



An updating rate assessment system of topo-geographical data using spatial remote sensing

ETATS

(système d'**E**valuation du **T**aux d'**A**ctualisation
de données topo-géographiques par
Téledétection **S**patiale)



May 9th 2003

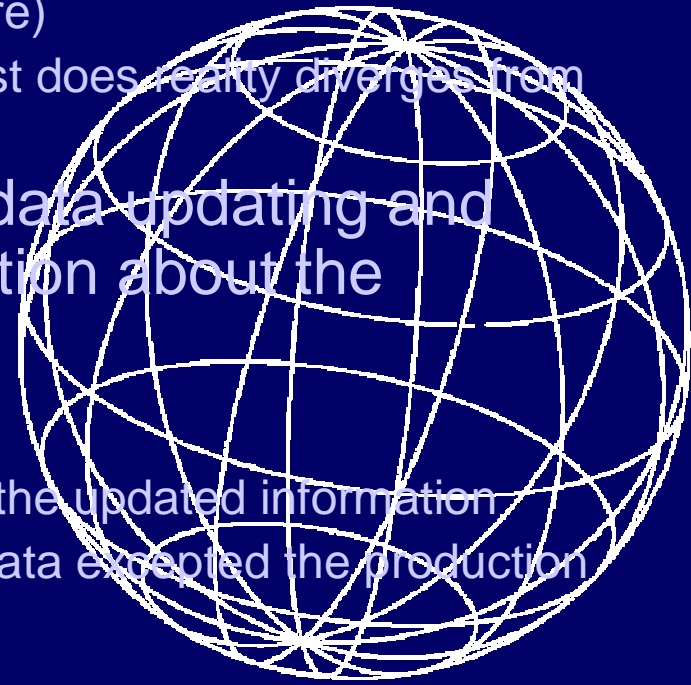
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Context

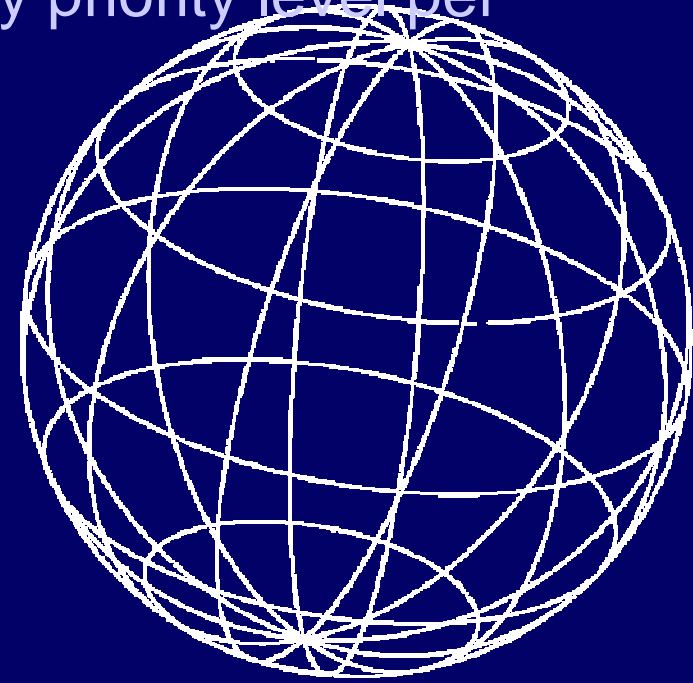
- In a near future, NGI will complete the map coverage of Belgium with 1:10 000 scale data
- In order to manage the updating process of this database, in constant evolution, NGI needs
 - Information on the change (what)
 - Information on the change places (where)
 - Information on the *change rate* (how fast does reality diverges from the data stored in DB)
- The NGI would like to schedule data updating and provide its users with an information about the actualisation status of the data
- Nowadays
 - NGI collects systematically on the field the updated information.
 - There is no actualisation status of the data excepted the production date





Aim of the project

- The project aim is to provide an actualisation status on the NGI data by semi-automatic analysis of remote sensing images
- This status will be represented by priority level per area





Expected results

- The project is expected to produce a change index by square cell of 500 x 500 m.
- This index should be calculated on the basis of an image to geographic database comparison

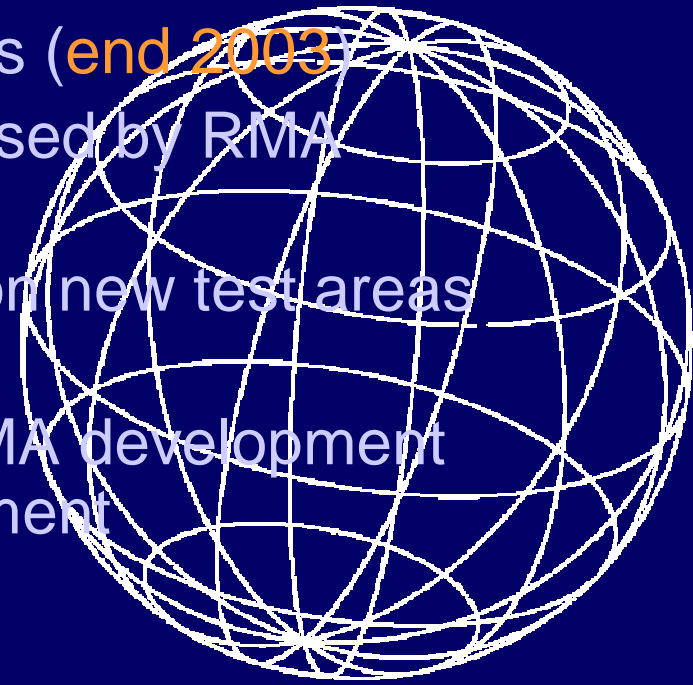
RMA task is to develop tools in order to produce these results





Work plan

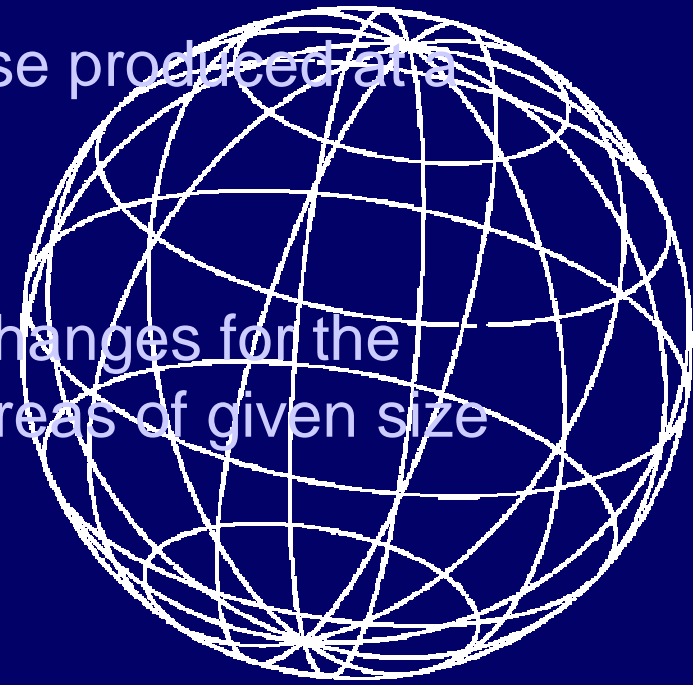
- Choice of the sensor and visual interpretation of the changes in some test areas (**mid 2003**)
- Search of the analysis methods (from bibliography and/or new methods) (**mid 2003**)
- Implementation of some methods (**end 2003**)
- Selection of the best tools proposed by RMA (**begin 2004**)
- Validation of selected methods on new test areas (**1-3rd quarter of 2004**)
- Transfer of the tools from the RMA development environment to the NGI environment (**4th quarter of 2004**)





Tools Specifications

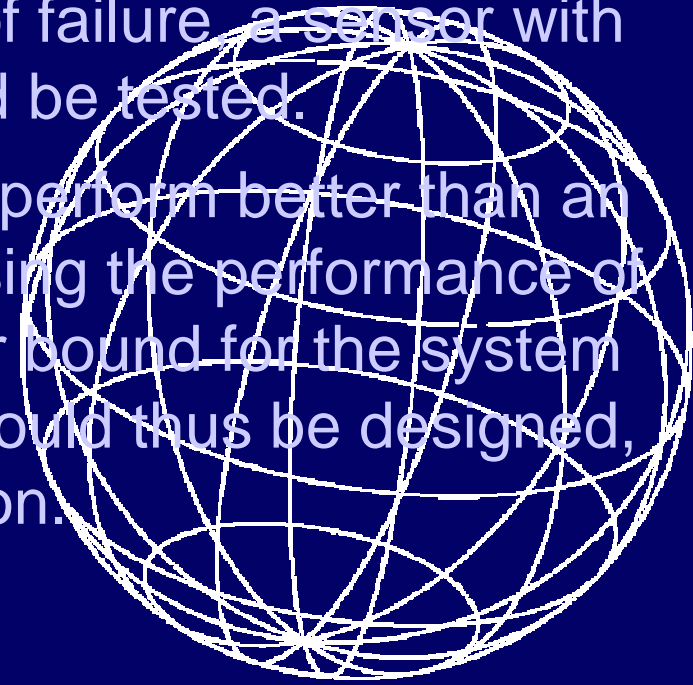
- Useable in the NGI environment (Windows),
- Having as input
 - satellite images (panchromatic and multispectral) taken at a given time
 - the topo-geographical data base produced at a former time,
- Having as output in a GIS
 - a grid of values of estimated changes for the objects « bâti et voirie » per areas of given size





Finding the appropriate sensor

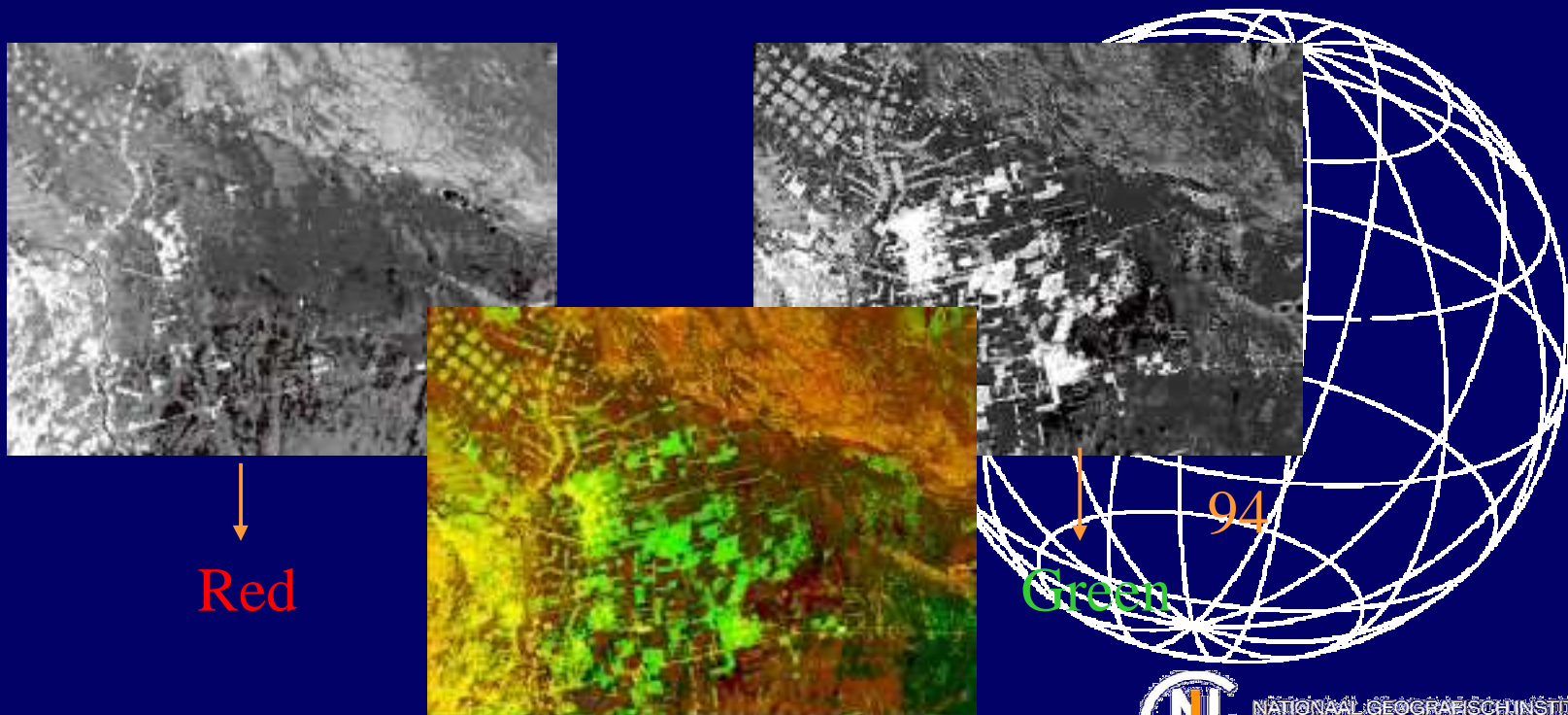
- Because of the financial constraints of the NGI planning, project, the SPOT5 sensor is first tested, despite the fact that a typical house (5mx10m) covers just two pixels!
- First, a visibility test should be performed in order to validate the sensor choice. In case of failure a sensor with a higher resolution (IKONOS) should be tested.
- As we assume that the tools will not perform better than an operator, we are interested in analysing the performance of a human operator to obtain an upper bound for the system performance. A “manual method” should thus be designed, applied and validated on a test region.





State of the Art

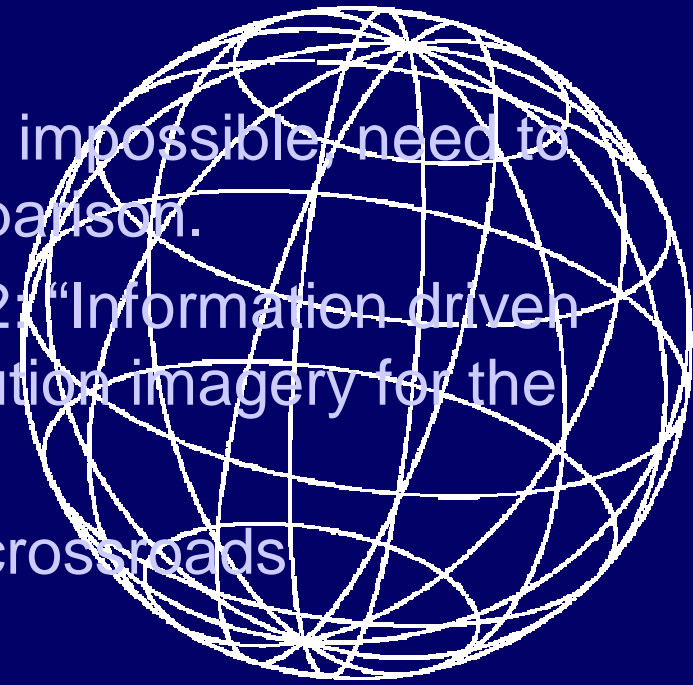
- Most articles and previous projects deal with changes between images, and not changes between an image and a data base. The methods will thus be different.





State of the Art

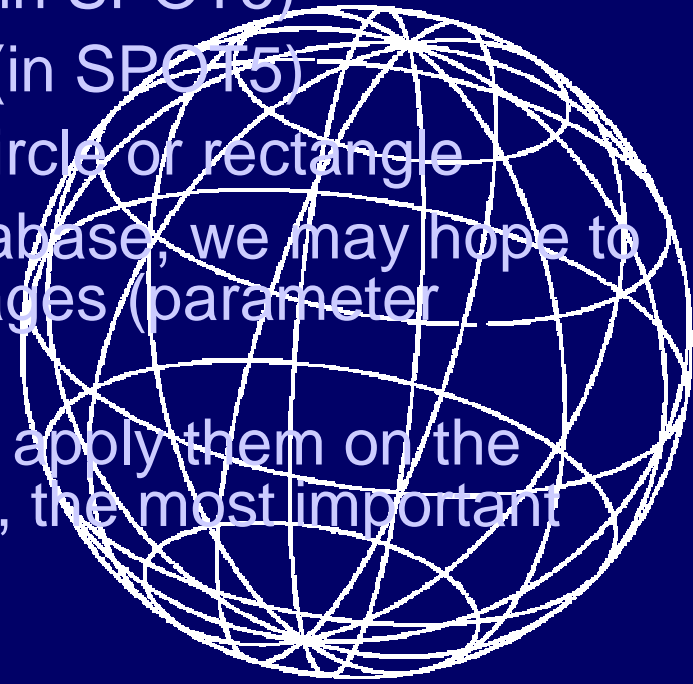
- Several reports made us think that an automatic change detection is impossible.
 - From an ULG report T4-12-71 “[...] Application à la télédétection des changements dans les orthophotoplans numériques”:
automatic change detection impossible, need to be assisted by visual comparison.
 - From a RUG report T4-02-572: “Information driven registration of very high resolution imagery for the update of road databases”:
5% to 20% of detection of crossroads





Key Idea

- Use *structure* and *statistics*. As a starting point, we wish to have a *measure of change*, but not the changes.
- Examples:
 - Road detection: line detection (in SPOT5)
 - Built up areas: house = texture (in SPOT5) –
industrial building = circle or rectangle
 - from the actual state of the database, we may hope to “learn” some rules from the images (parameter setting)
 - Having found the rules, we can apply them on the whole image, and see per area, the most important changes.





Work plan

- Enhance Detection: Line, edge, region, texture detection
 - learn parameters (contrast, size, multispectral aspects) from image at database vector location
 - use inter-relationships:
 - shape relationships (circle, rectangles)
 - neighbourhood relationships (neighbours densities)
 - introduce knowledge
- Use some strategy:

ex: detect water areas first, look for lines inside, then derive a mask: do not care anymore with this areas





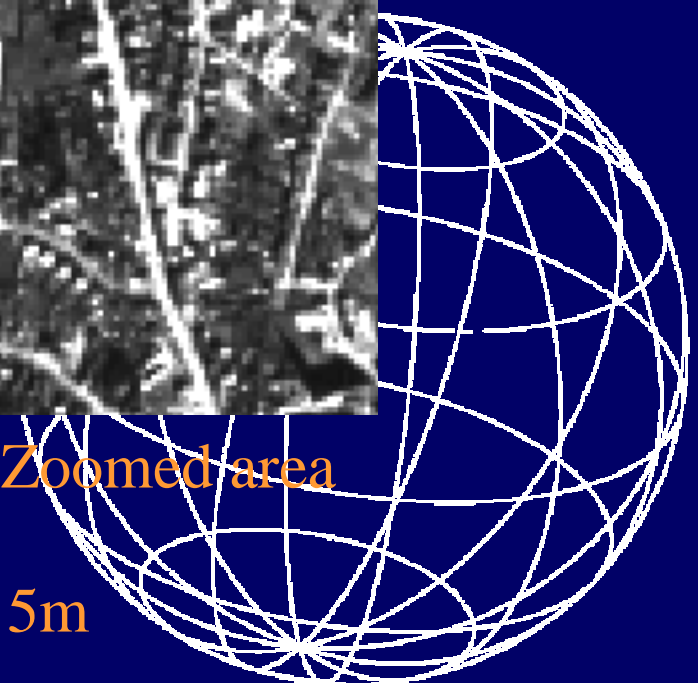
A look at the data

Received 11 April



Zoomed area

SPOT5 5m



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