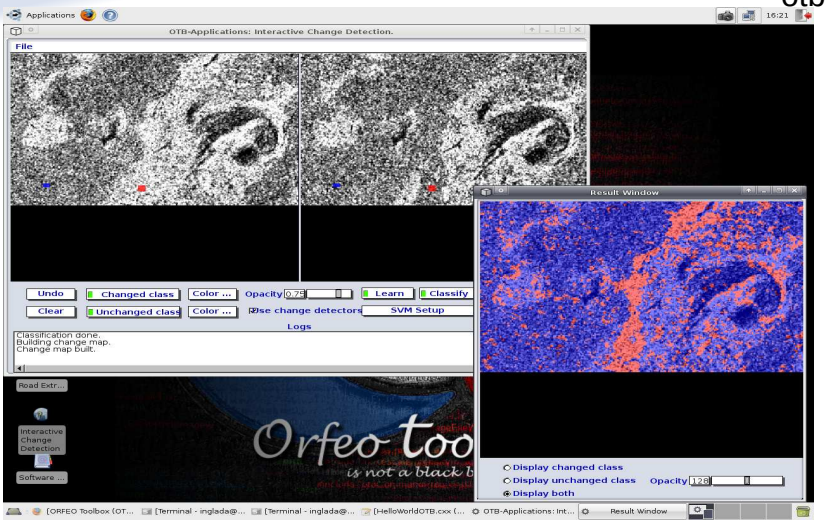

OTB Live CD – Write a program

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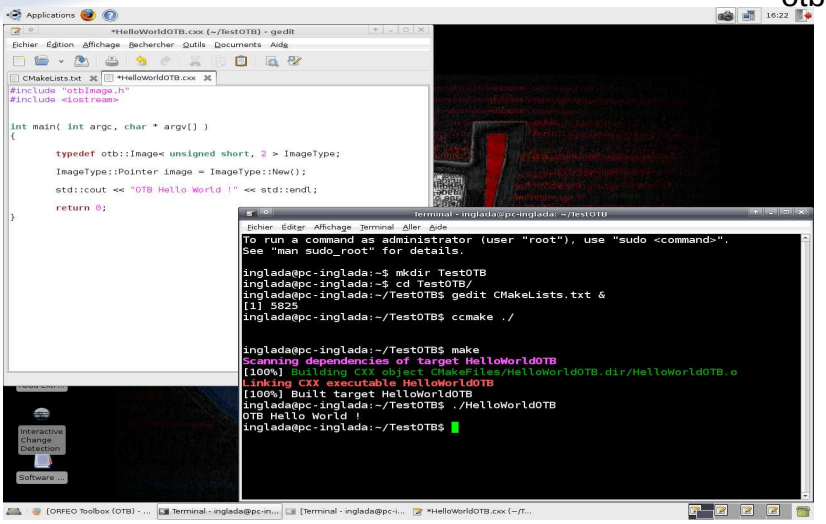

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Processing Chains

Goals and perimeter

- Evolution of the OTB-Applications package
  - OTB lib is now rich enough
- Ready to use tools (no need for OTB compilation, etc.) for thematic validation and operational use
- Complementary with *methodology developed by thematic users: capitalize, generalize, automate, deploy*
- To be made availabe as IDL/ENVI add-ons
- Will be improved after thematic user feedback

Proposed chains

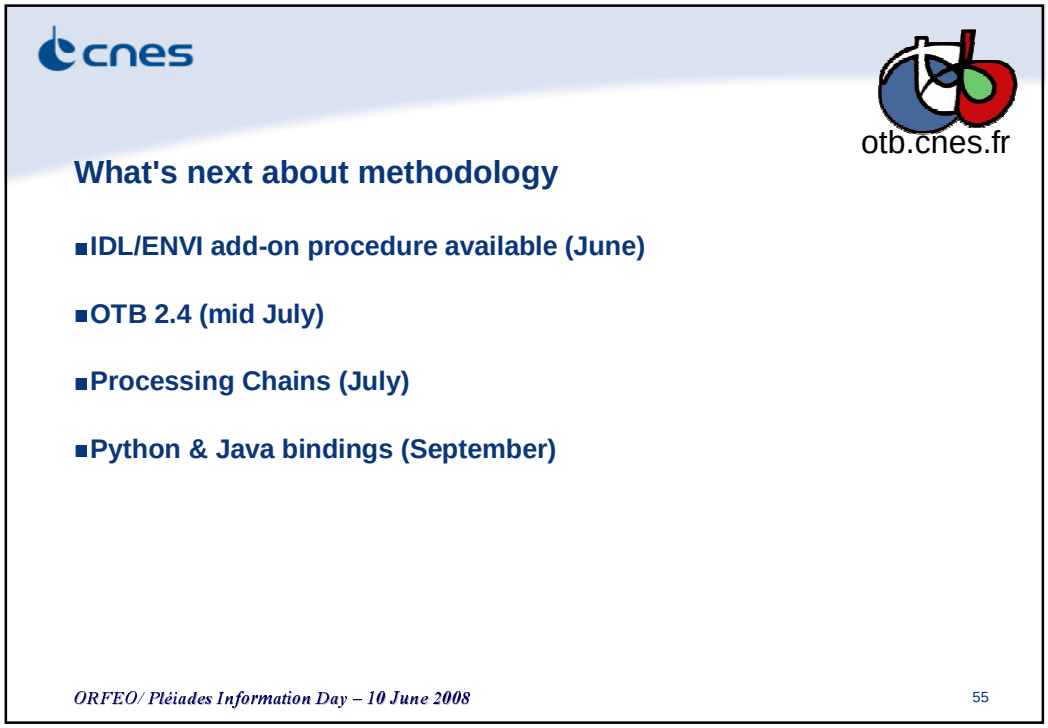
- July 2008
  - Ortho-registration (Pléiades, CSK, SPOT5, QB, Ikonos, TSX, etc.)
  - Ortho+pansharpening (Pléiades, QB)
  - Supervised pixel-based classification (multispectral, multitemporal)
- October 2008
  - Image co-registration (Pléiades/QB, Pléiades/SPOT5, Pléiades/CSK, CSK/ASAR/ERS, SPOT5/ASAR/ERS, etc.)
  - Standard – FAO, Corine – land cover map production (Pléiades, QB, Ikonos, SPOT5)
  - KML conversion (display & share on Google Earth)
  - 3D & stereo anaglyh viewer

Proposed chains

- December 2008
  - Object counting (Pléiades, QB, Ikonos)
  - Road network extraction (Pléiades, QB, Ikonos, SPOT5)
  - Hydrographic network extraction (Pléiades, QB, Ikonos, SPOT5)
- February 2009
  - Urban area extraction (Pléaides, CSK, QB, Ikonos, TSX, SPOT5)
  - Image to Data Base registration (Pléiades/QB to BDTopo)
- April 2009
  - Radiometric calibration (Pléiades, SPOT5, QB, CSK, ASAR, ERS, RadarSAT)
  - Individual trees and tree stands extraction
- Planning can evolve depending on user requirements

We need real life examples

- To go from product sheets towards production software
- Users give us: input images + detailed description of the expected product
  - Make the link between product sheets and VHR database
- And we give them back: software and/or output results for thematic validation
- Following improvement & tuning of the processing chain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What's next about methodology
IDL/ENVI add-on procedure available (June)
OTB 2.4 (mid July)
Processing Chains (July)
Python & Java bindings (September)
ORFEO/ Pléiades Information Day – 10 June 2008
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