5 Brain storming sessions
ICA Workshop on Generalisation and Multiple Representation
Leicester UK 20 – 21 August 2004

1 - Challenges for National Mapping Agencies

3 headings: Technical, Theoretical, and Institutional

Technical

- Tighter specification of algorithms, conforming to interoperability standards
- Further development of spatial analysis tools
- … in support of data enrichment and validation processes prior to generalisation
- Methods for gauging and predicting content levels according to viewing scale
- Methods 'combining' updating methodologies and generalisation techniques
- Fusing of heterogeneous databases (conflation of data that varies in theme and detail)
- Derivation of multiple products from a MRDB
- Modelling and generalisation of non spatial attributes of geographic datasets

Theoretical

- Examining cost of process of validation / data enrichment – versus development of robust algorithms capable of working with incomplete/ 'incorrect' data.
- Adapting map specifications to take into account current uses of NMA products
- Development of formalisms supporting specification of map user requirements
- … that enable definition of content specifications, and recording of procedural knowledge used in generalisation process

Institutional

- A need for greater collaboration and sharing of expertise among NMAs given their shared ambitions.
- Increased partnerships between NMAs, vendors and external research organisations
- Agreements that facilitate sharing of code / algorithms / development of shared solutions (→ issues of compliance with standards & OGC)
- Better integration of research outputs into production environments

2 - Building a MRDB

'MRDB for NMA' : reduce the number of data bases to manage, facilitate updating
'objects' are quite similar. different DBs from a single institution. In order to build such a MRDB 2 solutions exist :

- by generalisation from best DBs …
  - but in such a case, the new generalized data will not look like the old one, or at least they have different IDs. It could cause problems with customers
  - can we derive all concept from higher resolution DB ? can all objects be derived from a single master DBs?
- by matching existing data from different DBs …
  - we don't have to wait for generalisation
  - but it does not improved the quality of medium resolution DBs

'MRDB for New services' : remote data bases. different and distant data bases: complementary data … different Data providers :

- more difficulty related to the understanding of feature classes
  - would need not only data matching but also schema matching… and eventually the use of an Ontology to better recognise similarity.
  - the community of 'Data Fusion' could give us interesting input.

one of today difficulty : DB schema change very often .. how to build and use MRDB in such a context ? in some case, Data Schema changes nearly more than Data …

Unique schema and ontology (in the context of MRDB)

- would it be possible to find – and share – a common data schema that would facilitate MRDB ?
- as an 'ISO' or 'OGC' solution ..
- if not convenient, an ontology would help for integrating concepts and objects … but
- are there LOD where concept appear, and concepts desappear?
- should the ontology hold the concept of LOD ?
- it is not only that some concepts appear or disappear according to the LOD but the 'quantity of objects' also change : An hydrographic network is represented with less rivers (but the main ones) when resolution decrease..
- Some object seams to 'stay' what ever the LOD (e.g. a Church) while others are more DB dependant and scale range dependant (e.g. a vegetation area).

About the *persistence* of some objects and the *'ephemerity'* of others and the consequence of the data coherence …

- can we build a MRDB where some objects exist whatever the LOD while other are scale dependant. In such a case can we take the objects we want : would the global set be coherent (not coherent in itsel but coherent with the reality it is supposed to depict =Faithful to the reality ?
- the problem of topological coherence through scale is state … and should be more discussed.

3 Developing a research agenda in generalisation and multiple representations

Formalisation of Generalisation specifications
- a glossary of geo/ carto terms and their definition
- formal model describing mapping space at differing scales (possibly derived from inspection of NMA map specifications)

Methods for supporting updating of databases and propogation of form over varying scale
- modelling the extent of a region affected by any given update process
- defining the type of update and optimal ordering of updates (by class, by region/ group)

Process modelling in support of orchestration of map generalisation methods
- Modelling of sequencing of generalisation processes
- linking the modelling process to levels of analysis required both prior and during the process

4 - Impact of the web on mapping technology

Observations
Web services are :

- changing the expectations of the user:
  - information that is free, quick, current, with intuitive interaction, meaningful response, wide choice of output in various formats
- encouraging a geoworld perspective that requires Geospatial data infrastructures

Providers need to develop new *business models* adapted to web based services (business to business and business to customer)

Implications:

- Technology: Conformance to interoperability (OpenGIS and opensource)
- Use: Data integration techniques
- Services: National Mapping Agencies acting as repositories – sole source of *service* rather than supply of databases
- Delivering vector and raster solutions

Research issues:

- better interfacing between generalisation technology and lay, non-specialist users
- development of generalisation techniques in the context of integration of data that are disperate in scale, theme, and source.
- Generalisation on demand
- Generalisation techniques capable of creating many different types of maps

5 Issues of Interoperability in Map Generalisation

Education
Resources for the education of newcomers are particularly valuable:

- CD-ROM produced by Swiss Society of Cartography. Currently in German; English translation in the works (should be ready by the end of 2004?) → for ordering information, see www.kartographie.ch
- E-learning: Within the Swiss GITTA project (www.gitta.info) an English language lesson on generalisation has been produced by the Institute of Cartography, ETH Zurich. See GITTA homepage for further details.

Test Data
Although some test data sets are available on the (old) Commission website (www.geo.unizh.ch/ICA/), there is a need for more and better. These could be supplied as Shapefiles or in GML; in any case the key element is the metadata (description of the data model, schema, symbolisation, sample plot, description of generalisation requirement?)
It was noted that some these should emerge from the proposed EuroSDR State-of-the-Art project. They could be held for re-use by the Commission.

Software and Algorithms
Three levels were distinguished:

- Algorithms at the source code level. These could be supplied on a licenced basis or as Open Source. Two levels of use were noted

    - Informative. This might be achieved by 'pseudo-code' if supply of source code was a problem. Any user would probably have to adapt the code or re-code
    - As usable code. An issue would be the 'geoprocessing library' that the algorithm assumed. Standardisation (eg through OGC) exists only at the Simple Feature level

  The level of documentation required for usefulness is a potential issue.
- Executable code, either in component form (eg COM objects) or as a library. In the later case, several projects are successfully using JTS/JUMP which is an Open Source library. The possibility of building on this and extending it in support of Generalisation is an avenue to consider
- A Standardised Services-based Architecture. It was noted that although there is a 'placeholder' in the OGC specifications for 'Generalisation Services', it is empty. The ICA group might be appropriate for the task of initiating action. The key issue is the decomposition of the task into appropriate services. This is not yet well understood. The standardisation of the underlying 'geoprocessing library' is also an issue. It would be necessary to start with something simple. Development of formal standards require considerable resources.

There was great deal of enthusiasm for sharing, particularly in the research community. All the stakeholders need to make their positions clear, eg the user community (National Mapping Agencies) in relation to Open Source, the software vendors.

Proposals for Possible Next Steps

- An inventory of sources, that is, algorithms available in source code form
- Devise or select a commony usable pseudo-code for algorithms
- A re-implementation of the AGENT project in Open Source form or in some other more accessible manner (?)
- A start on a service-based architecture with some suitable small services
- Seek funding opportunities. It was noted that past projects have depended on a significant level of funding/subsidy. Resources would be needed. It was also noted that most Open Source projects had been explicitly designed and funded to produce an Open Source result.

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