

The role of the prediction strategies for the reliable transformation between two geodetic reference systems

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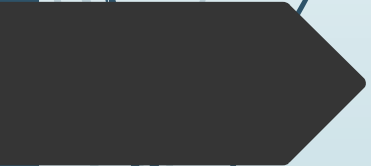
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Additional Material

THE PROBLEM

- Topographic Maps of the Topographic Agency, Ministry of Agriculture for land distribution or redistribution to refugees or landless citizens, started from 1910 and enhanced during 1920, 1930, 1950
- Topographic Maps with use of specific Reference System, the “old Bessel”, projection Hatt
- Geodetic work for “old Bessel”: prior to 1940

Problems:

1. “Old Bessel” does not have the need accuracy for modern needs
2. Hatt projection is not commonly used world – wide
3. Hatt projection is not included in GIS

Geodetic Reference System Army Geographic Agency

- Uses the “new Bessel”
- Based upon new and more accurate measurements, after 1980

... *THUS* ...

“Old Bessel” and “New Bessel” ***are two different systems***

Hellenic Geodetic Reference System 1987

- Hybrid RS for which were used both classical and satellite measurements
- Use GRS80 and Transverse Mercator Projection (one zone)
- **Official Reference System** for Hellenic Cadastre (1995) and all topographic diagrams and maps (2011)

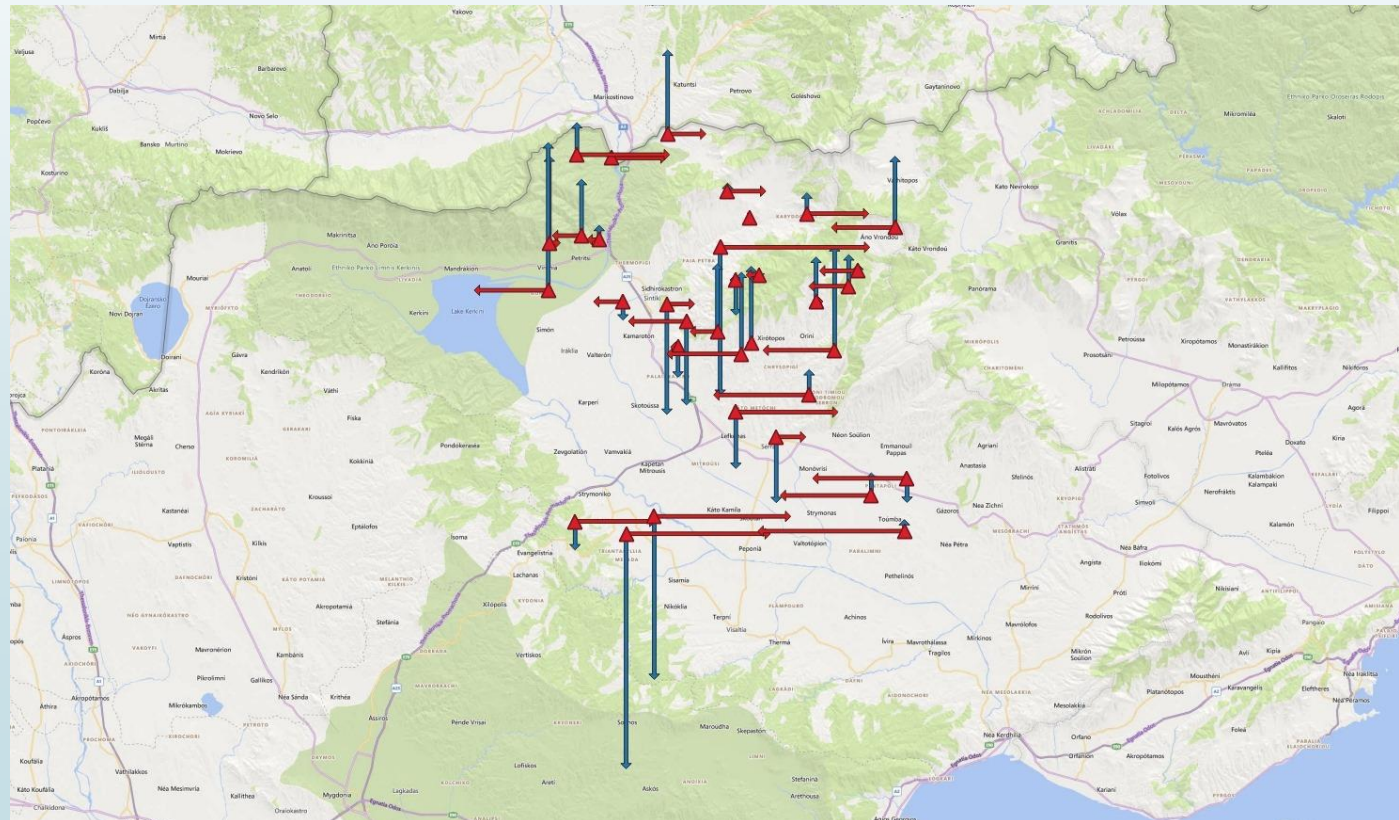
Transformations between RS

- 1995 official governmental act: transformations between “new Bessel” and Hellenic Geodetic Reference System 1987 (no vice versa)
- Accuracy: 15-20 cm
- Transformation between “old Bessel” and Hellenic Geodetic Reference System 1987 is not covered by official and common accepted procedure
- Adhoc techniques are applied: 2D

There is no official study on this transformation problem between “old Bessel” and Hellenic Geodetic Reference System 1987

2D Transformation between “old Bessel” & Hellenic Geodetic Reference System 1987

- Serres, North Greece
- 37 benchmarks, in both RS, were used: 3 as control points



2D Transformation between “old Bessel” & Hellenic Geodetic Reference System 1987 results 1/2

ID_GMA	dx	dy
60001	-0.184	-0.062
60006	-0.543	0.094
60023	-0.895	1.001
60026	0.047	0.027
60029	0.871	0.292
240002	-0.083	-0.493
240016	0.157	1.221
240018	2.106	-2.081
240020	-0.172	0.203
240022	-0.411	0.791
240039	0.539	0.113
240052	0.771	0.098
240053	1.303	0.451
240060	0.539	1.179
336002	2.031	-3.303
336006	1.125	-0.401
336008	1.921	-2.291
336050	1.438	-0.791
336054	0.825	1.081
336077	-0.105	-0.423
336083	-0.385	0.951
336089	-0.816	-1.174
336096	0.391	-1.551
336097	-0.414	-0.258
336100	-1.042	2.074
333004	-2.062	0.162
333021	-1.282	0.316
333031	-1.329	-0.338
333048	0.416	-0.923
333070	-1.344	0.355
333083	-1.609	-0.099
333086	-1.051	1.147
333089	-1.009	1.469
333093	-0.063	1.082
333104	-0.177	1.162
333112	0.097	0.623
333117	-0.561	0.442

34 benchmarks in both RS, 2D transformation, calculation of dx & dy

3 benchmarks were used as control points
(not used in interpolation process)

2D Transformation between “old Bessel” & Hellenic Geodetic Reference System 1987 results 2/2

- Transformation between “old Bessel” & Hellenic Geodetic Reference System 1987 shows good consistency
- Interpolation of 34 benchmarks dx and dy: Bayesian Kriging & Radial Basis Function
- Prediction values and cross validation for dx & dy of 3 control points: **excellent consistency**
- **Kriging gave better results**



Thank you for your attention!