


University of Ljubljana Faculty of Civil and Geodetic Engineering

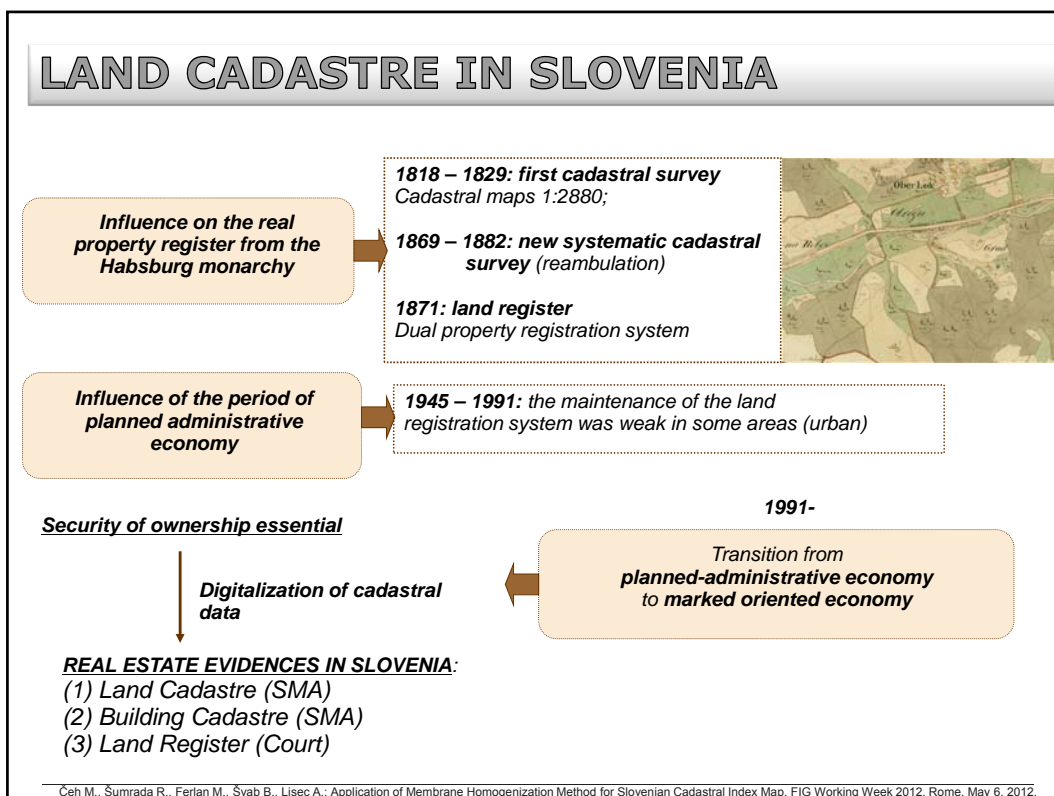


Application of Membrane Homogenization Method for Slovenian Cadastral Index Map

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FIG Working week 2012, Rome, May 6-10, 2012

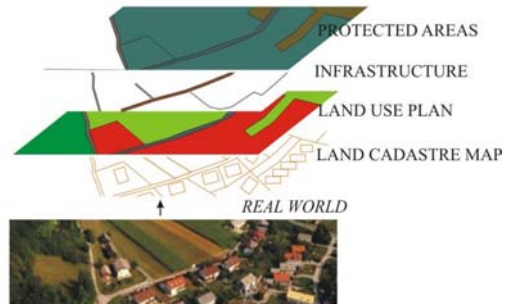


LAND CADASTRAL INDEX MAP

Digital cadastral maps (vector model)

are in many cases the:

- geometrical and
 - topological reference
- for other spatial data;



Improvement of digital cadastral maps' quality

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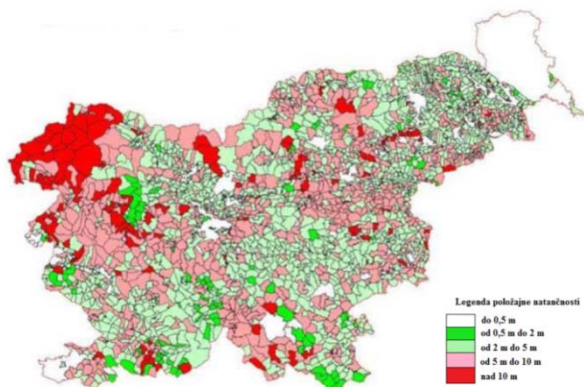
LAND CADASTRAL (INDEX) MAP – 1.

1. DATA SETS HAVE BEEN DEVELOPED OVER LONG PERIOD

- different methods of data acquisition;
- different methods of data maintenance;
- **dynamic system** – new observation ...



*Graphical cadastre surveying
Students of geodesy at UNI Ljubljana 2004*



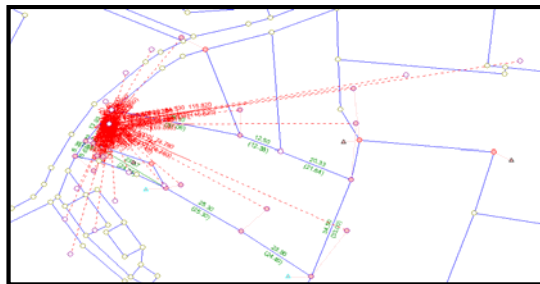
Positional accuracy of land cadastral index map in the cadastral communities in Slovenia (Source: Geodetic Institute Slovenia)

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LAND CADASTRAL (INDEX) MAP – 2.

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 than necessary to be able to calculate unique point coordinates!
- **neighbourhood (distance) dependent observations!**

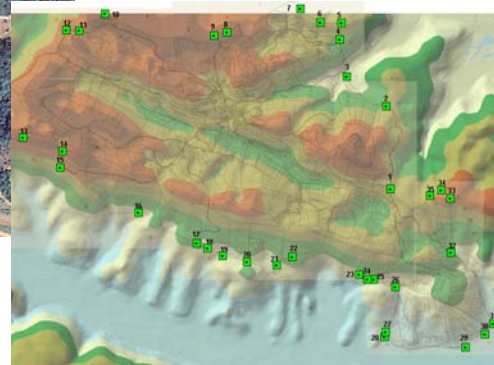
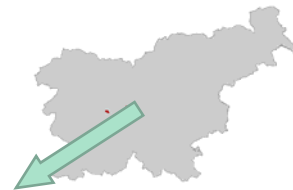


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PILOT PROJECT – study area

Study area:

Cadastral Community of Žažar



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PILOT PROJECT – methodology

Methodology:

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



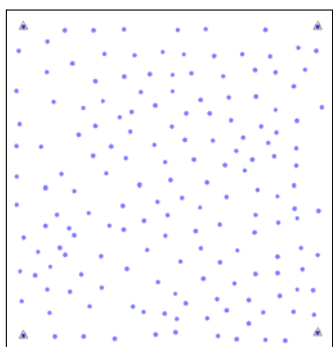
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PILOT PROJECT – membrane method

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

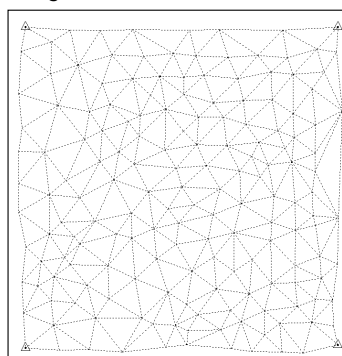
MEMBRANE METHOD

Observations, local coordinates



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

Homogenization (membrane method)



Simulation of observations:
- distances (triangulation)

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PILOT PROJECT – membrane method

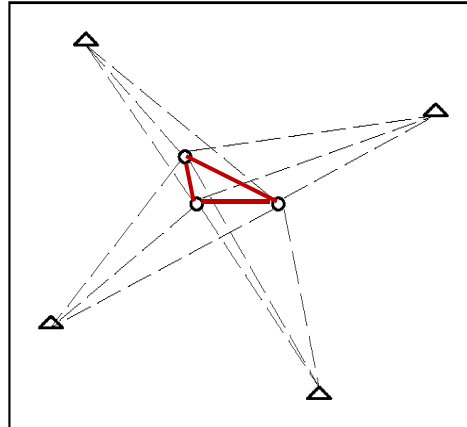
HOMOGENIZATION - Distance Dependent Residual Distribution

(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.



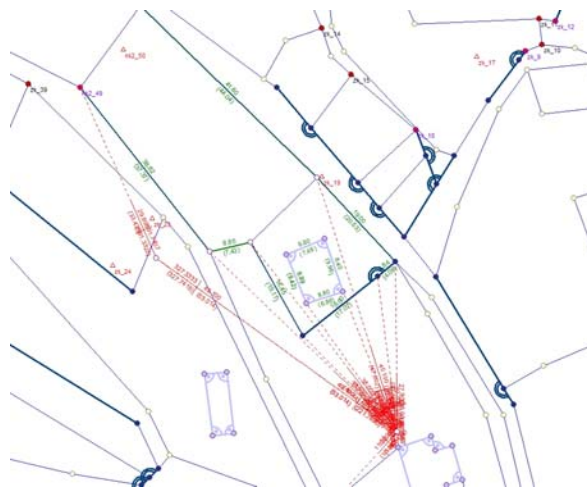
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PILOT PROJECTS – relative geometry

INTEGRATION OF RELATIVE GEOMETRY – original and artificial observations:

MEMBRANE METHOD

- identified** observations
- membrane triangles**
- straightness** observations
- rectangularity** observations
- parallelism** observations
- local coordinates**
- distances**



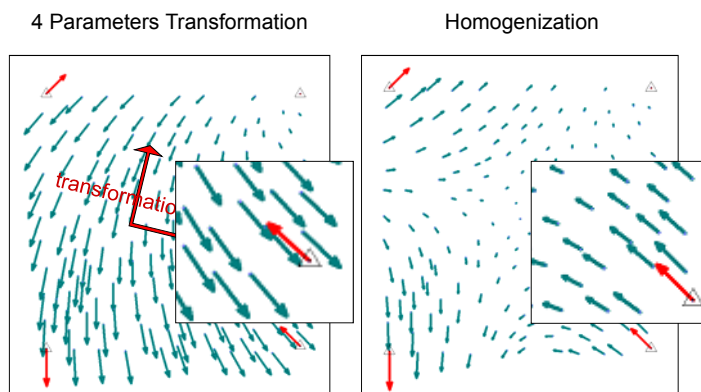
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PILOT PROJECT – membrane method

HOMOGENIZATION - Distance Dependent Residual Distribution (Gielsdorf, 2011)

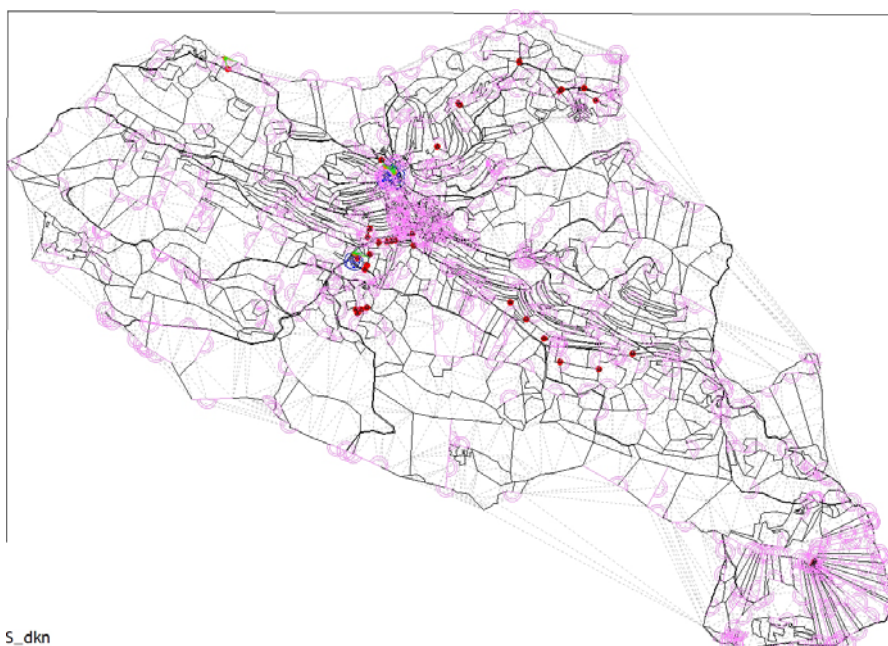
- coordinates are originated by measuring and mapping by the **principle of neighborhood**;

Example: points of a cadastral map.



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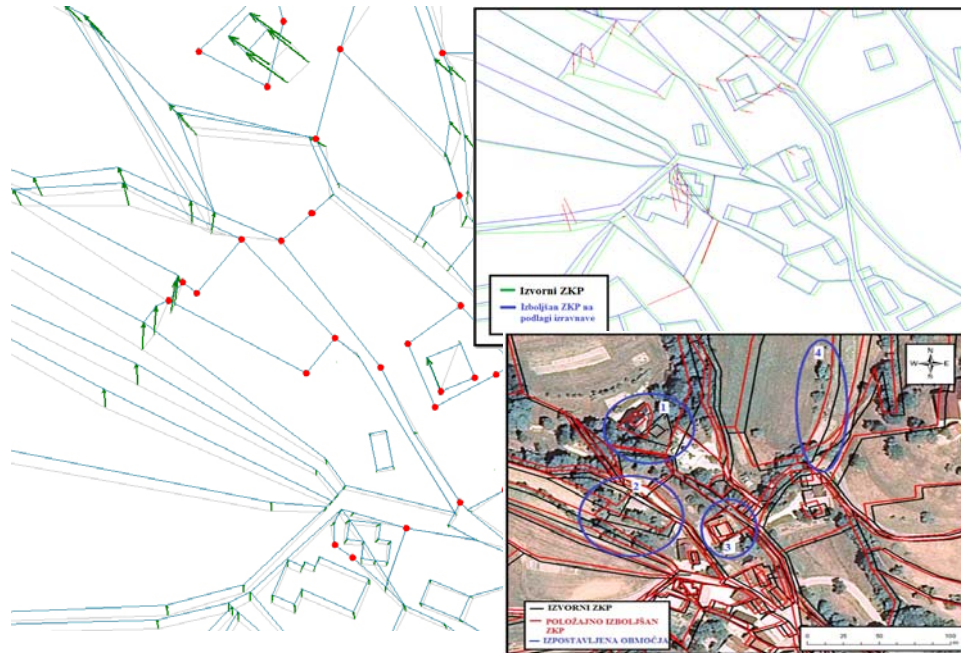
CADASTRAL COMMUNITY ŽAŽAR: INPUT DATA AND OBSERVATIONS



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CADASTRAL COMMUNITY ŽAŽAR: INPUT MAP AND RESULTS OF MEMBRANE ADJUSTMENT



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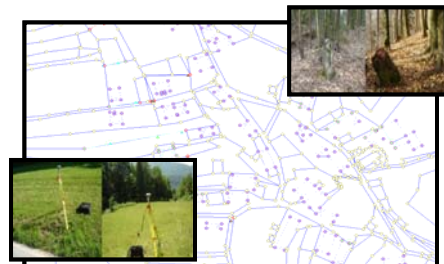
CONCLUSIONS

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.**



ACKNOWLEDGEMENT:
The research project has been supported by Technet GmbH (Systra)

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THANK YOU FOR YOUR ATTENTION!

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