Competence Centre on Information Extraction and Image Understanding for Earth Observation

SAMT

3rd International Conference on Semantic and Digital Media Technologies

2008

TELECOM ParisTech, Institut TELECOM
CNRS LTCI, 46, rue Barrault, 75013 Paris.
FRANCE

PLATO for Information Mining in Satellite Imagery

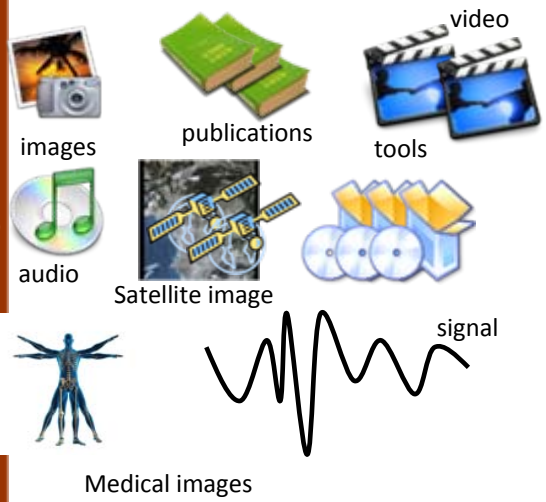
Soufiane RITAL, Marine Campedel, and Mihai Costache

www.tsi.enst.fr/~rital

Supported by :

PLATO

Multimedia mining platform for researchers



HTTP://

/plato.enst.fr/

Organization

PLATO stores and centralizes all data/metadata and tools using our multimedia data management system;

Sharing

PLATO facilitates navigation and provides visualization tools, etc.

Exploitation

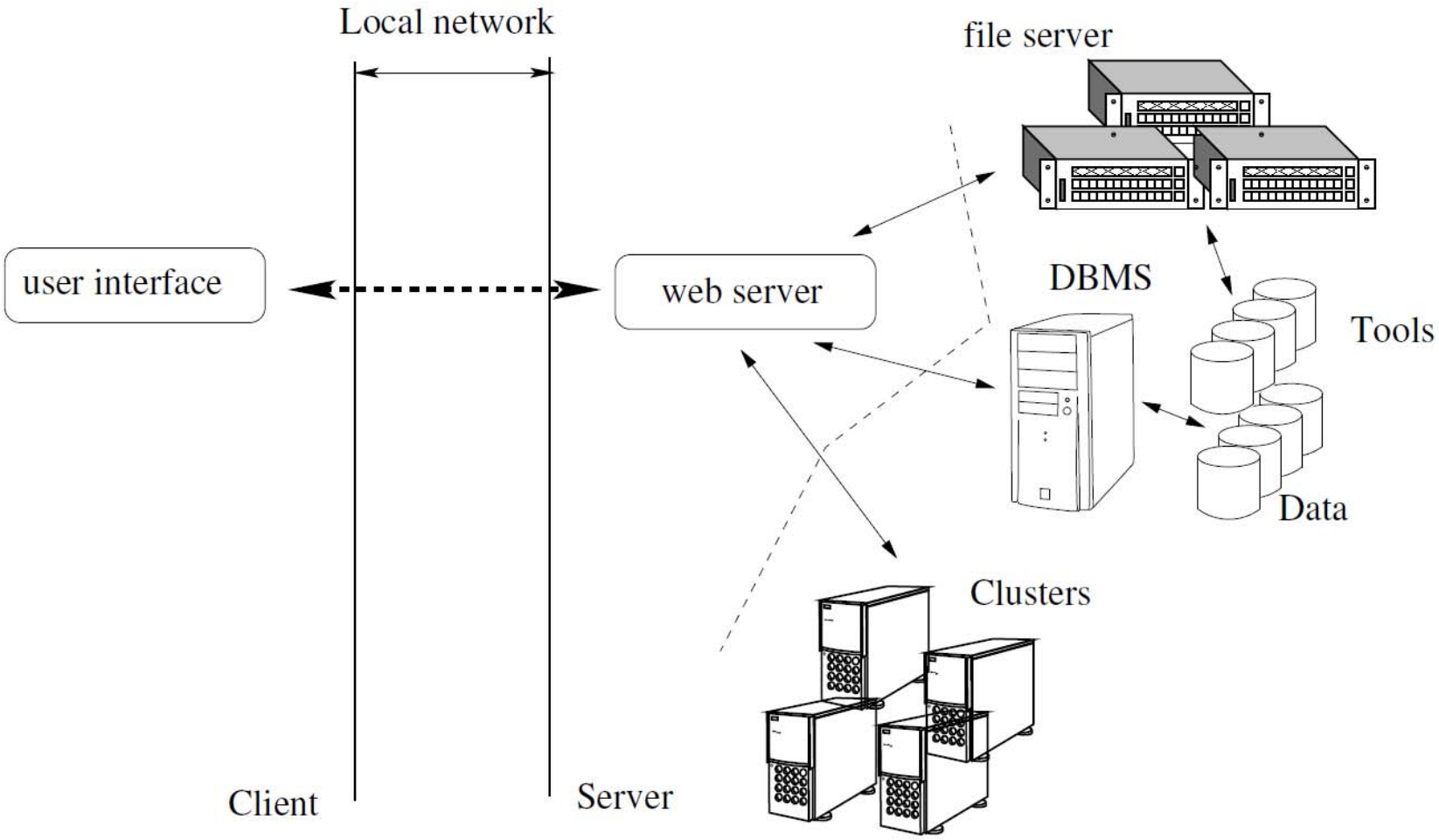
PLATO allows Test/Evaluation/Development: using both graphical interface and cluster power, the user develops and evaluates algorithms inside complex processing chains;

Communication

PLATO includes a Wiki between Plato users and bugs reports; it also helps to for demonstration design, and creates links between publications and data or tools.

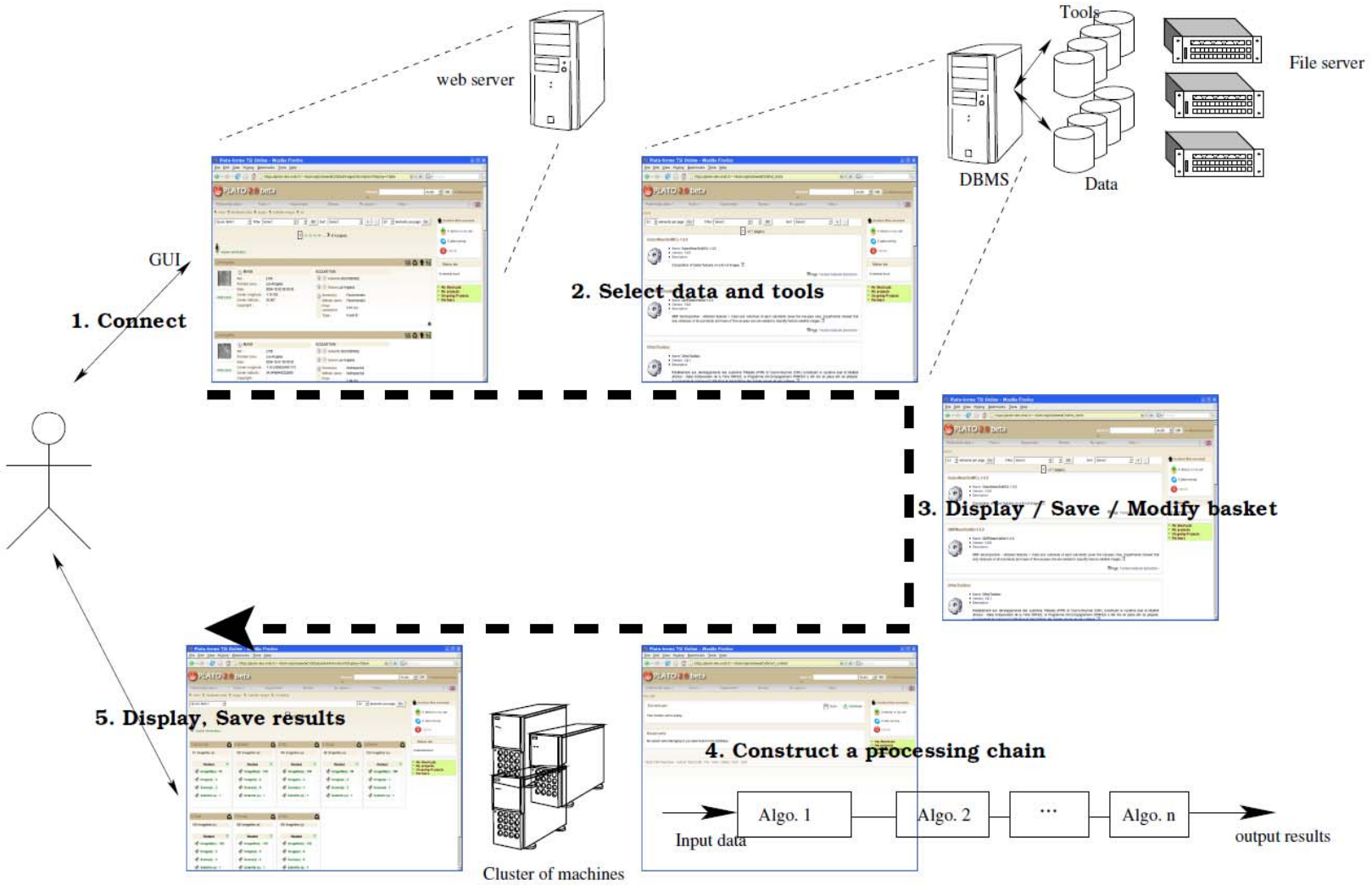
• • •

System architecture…



AJAX, PYTHON Server Pages, POSTGRESQL, PYTHON, …

From data and tools to processing chain …



Satellite images

- **Satellite images are numerous**
  - **Example : SPOT5 satellite provides several terabytes / year**
- **Satellite images are underexploited**
  - **Less than 3% are used – by photointerpreters – visually**
- **Satellite images are semantically rich**
  - **Lots of applications**
  - **More and more very high resolution images (50cm/pixel)**

=> Urgent need for automatic processing

PLATO and satellite images

- **Basic data management :**
  - **metadata, images, results of processing**
- **Visualization tools**
  - **1 SPOT5 image = 12000x12000 pixels !**
  - **High/low precision**
  - **Facilities like « crop »**
- **Navigation inside images and help to annotation**
  - **Image indexing**
  - **Active learning (relevance feedback)**
    - A learning machine
    - A selection methods (what to present to the user)
    - An interactive interface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Search
Audio
OK
>> Advanced search >>
Multimedia data »
Tools »
Experiment
Demos
My space »
Help »
Home
Multimedia data
Images
Satellites Images
Explore
Quick NAV !
Search
powered by Google
Paris
Search
powered by Google
Paris
Paris
France
directions
Save this location
Acapulco 01
Acapulco 02
Adelaide
Angers
Annecy
Ariege
Bagdad
Bandarabas
Baqueira
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Links
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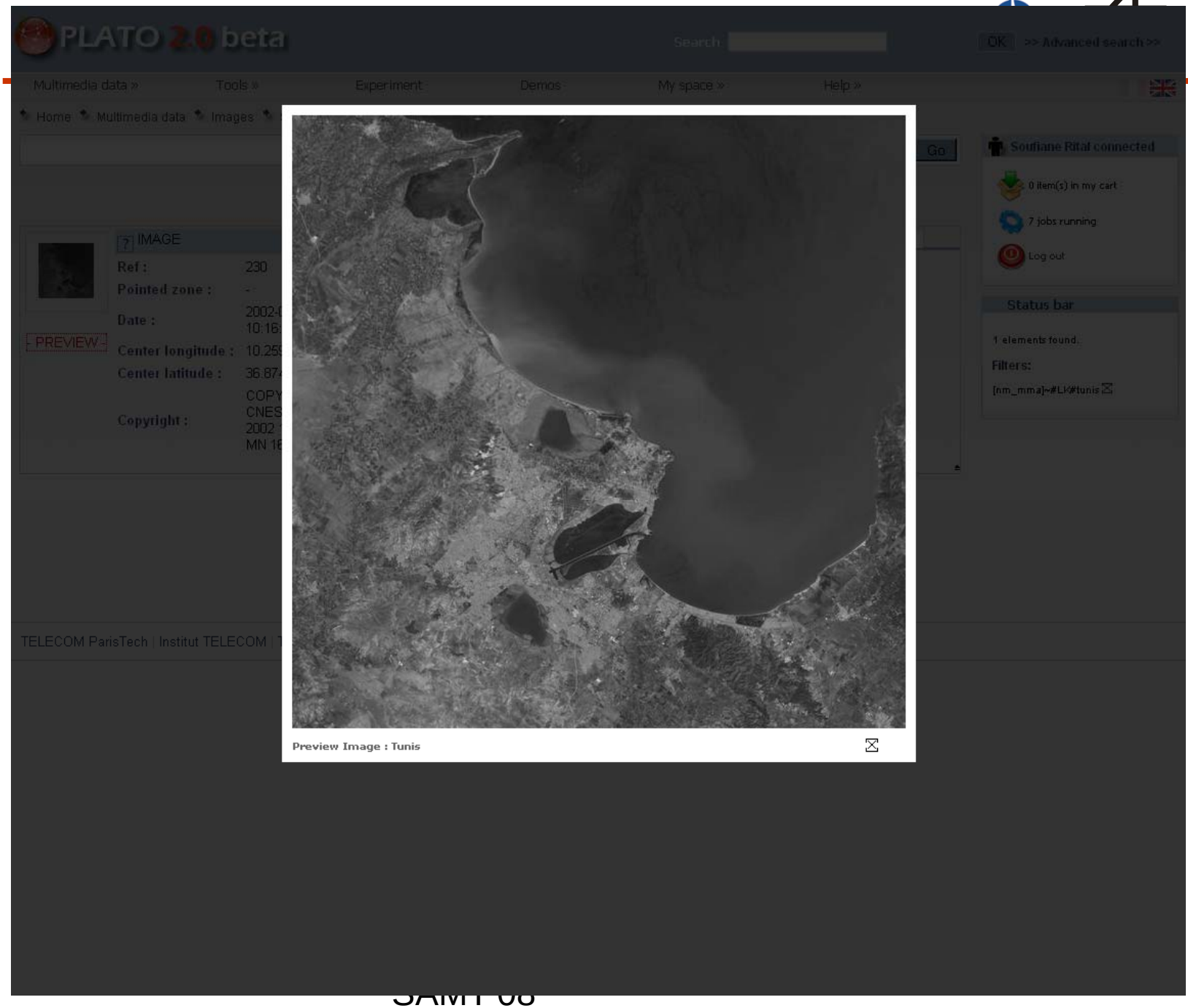
[790] imagette(s)
[8] label(s)
[42] scene(s)
Labels
SPOT
Quickbord 2
IKONOS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Search
OK
>> Advanced search >>
Multimedia data »
Tools »
Experiment
Demos
My space »
Help »
Home
Multimedia data
Images
Go
Soufiane Rifai connected
0 item(s) in my cart
7 jobs running
Log out
Status bar
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FEATURES

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Multimedia data » | Tools » | Experiment | Demos | My space » | Help »

Home | Multimedia data | Images | Satellites Images | Tools

Features

Image crop

Navigation in HR* mode

Learning

Choose a feature?

QMF in XML Format

- Descriptor : feature_QMF.xml
- Size : 43.61 MB
- winsize : 64
- step : 32
- nbrcoefs : 20
- precision : 6
- level : 3

Ok

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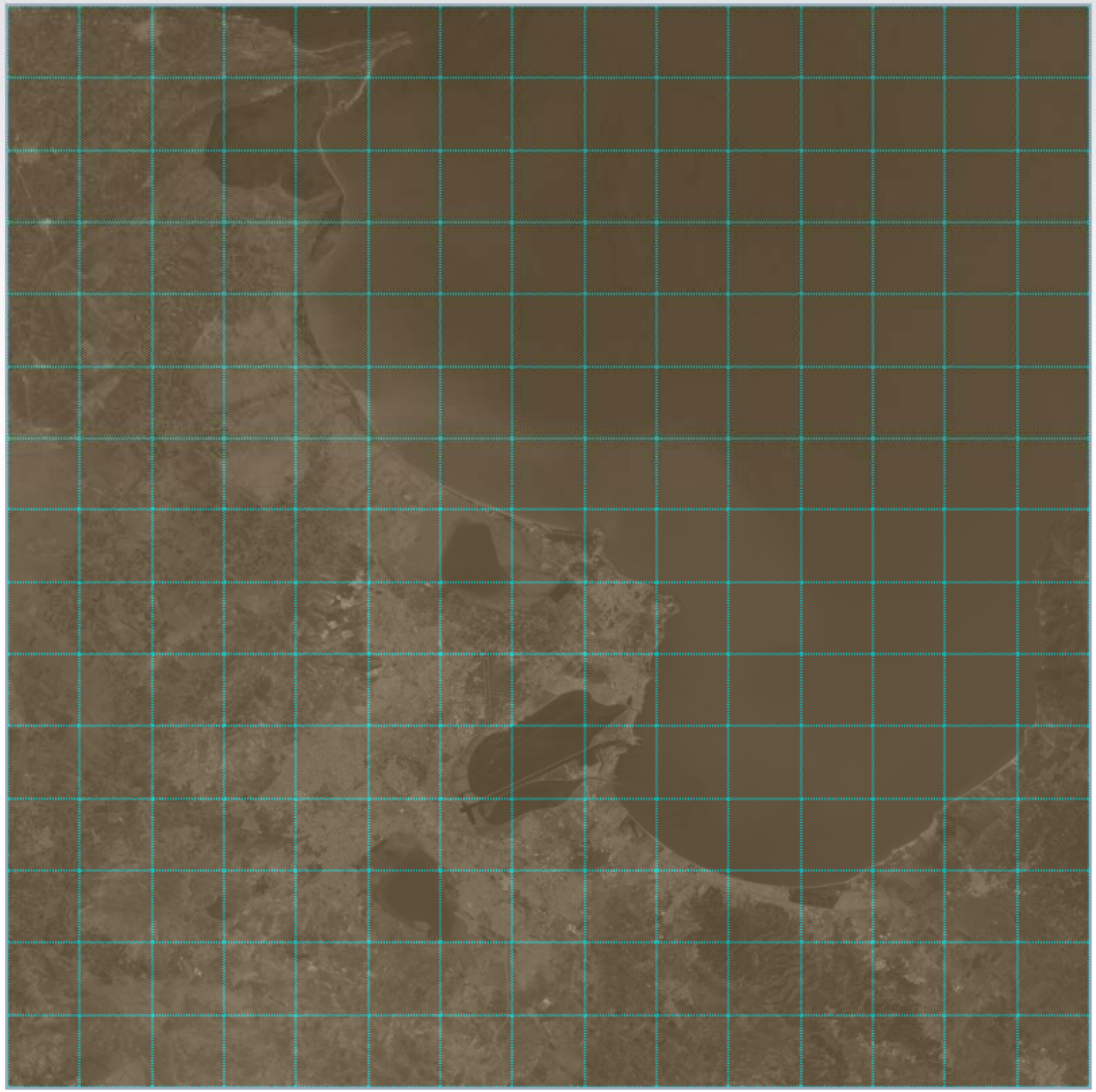
Search | Audio | OK | >> Advanced search >>

Multimedia data » | Tools » | Experiment | Demos | My space » | Help »

Home | Multimedia data | Images | Satellites Images | SVM DEMO ?



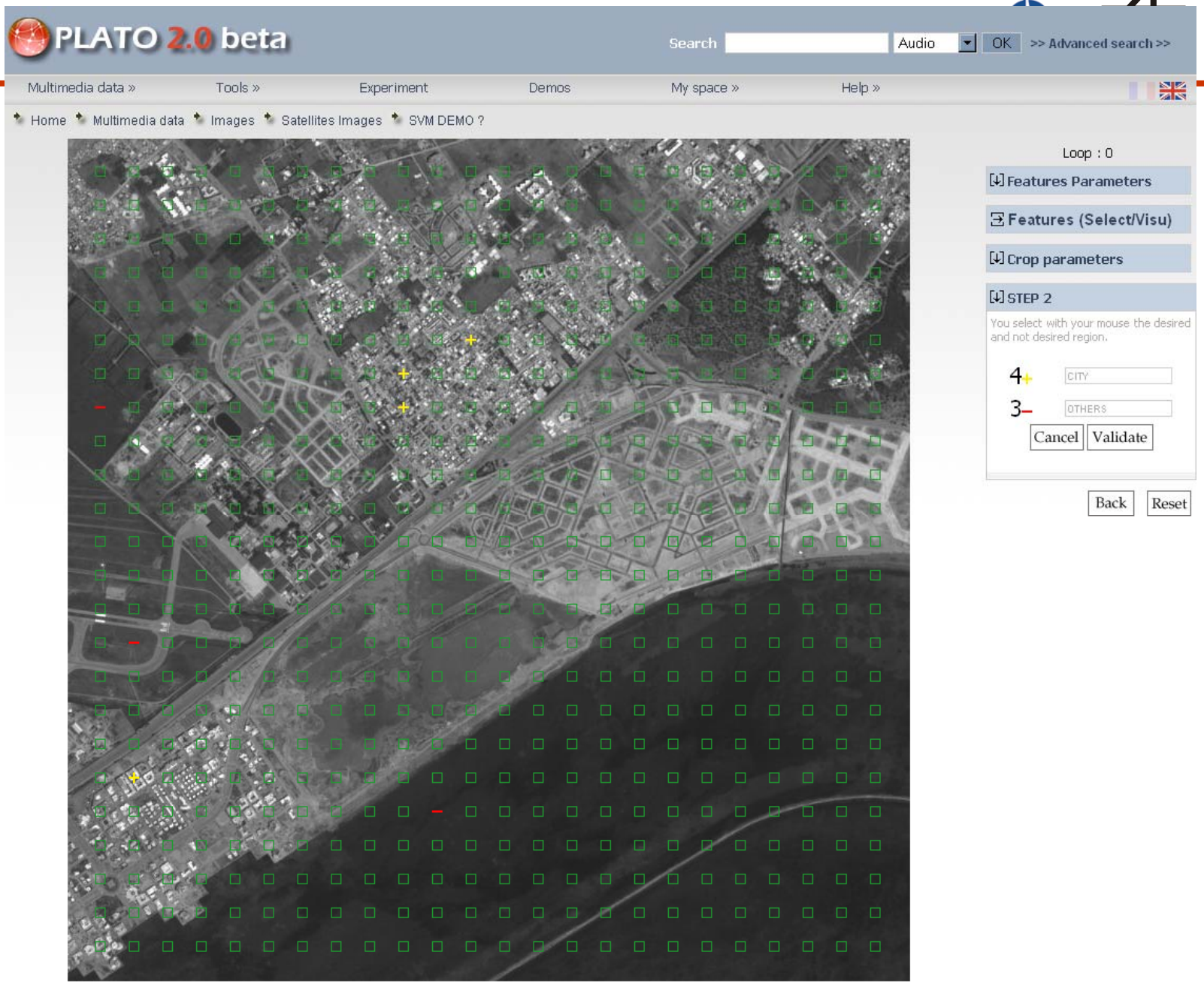
Features Parameters

Crop parameters

STEP 1

You select one region in satellite image. For this, you move your mouse until you find an intereset region, then you click.

Back | Reset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Search
Audio
OK
>> Advanced search >>
Multimedia data »
Tools »
Experiment
Demos
My space »
Help »
Home
Multimedia data
Images
Satellites Images
SVM DEMO ?
Loop : 0
Features Parameters
Features (Select/Visu)
Crop parameters
STEP 2
You select with your mouse the desired and not desired region.
4
CITY
3
OTHERS
Cancel
Validate
Back
Reset

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Search | Audio | OK | >> Advanced search >>

Multimedia data » | Tools » | Experiment | Demos | My space » | Help »

Home > Multimedia data > Images > Satellites Images > SVM DEMO ?

Usage: svm-train [options] training_set_file [model_file]

options:

-s svm_type : set type of SVM (default 0)

0-- C-SVC
1-- nu-SVC
2-- one-class SVM
3-- epsilon-SVR
4-- nu-SVR

-t kernel_type : set type of kernel function (default 2)

0 -- linear: u'*v
1 -- polynomial: (gamma*u'*v + coef0)^degree
2 -- radial basis function: exp(-gamma*|u-v|^2)
3 -- sigmoid: tanh(gamma*u'*v + coef0)
4 -- precomputed kernel (kernel values in training_set_file)

-d degree : set degree in kernel function (default 3)
-g gamma : set gamma in kernel function (default 1/k)
-r coef0 : set coef0 in kernel function (default 0)
-c cost : set the parameter C of C-SVC, epsilon-SVR, and nu-SVR (default 1)
-n nu : set the parameter nu of nu-SVC, one-class SVM, and nu-SVR (default 0.5)
-p epsilon : set the epsilon in loss function of epsilon-SVR (default 0.1)
-m cachesize : set cache memory size in MB (default 100)
-e epsilon : set tolerance of termination criterion (default 0.001)
-h shrinking: whether to use the shrinking heuristics, 0 or 1 (default 1)
-b probability_estimates: whether to train a SVC or SVR model for probability es timates, 0 or 1 (default 0)
-wi weight: set the parameter C of class i to weight*C, for C-SVC (default 1)
-v n: n-fold cross validation mode

Loop : 0

Features Parameters

Crop parameters

STEP 3

You run libsvm ! [More info]

1. SVM_TRAIN -s 0 -b 1 ...
2. SVM_PREDICT -b 1 ...

- SVM Train usage
- SVM Predict usage

Run

Back | Reset

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RESULT OF CLASSIFICATION

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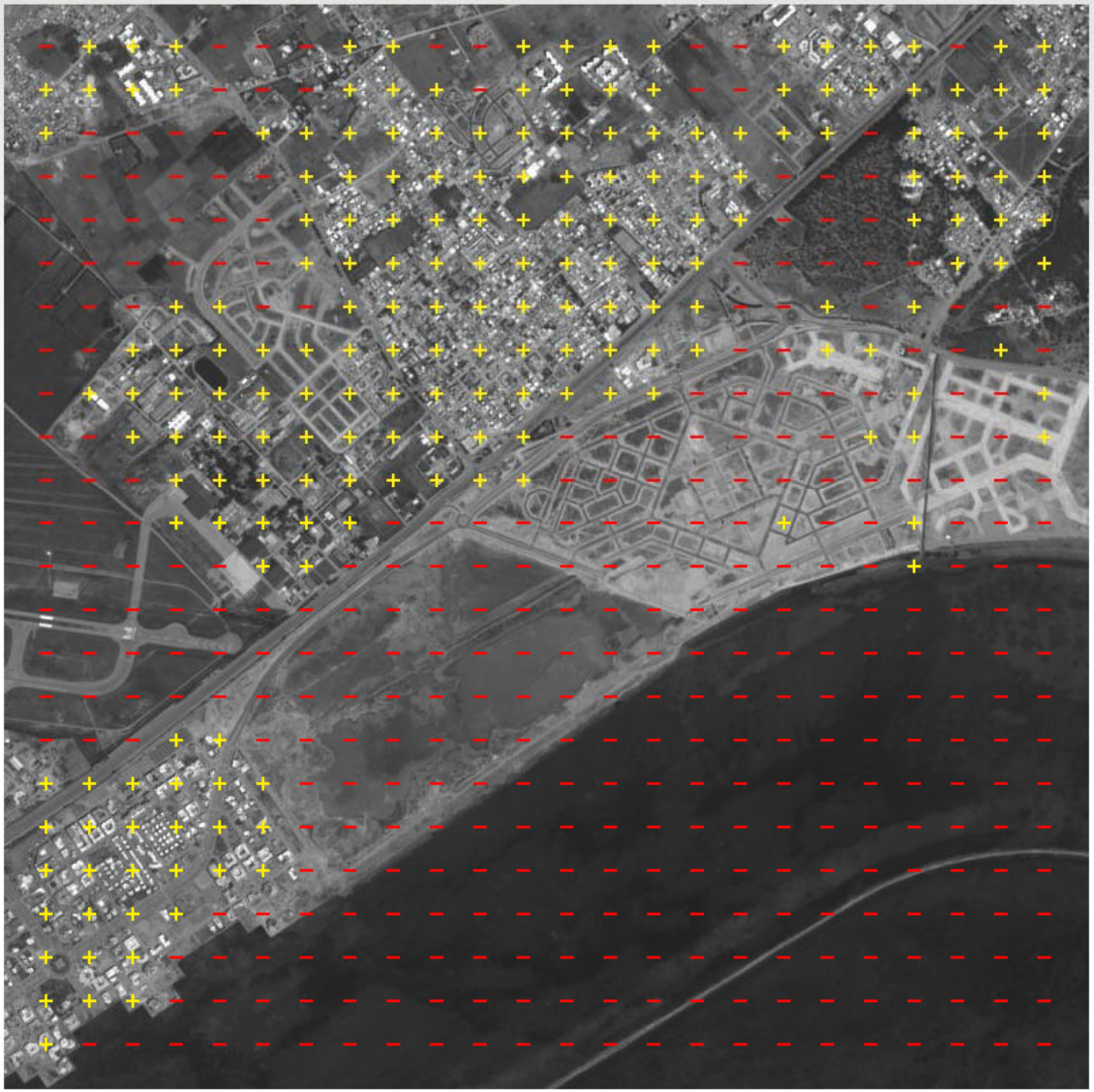
Multimedia data » | Tools » | Experiment | Demos | My space » | Help »

Home | Multimedia data | Images | Satellites Images | SVM DEMO ?



Loop : 2

Features Parameters

Crop parameters

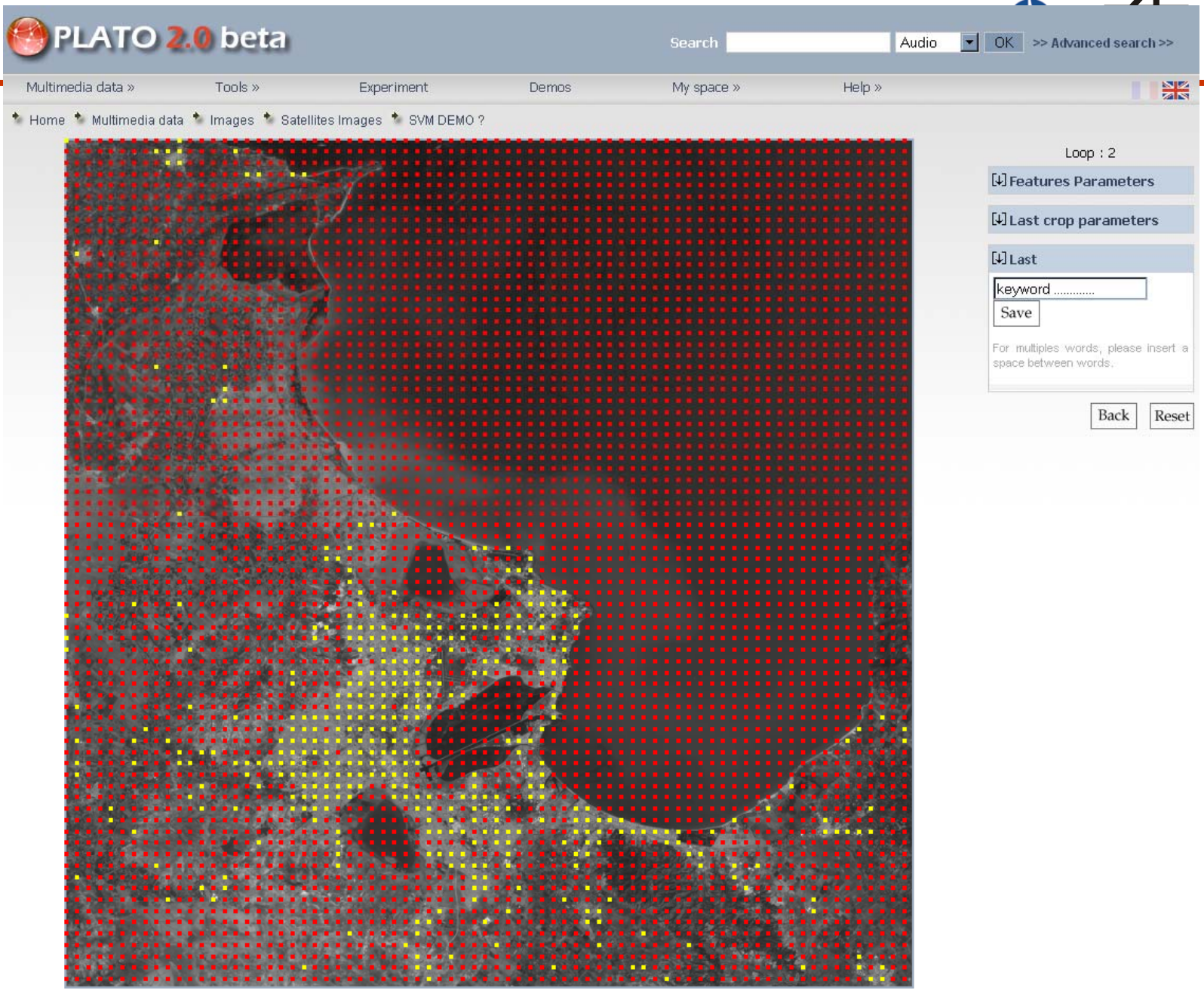
STEP 4

Classification results :

+: postif response,
−: negatif response,

Repeat? Generate?

Back | Reset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Search
Audio
OK
>> Advanced search >>
Multimedia data »
Tools »
Experiment
Demos
My space »
Help »
Home
Multimedia data
Images
Satellites Images
SVM DEMO ?
Loop : 2
Features Parameters
Last crop parameters
Last
keyword .....
Save
For multiples words, please insert a space between words.
Back
Reset

Conclusion

- **Is it new ?**
  - **PLATO is based on well-known technologies**
  - **Relevance feedback is well-known for a decade**
- **To adapt CBIR systems to satellite images is new !**
  - **Satellite images contain an enormous amount of data**
    - PLATO proposes efficient storage means to keep original information untouched and to track applied processes
    - PLATO helps people navigating inside images
    - PLATO illustrates how active learning could help interpreters in their annotation work.
- **It is very useful to researchers !**

Conclusion

- **PLATO demos are available as films on www.tsi.enst.fr/~rital**
  - **Not only for satellite images but also for web photos**
- **Of course, results of learning can be memorized, associated to keywords and reused later.**
  - **Automatic annotation can be performed and text retrieval can be used to accelerate the retrieval process**
- **Memory management has been proposed by Mihai Costache (phd, sept. 08) : learning/unlearning**
- **Perspective : current work with photo-interpreters about major catastrophes management**