

Developing urban modelling methodologies based on micro spatial units

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In recent, approaches in which urban models are constructed have been sifted from macro to micro-level basis. This thesis examines the effectiveness of urban modelling methodologies based on micro spatial units to analyse various socio-economic phenomena as well as to conduct policy evaluations. To achieve this aim, this thesis tackles three issues relating to spatially disaggregated microdata creation, individual based modelling with local interactions and dynamic elements, and area-based policy evaluations through constructing spatial microsimulation models for landuse change, commuting, consumer behaviour and machiya housing.

The results of the study can be summarised by the three methodological issues. Firstly, by using a combinatorial optimisation method, highly accurate and spatially disaggregated synthetic microdata were created either from a large or small sample dataset available in Japan. A synthetic reconstruction approach was also applied to add various socio-economic variables by merging multiple datasets.

Secondly, discrete choice models incorporating local interactions can significantly improve estimations of landuse change and mahchiya demolitions. Such a statistical model was integrated within a dynamic simulation framework in more realistic manner based on an Objected-Oriented approach. In addition, the model outputs were visualised in the forms of cross-tabulations, graphs and maps in accordance with analysts' needs.

Thirdly, it was examined that how a spatial microsimulation model can be applied for policy evaluations in particular, for estimating spatial impacts. Since the models were able to reveal underling spatial patterns of populations, it is highly effective to analyse spatial inequalities and understand distributional impacts by policy implementations.

In a conclusion, a spatial microsimulation approach supports detailed spatial analysis with spatially disaggregated microdata, individual based modelling methods and analytical flexibilities of model outputs. These findings verify the effectiveness of urban modelling methodologies based on micro spatial units as a social scientific analysis and policy-decision making tools.