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PIOTR WERNER¹

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APPLICATION OF CELLULAR AUTOMATA AND MAP ALGEBRA IN STUDIES OF LAND USE CHANGES THE NEIGHBORHOOD COEFFICIENTS METHOD^{*,2}

*Motto: Everything is related to everything else only near things are more related than distant things.
(W. R. Tobler, 1970)*

Key words:

Land use, land cover, cellular automata, map algebra, neighborhood coefficient, simulation, urbanization, Warsaw

Abstract

Cellular automata are mathematical models for complex systems containing large numbers of simple identical components with local interactions.

The aim of the research is to verify the hypothesis stating that existing spatial pattern and the range of area with different classes of land use show defined tendencies for further spatial development according to the geographical model. The idea of using of the neighborhood indicator in analysis of land use changes is combination the method of map algebra and two-dimensional cellular automata. The aims of research are formulating the theoretical structure of the neighborhood indicator and checking its usability in practice.

During the process of simulation, socio-economic and physico-geographic factors are not taken into consideration. According to Fotheringham (et al., 2000), one of the purposes of cartographical analysis is indirect understanding of the phenomena by analyzing spatial patterns and inferring spatio-temporal processes recognizing local hot-spots.

On the basis of a statistical analysis of the neighborhood indicators the transition rules for cellular automata were formulated to the purpose of the simulation of the state of the extent of these areas in the future.

The sets of the transition rules derived from the calculated neighborhood coefficients will be the base for simulations. The processes consist not only of computed transition rules but of all the neighborhood coefficients and simulation steps which are also (geo)visualized and statistically verified for the past.

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² Written within the framework of the research project: The Research Method and Forecast of Land Use Changes using Map Algebra and Cellular Automata.