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Ying Long  
Zhenjiang Shen

# Geospatial Analysis to Support Urban Planning in Beijing

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Ying Long • Zhenjiang Shen

# Geospatial Analysis to Support Urban Planning in Beijing

 Springer

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# Foreword

Geospatial analysis as one of key techniques for supporting urban and regional planning has been developed for decades and used widely in the world. Authors of this book focus on planning support for the planning compilation and evaluation procedure of planners in the Beijing Institute of City Planning. Such experiences enrich advanced geospatial analysis techniques for planning support in various aspects. The book, consisting 13 chapters, elaborates diverse planning support efforts, which primarily introduced how geospatial analysis could be applied to the planning practice to facing multi-issues in the mega capital city.

The applications of geospatial analysis in Beijing are described as two essential aspects of urban system: urban space and urban activity. In the book, urban activity refers to human behaviour taking place in urban space, and their spatial pattern can reflect how human beings behave relative to the urban form. Authors have tested urban activity using large-scale personal traffic surveys and their moving tracks recorded in mobile devices. The analysis was intended to identify the conflicts between urban activity and urban spaces, therefore providing solutions to the problems of urban planning and design.

While reading these manuscripts, we are witnessing a dramatically changing world in the twenty-first century, especially our data environment. In such a background, the book includes several chapters which adopt open/big data as the main data source, e.g. public transit smart card records. And they also propose a new research diagram called “Big Model”. We expect there would be more and more new data sources for feeding geospatial analysis in the coming works of new urbanization and promoting urban planning support to a new stage.

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# Foreword

Humanity is facing the inevitable fact that most of the global population will be concentrated in urban areas in the not too distant future. Human population movement and displacement are quickly becoming important contemporary issues. The resulting urban growth from population movement is a key factor contributing to the reduction of valuable agricultural and forested lands, increase in environmental degradation, and loss of natural ecosystems. Population displacement arising from economic growth and uncertainty, climatic hazards, landslides and earthquakes impose unplanned relocations that have consequences on the evolving local and global dynamics of cities around the world. The overall dynamic is that some cities decline while others expand at seemingly uncontrolled rates.

Consequently, there is a vital need to monitor, analyze, and model the spatial dynamics of land use change and urban growth in order to better understand the changes from a human-environmental perspective so that we can improve planning for a sustainable future. One approach is to integrate the suite of available geospatial methods and tools to bridge the gap between the complex technical models of geocomputation and geosimulation with the needs of urban planners in order to make decisions that have minimal unintended consequences. This new book provides a valuable step in that direction.

Beijing is one of the world's megacities with a rich history making it a vibrant spot on the earth that has attracted people for centuries. Today, the city is experiencing increased economic growth and faster than ever physical expansion, thus the urgent need for advanced urban planning support systems. The timing for this book could not have been more relevant as it provides a comprehensive list of the cutting-edge approaches that the geospatial community can currently offer to better understand and forecast urban change patterns to manage their ecological impacts and assist in robust planning.

The book is organized at both a conceptual level and a technical level. At the conceptual level, the important issues related to the causes and effects of urban form changes are emphasized. At the technical level, the analysis and simulation of spatial patterns of land use change caused by human interactions, stakeholder desires,



and constant urban development are emphasized. Cellular automata and agent-based modeling are presented as useful planning support tools that can represent and handle the complexity of changes in the urban fabric from local levels to larger city levels. Issues such as human mobility and transportation are tackled with care as they are key components in the massive daily interactions between commuters. Economic elements are also considered in the simulation approaches as land and rent prices together with economic constraints that impact labor demand and supply all having an impact on the future urban landscape. Using a foundation of geosimulation and other geospatial tools in an era when big data is becoming increasingly accessible, this book offers a unique approach to urban planning by using geospatial models to support and shape future development in Beijing.

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We are deeply indebted to Professor Qizhi Mao from the School of Architecture, Tsinghua University, whose help, stimulating suggestions and encouragement helped us in all the time of research. We want to express our thanks to the contributors listed below. We enjoyed the academic collaborations with them. Without them, the monograph cannot be fulfilled and reach the current quality.



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## Geospatial Analysis to Support Urban Planning in Beijing

This book describes a comprehensive framework of novel simulation approaches, conventional urban models, and related data mining techniques that will help develop planning support systems in Beijing as well as other mega-metropolitan areas. It investigates the relationships between human behaviors and spatial patterns in order to simulate activities in an urban space, visualize planning alternatives, and support decision making.

The book first explains urban space using geometric patterns, such as points, networks, and polygons, that help identify patterns of household and individual human behavior. Next, it details how novel simulation methodologies, such as cellular automaton and multi-agent systems, and conventional urban modeling, such as spatial interaction models, can be used to identify an optimal or a simulated solution for a better urban form.

The book develops a comprehensive land use and transportation integrated model used to explore the spatial patterns of mutual interaction between human mobility and urban space. This model can help forecast the distribution of different types of households, rent prices, and land prices, as well as the distribution of routes and traffic volume based on an appraisal of labor demand and supply.

This book shows how geospatial analysis can be a useful tool for planners and decision makers to help in ascertaining patterns of activities and support urban planning. Offering both novel and conventional approaches to urban modeling, it will appeal to researchers, students, and policy makers looking for the optimal way to plan the development of a mega-metropolitan area.

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