Alternative Approaches to Perception of Space in Spatial Analyses Using GIS Tools: a Polish Case Study

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SUMMARY

1. Introduction

The main purpose of the following study was to examine the utility of chosen tessellation methods in comparison with commonly used interpolation methods in geospatial analyses for the purposes of land management. Basing on the analysis of an existing scientific gap regarding the consideration of irregularities of various spatial phenomena, the main purpose was to demonstrate how an application of an irregular space partition can enable to visualize the real world in a way similar to its factual, heterogenic nature, especially in the case of dispersed data or the lack of them.

2. Materials and Methods

The main study was based on a database of real estate prices from the Register of Prices and Values of the Real Estates in the olsztyński poviat (a local real estate market), consisting of transactions of ownership rights of undeveloped agricultural land, from the secondary market, with natural persons, legal persons, the State Treasury, and local government units as parties of the transaction, made between 2007 and 2017.

The research consisted of the commonly used interpolation methods, as inverse distance weighting (IDW) interpolation, natural neighbour interpolation and kriging (25x25 m). Although, the main topic of interest in this study was tessellation, understood as a process of dividing a bigger area into smaller polygons (of the same or a different shape), without gaps or overlaps. In the research square tessellation (5x5 km), geodetic division and Voronoi diagrams (as examples of tessellation) were used.

Under the study an analysis of spatial distribution of real estate prices was

performed, considering the heterogenic nature of the real estate market and spatial discontinuities, and a comparison of the results obtained by using chosen interpolation and tessellation methods to Voronoi diagrams generated for the same set of points was made.

The research consisted of a general statistical analysis of the real estate market in the olsztyński poviat, regarding the spatial distribution of prices, the results of which are presented using chorochromatic maps.

3. Results and Discussion

The next stage of the research was the validation of the obtained results with a subset of 261 transactions by the comparison of the results of selected methods of interpolation and tessellation with the prices actually obtained as a result of concluding transactions.

4. Conclusion

Basing on the conducted case studies, one can state that:

1) Activity of the real estate market is not correlated with the surveying borders in a macro (districts/poviats), meso (geodesic precincts) and micro (land lots) division, and the usually applied averaging of observations within those borders is an excessive simplification deforming the reality.

2) Using typical cadastral classification is not the best solution in every situation. While conducting various analyses of the real estate market or space, methods of space-division other than the most common ones should be considered as well, especially in case of extremely dispersed data or a shortage of them. The “natural” shape of chosen tessellation methods can be considered useful while making investment decisions (regarding given criteria) for the purposes of land management.