MRDB APPROACH FOR AUTOMATIC INCREMENTAL UPDATE

K.-H. Anders¹, J. Bobrich²
¹Institute for Cartography and Geoinformatics
University of Hannover
²Federal Agency for Cartography and Geodesy
Frankfurt
ATKIS MRDB

- Project is funded by the Federal Agency for Geodesy and Cartography (BKG)
- Integrated consistent storage of all ATKIS data sets in Germany
  - BaseDLM (1:25.000), DLM50 (1:50.000), DLM250 (1:250.000), and DLM1000 (1:1.000.000)
- Automatic generation of links between related objects of the different DLM’s by
  - Matching
  - Generalisation
- Automatic incremental update of DLM50, DLM250, and DLM1000 based on the changed BaseDLM.
Harmonisation of the ATKIS Object-Catalogues

Example Object type 2315 Building

- **OK50**
  - Object type: point, area
  - Special object creation rules: none
  - Capture rule: Complete for the DTK50, Greenhouses only if building area $\geq 2.5$ ha

- **OK250**
  - Object type: point
  - Special object creation rules: none
  - Capture rule: Building with high national or tourist significance

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Ambiguous! doesn’t fit to the OK50, because the national or tourist significance is not captured in the OK50!
Consequences for the ATKIS Object-Catalogues

- Homogenous semantic model
  - OK1000 $\subset$ OK250 $\subset$ OK50 $\subset$ BasisOK for all object types and attributes
- Capture rules without ambiguities
- Transition rules from one catalogue to the next following
- Rules have to be *readable* for computers!
  - Rules understandable only for a human operator are only allowed for the BaseDLM
MRDB System
MRDB as a Federated Database System

Federation Layer

Administration of Object Links
MRDB Prototype: System Components

**GUIs**
- Register DB
- Matching
- Visualisation (GisVisual)
- Visualisation (ArcMap)
- Generalisation

**Stored Procedures / SQL**
- ADO
- ArcSDE

**Working-DBS (Oracle9i+Spatial)**
- Links
  - BasisDLM
  - DLM50
  - DLM250
  - DLM1000
  - ArcSDE-Metadata
MRDB Prototype: Object Link Schema

Complex Object A

Complex Link
+Geometric Relation
+Type of Generalization

Complex Object B

Simple Object A

Simple Link

Simple Object B

consisting of

consisting of
MRDB Visualisation
MRDB Visualisation with ArcGIS
Beispiel: ATKIS DLM1000, DLM250 und DLM50
MRDB Update
Update Situations in an MRDB

Incremental Update

Verification or Hypothesis for Update

Small Scale

Intermediate Scale

Large Scale (Base Model)

Change
Update Trigger

- Updates can have different reasons

ATKIS-Object

- Insert
- Delete

- Reclassification
  - Type
  - Coordinates
  - Model Generalisation

- Reshape
  - Type
  - Coordinates

- Geometry
  - Modify

- Attribute
Sequence of Procedures

- Insert
- Delete
- Reclassify
- Reshape
- Attribute
- Aggregate
- Generalise
MRDB Update Propagation

Delete

Rep1    Rep2    Rep3

RepN
MRDB Update Propagation

Object deleted
MRDB Update Propagation

Classification
Aggregation
Reshape

Rep1
Rep2
Rep3
RepN
MRDB Update Propagation

Rep1   Rep2   Rep3

RepN
Problem using MRDB Links
Deleting Object

Priority-Table

The diagram shows the process of deleting an object from a priority table. The object is marked with an 'X' and is moved from the table to the right side, as indicated by the arrow.
Stored Object Links

Priority-Table

[ikg logo]
Using Links for Updating

Priority-Table
Using Links for Updating

Priority-Table
Using Links for Updating

Priority-Table

Diagram showing the updating process with links and priority table.
Using Links for Updating

Priority-Table
Using Links for Updating: Wrong or Right?

Priority-Table

Diagram showing the use of links for updating in a priority table.
Using Links for Updating: Wrong or Right?

Priority-Table

Solution: Neighbourhood must be analysed at first!
Further Work

- End 2004: first running prototype for
  - Matching of line and area objects
  - Incremental update for area objects
  - Rule based process control

- 2005
  - Model generalisation of line objects
    - Roads, water, and railway
  - Migration concept to the new AAA-Model (ATKIS-ALKIS-AFIS)

- General other work
  - Improvement of the ArcGIS MRDB visualisation
  - Development of multi-scale data analysis tools
  - Automatic verification and hypotheses of updates into larger scales
General Open Questions

- Different DB’s for multi-representations or one DB with different DB-Views?
- Efficient implementation of an MRDB
  - Efficient storage of explicit links
  - Efficient derivation of links by queries
- Efficient infrastructure for an MRDB using distributed databases
- Design of multi-scale operations that take MRDB-structure into account