Spatial Configuration of Geodetic Points

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Intoduction

- The geodetic control network provides a reference system for determining the position of all geospatial data, defined by coordinates in the national reference frame.
- It plays a key role in developing all core data and users' thematic data, because it provides the spatial reference source to register all other spatial data.

The study aims at:

- Analysing the relationship between the number of geodetic control points (GCP) and the type of land use using linear regression (OLS) and geographically weighted regression (GWR).
- Analysing the density of geodetic control points.

Study area

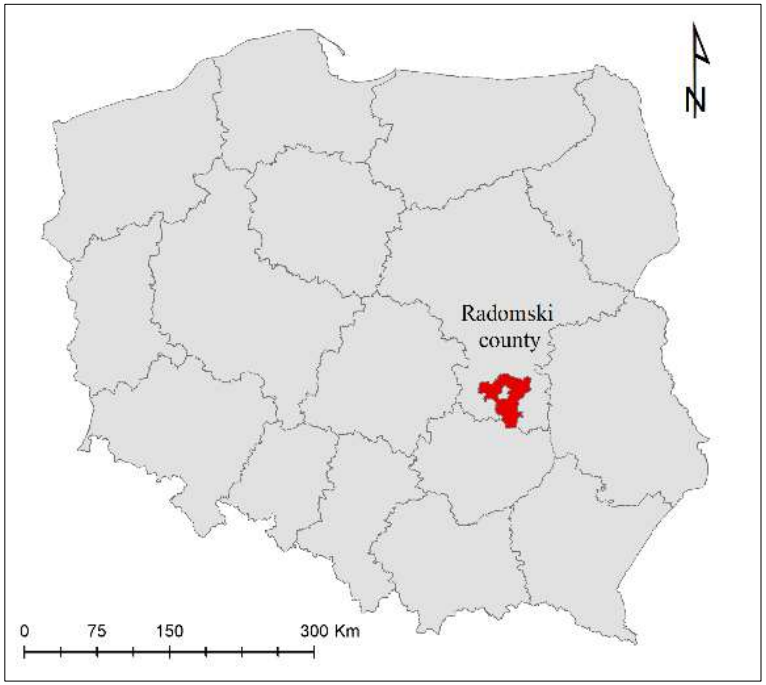


Fig.1. Radomski county location

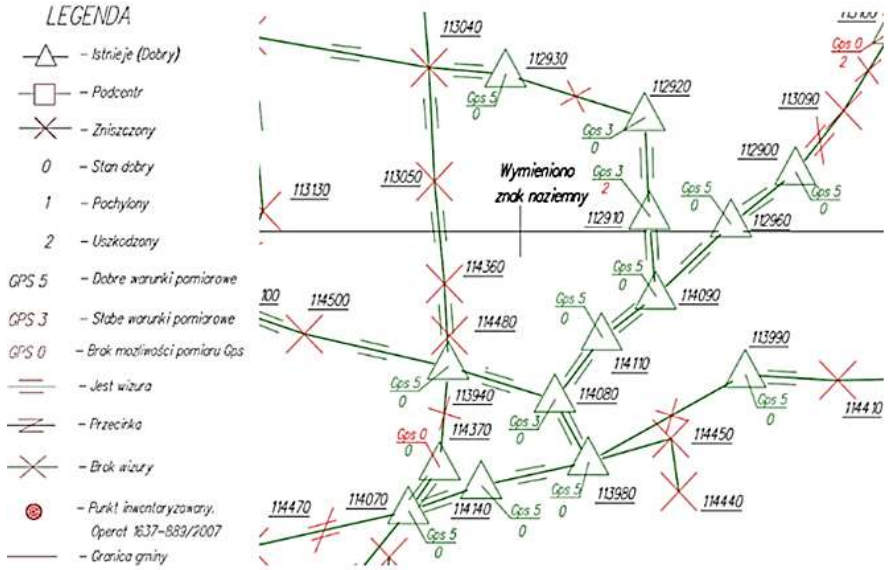
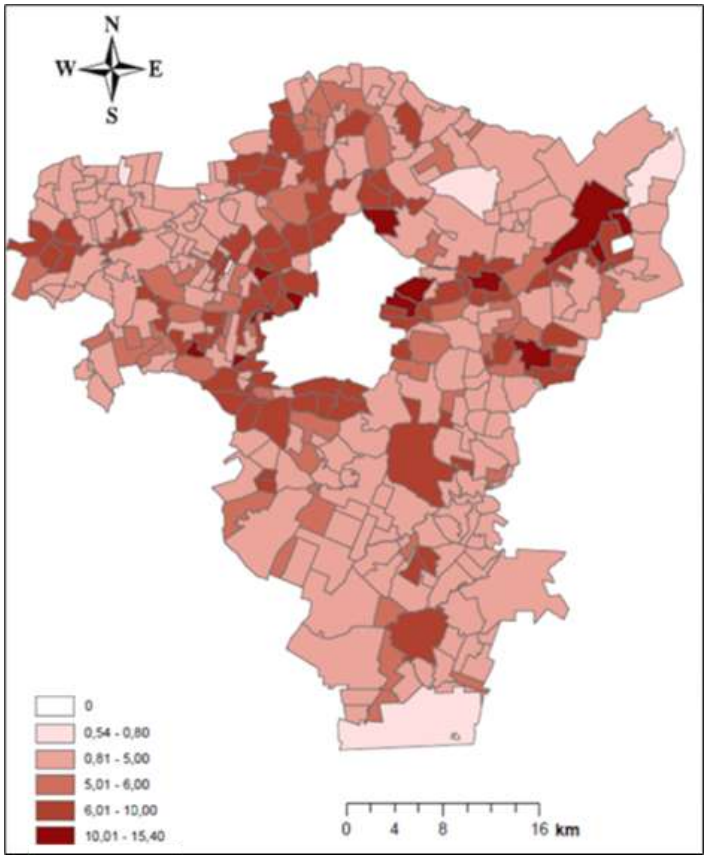


Fig.2. Detailed, horizontal geodetic network, an example

Density of geodetic control points (GCP)

- The average density of GCPs is one point per 21.3 ha.
- Local density of GCPs varies from 0.54 to 15.4 points over 1 km^2 and shows places of higher and lower point density.
- A significant increase in the density of geodetic points is observed in urbanized regions.



Number of GCPs in the vicinity of roads, railways, electricity lines and water bodies.

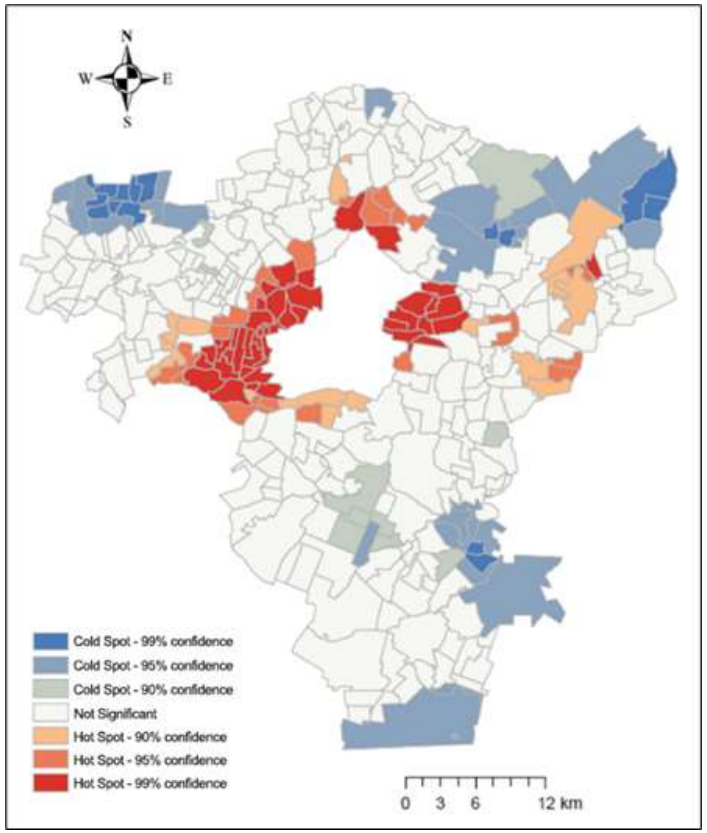
Buffer zones	Geodetic Control Points Number
50 m around paved road	6056
15 km around railways	89
100 m around electricity lines	4426
100 m around water	787

Density of GCPs over land use types

Land use	Number of GCPs	Area [ha]	Number of GCPs per 1 ha
Rural	3816	92838.3	24.3
Built-up	2421	39465.7	16.3
Forested	693	17707.4	25.6
Miscelaneous	93	2935.3	31.6

Moran's I and Getis-Ord hot spot

- Global Moran's I statistics, based GCPs density returned negative I and z-score values of 10.459 with a 99% level of significance.
- This empowers rejection (with a probability greater than 1%) of the null hypothesis assuming that, density of geodetic control points is randomly distributed in study area.
- Therefore, the spatial distributions of geodetic control point density is clustered.



OLS regression

		coefficient	Std.	T statistics
Independent variable	GCPs density	4.85	2.59	1.88
Exploratory variables	Area	-0.01	0.02	-0.52
	Road density	0.28	0.09	3.22
	Built-up areas (%)	0.26	0.05	5.68
	Forests (%)	-0.04	0.03	-1.34
	Rural areas (%)	-0.02	0.03	-0.88
$R^2 = 0.40$ corrected $R^2 = 0.39$ Akaike AIC = 1349.73				

CONCLUSIONS

- The conducted study proved that geodetic control points are scattered with significantly visible groupings along roads, railways, and built-up area.
- It also shows that information on the land use has a vital influence on the number of geodetic control points and indicates where geodetic control needs densification.

Thank you

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