PREFACE

Special Issue: Spatio-temporal theories, technologies and applications for transport and urban planning

Growing attention is being paid to the field of spatial science in the areas of transport, travel and mobility as location intelligence dominates the transport and urban planning landscape. Spatio-temporal technologies can help evaluate, plan and design sustainable, efficient and equitable transport and urban residential systems that exhibit location characteristics. These technologies also highlight many challenges in the areas of spatial science, transport analysis and modelling, urban planning and regional development. In particular, the need for novel, fast and effective algorithms for dealing with large-scale data sets in dynamic and uncertain environments— a largely unexplored field.

This special issue showcases innovative thinking concerning spatial science theories and algorithms, and how these have been applied to solve real-world geospatial problems in transportation and urban planning. Twelve papers were accepted for this special issue after peer review based on their quality and their significant contribution to the field. These papers are arranged into the themes of network performance management, environmental issues related to transport and urban development, land use in recreation spaces, and traveller preference management. These themes were selected because spatial techniques and methods are recognised as emerging technologies that are important in facilitating the development of research and understanding of knowledge in these four areas.

Network Performance Management

Spatial techniques have become popular in evaluation and management of network performance. This special issue includes five studies related to the management of both road and rail network performance using spatial network analytics. The key questions asked are what are the characteristics of transport networks (such as node centrality, connection hierarchy and spatial clustering) and how can these characteristics be used to evaluate road and rail performance.

Combining spatial and temporal techniques in network analyses is powerful in understanding the trends of network expansion, which not only helps us understand what has happened in the past, but also provides insights into what may happen in the future. Two studies investigate network evolution in terms of traffic management. Wang et al. examine the features and evolutionary tendencies of the underlying structures of the street network over the past century (1912-2013) in the old Beijing city via space syntax. A shorter period (10 years) study was conducted to understand impact of traffic location evolution on urbanisation. The study found that understanding of network evolution has a strong interpretative power for the improvement of urbanization levels.

Gao and Chao also evaluate road network characteristics with a focus on tourism destination management. The study suggests each tourism node should be equipped with appropriate facilities and services based on their structural characteristics and functions to promote sustainable development of tourism destinations.

Open big data have been used broadly in transport network analysis. Cui et al. uses big data from ticketing websites for characterising spatial features of the Chinese high-speed rail system. Discrepancies between the actual and planned structure, displacement of regional railway hubs, and the mismatch between the spatial and network dimensions of system modularity provide useful insights into the management of Chinese HSR system.

Spatial network analysis has been extensively used to evaluate accessibility to destinations. In this special issue, we include one paper in this area. An improved two-step floating catchment area method was developed by Wang et al. to quantify spatial accessibility. The study found uneven distribution of accessibility to ecological recreation spaces, most likely due to the history and pattern of rapid urbanization and industrialization.

Environmental Issues Related to Transport and Urban Development

Environmental issues related to transport and urban development, such as noise, air quality, water quality and biodiversity, have been explored in the literature using spatial visualisation techniques. These problems have heavily impacted on human health and created substantial economic burdens to our society. The spatial distribution of carbon emissions and urban thermal environments (UTE) were studied by the authors of two special issue papers. Qiao et al. discover that urban heat islands are located in regions of the central city and the Capital International Airport with higher concentrations of population and low density of vegetation. While the study by Li et al. found that high emitters are mostly located at the urban fringe, indicating that sustainable transport policies are required to reduce carbon emissions. These two studies encourage us to think spatially by using geovisualisation techniques and identity geo-located problems to better target our management efforts.

Land Use in Recreation Spaces

Recreation and tourism industries play an important role in forming landscape and driving land use changes. Ecosystem services have recently become the centre of attention in understanding this relationship. Two papers by Yang et al. and Xi et al. in this area were chosen to illustrate how spatial visualisation and analytical methods can be used to understand how and why recreation landscape and land use changes are based on ecosystem service indicators. The studies reveal that ecosystem service value and aesthetic quality have generally declined while the overall ecological risk has increased, meaning we need to better understand the appropriate scale and structure of the tourism industry for ecological security.

Visual sensitivity has been considered as one of the vital indicators in assessing recreation landscapes. Geographic Information Systems were used by Wang et al. to combine slope, distance, visual

probability and striking degree to quantify visual sensitivity of urban landscapes and provide suggestions on landscape protection and construction for different levels of visual sensitivity, recommending that insensitive areas should be given the most important value in resource development.

Traveller Preference Management

This special issue also includes studies related to human factors in transportation such as understanding travellers' preferences. Travellers may have different levels of accessibility, mobility and preference for travel modes. Spatial statistics can elaborate the geographical heterogeneity of market share of transport usage. The study by Lin et al. examines the size and shape of train station catchment areas by different travel groups, such as gender, age and access mode, and develops new spatial market segmentation indices based on station catchment areas. Liu et al. study automobile brand preference and its spatial variation in China. Apparent regional and spatial concentrations in automobile brand preferences across China's automobile market were identified using the index of Location Quotient. The location factors were found to be significant in the Chinese automobile market.

Conclusion

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