Generating and using an MRDB for mobile applications

Mark Hampe, Monika Sester

Institute of Cartography and Geoinformatics, University of Hannover, Germany
Overview

- Generating Multi-Representation Database (MRDB)
  - Generalisation
  - Matching

- Case studies using the MRDB
  - Support realtime generalisation process
  - Variable scale maps
  - Emphasize PoI’s
  - Information drilling

- Near future work
  - Improve middle layer

- Summary & Outlook
Aim and concept of the MRDB tests

- Test the concept of an MRDB by populating it with buildings / built-up areas for scale-range 1:1,000 up to 1:1,000,000.
Establishing LoD‘s and links

- Different LoD‘s already exist
  - derive the links by a data matching process

- Derive LoD‘s by generalisation methods
  - derive the links as a „by-product“ of a generalisation process
The generalisation processes

- Simplification
- Combination (amalgamation)
- Enlargement / Exaggeration
- Selection / Elimination / Typification
- Classification
- Displacement
Simplification
Amalgamation of buildings

Original geometries

Amplify the geometries

Merge and make the geometries smaller
Displacement (PUSH-Software)
Displacement (PUSH-Software)
Quality of displacement
Creation of links by matching process

- Match by distance:
  - Find objects located inside an envelope around certain object by calculating intersection (iterative; right case distance=0)
  - Calculate distances (in left case)
  - Calculate overlapping areas
Store the geometry and the links

MRDB level 1: original dataset

MRDB level 2: generalised buildings

Storing the links in an
a) extra table  b) extra columns
Workflow for MRDB process

1. **(mobile) User** requests data via HTTP
2. **Java Servlet Container** processes the request using XSLT to convert to GML format
3. **MRDB** retrieves data and processes it
4. **SVG** is generated as output
MRDB for realtime generalisation

The role of the MRDB in the realtime-generalisation process

- Pre-calculate the time-consuming generalisation processes
- Store the geometries in certain generalisation steps
- Store additional attributes to support the realtime-generalisation
  - Center of gravity
  - Area
  - Orientation of buildings
  - Minimum bounding rectangle (MBR)
  - ...

### Information drilling (Geometry)

<table>
<thead>
<tr>
<th>Owner</th>
<th>Size</th>
<th>Street</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peterson</td>
<td>200 m²</td>
<td>Mainstr.</td>
<td>4711</td>
</tr>
</tbody>
</table>
Information drilling (Attributes)

<table>
<thead>
<tr>
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<th>Size</th>
<th>Street</th>
<th>Number</th>
<th>ID</th>
</tr>
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<tbody>
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<td>10</td>
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</tbody>
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<table>
<thead>
<tr>
<th>District</th>
<th>Postcode</th>
<th>ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nordstadt</td>
<td>30167</td>
<td>110</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City</th>
<th>Inhabitants</th>
<th>ID</th>
</tr>
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<tbody>
<tr>
<td>Hanover</td>
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</tr>
</tbody>
</table>

MRDB

1:500k → 1:100k → 1:25k → 1:5k
Multiscale maps for small displays

Original Data (MRDB) (by Lars Harrie)

Variable-scale map
Variable-scale map

(by Lars Harrie)

Coarse data

Detailed data
Workflow for variable scale map

1. Request coarse data
2. Identify built-up areas in the central part
3. Request buildings in central part
4. Merge data
5. Perform variable scale mapping

(mobile) User

MRDB access via WFS
Visualise landmarks in a multiscale map
Near future work: Improve Middle-Layer

- Develop a rule based middle layer to collect necessary MRDB data
  - Rules should determine necessary
    - LoD
    - Feature Class => Table containing the data
    - Features
  - Dependent on
    - Application
    - Actual scale
    - Position
    - ...
- Provide Metadata of the MRDB
Workflow for visualising landmarks

1. Request source data
2. Match landmark position with buildings
3. Delete matched object
4. Request buildings linked with matched object
5. Match the landmark position with new buildings
6. Keep matched buildings, merge remaining objects

MRDB access via WFS
Summary & Outlook

- An MRDB can be used for several (mobile) tasks
  - Support for realtime generalisation
  - Multiscale maps
  - Information drilling functionalities
  - Visualising PoI’s

- Future work
  - Derive further MRDB level by generalisation
  - Develop a more intelligent rule based middle layer to receive data from the MRDB
  - Implement introduced test applications on PDA for mobile use
More information at:

Thank you ...

http://www.ikg.uni-hannover.de

http://gimodig.fgi.fi