Geophysical Research Abstracts,
Vol. 11, EGU2009-638, 2009
EGU General Assembly 2009

Prediction of Land use changes using CA in GIS Environment

H. Kiavarz Moghaddam (1) and F. Samadzadegan ()

(1) Tehran University, Departmant of Geomatics and Surveying ,Engineering Faculty, Tehran, Islamic Republic Of Iran (hkiavarz@gmail.com, 0098 21 22295898), (2) Tehran University, Departmant of Geomatics and Surveying ,Engineering Faculty, Tehran, Islamic Republic Of Iran (samadz@ut.ac.ir, 0098 21 22295898)

Urban growth is a typical self-organized system that results from the interaction between three defined systems; developed urban system, natural non-urban system and planned urban system. Urban growth simulation for an artificial city is carried out first. It evaluates a number of urban sprawl parameters including the size and shape of neighborhood besides testing different types of constraints on urban growth simulation. The results indicate that circular-type neighborhood shows smoother but faster urban growth as compared to nine-cell Moore neighborhood. Cellular Automata is proved to be very efficient in simulating the urban growth simulation over time. The strength of this technology comes from the ability of urban modeler to implement the growth simulation model, evaluating the results and presenting the output simulation results in visual interpretable environment. Artificial city simulation model provides an excellent environment to test a number of simulation parameters such as neighborhood influence on growth results and constraints role in driving the urban growth .Also, CA rules definition is critical stage in simulating the urban growth pattern in a close manner to reality. CA urban growth simulation and prediction of Tehran over the last four decades succeeds to simulate specified tested growth years at a high accuracy level. Some real data layer have been used in the CA simulation training phase such as 1995 while others used for testing the prediction results such as 2002. Tuning the CA growth rules is important through comparing the simulated images with the real data to obtain feedback. An important notice is that CA rules need also to be modified over time to adapt to the urban growth pattern. The evaluation method used on region basis has its advantage in covering the spatial distribution component of the urban growth process.
Next step includes running the developed CA simulation over classified raster data for three years in a developed ArcGIS extention. A set of crisp rules are defined and calibrated based on real urban growth pattern. Uncertainty analysis is performed to evaluate the accuracy of the simulated results as compared to the historical real data. Evaluation shows promising results represented by the high average accuracies achieved. The average accuracy for the predicted growth images 1964 and 2002 is over 80 %. Modifying CA growth rules over time to match the growth pattern changes is important to obtain accurate simulation. This modification is based on the urban growth relationship for Tehran over time as can be seen in the historical raster data. The feedback obtained from comparing the simulated and real data is crucial in identifying the optimal set of CA rules for reliable simulation and calibrating growth steps.