

An agent-based model of urban expansion

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Abstract Agent-based models are bottom-up and processed based models, and they are useful tolls to explore internal mechanism of complex system. They have been used by geographers to analyze and simulate the coupled human and natural system and to study one of the top questions in geography: the relationships of pattern, process, and scale. In this paper, an agent-based model of urban expansion was built on the platform of Netlogo. The model is a conceptual one and built on hypothetical data. It is used to explore the complicated spatial decision-making behaviors in residential location as well as the evolution process of urban expansion, which is resulted from interactions between residents and environment. The modeling results show that: (1) increasing heterogeneity, environmental effects and searching range of residential behaviors will accelerate urban expansion; (2) Increasing the effect of preference of neighborhood will lower urban expansion; (3) Combination of different scenarios played a nonlinear role in the process of urban expansion , and this effect is difficult to be predicted qualitatively; (4) urban expansion itself is an endogenous, coupled feedback process, and it is the result of the interaction between agent and environment; (5) The process of urban expansion and the changes urban spatial pattern are combined in a continuous, dynamic unity; (6) urban expansion contains spatial complexity, time complexity and process complexity. More land use change processes and mechanisms, e.g. land market and land management, can be incorporated into the model. It has been proved that the model can be useful for evaluating urban expansion and its environmental effects.

Key words complex system; urban expansion; agent-based models; spatial modeling