Application of Membrane Homogenization Method for Slovenian Cadastral Index Map

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LAND CADAstre IN SLOVENIA

1818 – 1829: first cadastral survey
Cadastral maps 1:2880;

1869 – 1882: new systematic cadastral survey (reambulation)

1871: land register
Dual property registration system

1945 – 1991: the maintenance of the land registration system was weak in some areas (urban)

1991-
Transition from planned-administrative economy to marked oriented economy

Security of ownership essential

Digitalization of cadastral data

REAL ESTATE EVIDENCES IN SLOVENIA:
(1) Land Cadastre (SMA)
(2) Building Cadastre (SMA)
(3) Land Register (Court)
Digital cadastral maps (vector model) are in many cases the:
- geometrical and
- topological reference for other spatial data;

Improvement of digital cadastral maps’ quality

1. DATA SETS HAVE BEEN DEVELOPED OVER LONG PERIOD
   - different methods of data acquisition;
   - different methods of data maintenance;
   - dynamic system – new observation ...
2. DATA ARE BASED ON OBSERVATIONS - measurement based data (Gielsdorf, 2005):
- **random variables**: any measured value contains some uncertainty!
- **redundant variables**: commonly there exist more measured values then necessary to be able to calculate unique point coordinates!
- **neighbourhood (distance) dependent observations**!
PILOT PROJECT – methodology

Methodology:
- identification of identical (tie) points,
- field measurements,
- adjustment and homogenization,
- interpretation of results.


PILOT PROJECT – membrane method

Positional and Geometrical Accuracy Improvement of Cadastral Index Map (Source: Gielsdorf, 2011)

MEMBRANE METHOD

Observations, local coordinates

Data sources:
- GNSS and tachimetric measurements of identical points
- field books

Homogenization (membrane method)

Simulation of observations:
- distances (triangulation)

PILOT PROJECT – membrane method

HOMOGENIZATION - Distance Dependent Residual Distribution
(Gielsdorf, 2011)

Artificial observations from each new point to the fixed points surrounding him

Observation topology **neglect the direct neighborhood**

The neighborhood is violated if **geometrical conditions** are introduced.

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PILOT PROJECTS – relative geometry

INTEGRATION OF RELATIVE GEOMETRY – original and artificial observations:

MEMBRANE METHOD
- identified observations
- membrane triangles
- straightness observations
- rectangularity observations
- parallelism observations
- local coordinates
- distances

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HOMOGENIZATION - Distance Dependent Residual Distribution (Gielsdorf, 2011)

- coordinates are originated by measuring and mapping by the principle of neighborhood;
Example: points of a cadastral map.

4 Parameters Transformation

Homogenization

CADASTRAL COMMUNITY ŽAŽAR: INPUT DATA AND OBSERVATIONS
CONCLUSIONS

Improvement of cadastral maps’ geometrical quality

Homogenization (neighbourhood relations and geometrical constraints) should be considered by the adjustment model with integration of:

- GNSS and tachymetric measurements
- field book data.

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