



Simulation of land use spatial pattern of towns and villages based on CA–Markov model

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ABSTRACT

Firstly, this paper analyzes the basic principles and processes of the spatial pattern changes of land use in towns and villages, and the result shows that the land resource demands of urban development and population growth lead to the spatial pattern changes. Secondly, in order to grip land use changes better, the paper proposes a method for the simulation of spatial patterns. The simulating method can be divided into two parts: one is a quantitative forecast by using the Markov model, and the other is simulating the spatial pattern changes by using the CA model. The above two models construct the simulative model of the spatial pattern of land use in towns and villages. Finally, selecting Fangshan which is a district of Beijing as the experimental area, both the quantity and spatial pattern changing characteristics are investigated through building a changing dataset of land use by using spatial analysis methods based on the land use data in 2001, 2006 and 2008; CA–Markov is used to simulate the spatial pattern of land use in Fangshan for 2015.

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1. Introduction

Rapid advances in geospatial models have made it increasingly possible to design and simulate spatial patterns for land use change (LUC). An approach commonly used in the simulation model for LUC is based on cellular automata theory and the GIS framework [1,2]. So far, the establishment of simulation models to monitor and adjust the changes of land use is a local and global issue of great concern. Mainly simulation methods include two aspects: the first one is the number of prediction, and the other one is simulating for the spatial patterns of the future. Spatial patterns of land use changes in the dynamic simulation and analysis relating to the impact of land use changes in many drivers is a very complex process [3]. Models based on the simulation of the spatial pattern of land use change processes are used to understand and explain the process of regional land use changes and trends in effective ways. However, the current real land use changes and the spatial distribution of the combination in different scales of land use, spatial and temporal dynamic model of the evolution rule are rare.

Both cellular automata (CA) and the Markov model have great advantages in the study on land use changes, while both of them have respective disadvantages. The Markov model for land use changes has been widely used, but with the traditional Markov model it is difficult to predict the spatial pattern of land use changes. The CA model with powerful spatial computing can be used to simulate the spatial variation of the system effectively. A CA–Markov model is a robust approach in the spatial and temporal dynamic modeling of land use changes because geographic information systems (GIS) and remote sensing (RS) can be efficiently incorporated [4]. The CA–Markov model absorbs the benefits from the time series and spatial

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