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**Guest Editorial: Modelling Urban Behaviour**

This part special issue comprises three papers, which originally formed the basis of presentations given at the 21st GIS Research UK (GISRUK) conference, held in Liverpool in April 2013. Each of the articles presents research which considers how individuals operate in, and react to, urban environments. More specifically, the papers focus on approaches to modelling the presence of people in urban environments at different times of day (Smith *et al.*) and the formation of spatial knowledge and decision-making (Manley and Panagiotis *et al.*). An understanding of where people travel and what conditions their movement through urban environments is crucial in multiple domains, such as planning the development of transportation and place-specific services, providing information which helps individuals navigate their way through urban space, and mitigating risks of natural or human-induced disasters.

The first paper by Smith *et al.* considers a core theme in contemporary quantitative population research – how can we move from a detailed understanding of just residential (or night time) geographies, as represented by traditional census outputs, to one which encompasses the multiple activity spaces within which people operate. The paper makes use of a spatio-temporal gridded population model constructed using the SurfaceBuilder247 software, making use of estimated retail activity and the retail workforce. The derived grids provide estimates of the total population for 200m cells for any specified time point and these are then used to assess exposure to flood risks. The analysis focuses on an area around the city of Southampton and it shows marked geographical variations in the population across the day and thus in the population exposed to flood risks. Such approaches have considerable potential for better managing natural hazards. More generally, the use of multiple sources of information to derive spatially-detailed estimates of the presence and movements of people in the way represented by this study offers a powerful new framework for understanding how and when urban spaces are used, and for adapting transportation and other place-based services to the changing demands of the population.

The second contribution, by Manley, focuses on how specific locations are used in the construction of spatial knowledge. The study then goes on to develop a spatial interaction model, calibrated using survey data, which is used to explore the relationship between home locations and the locations of leisure activities. Through a case study based on London and with a focus on vehicle users specifically, this information is combined in a model of spatial learning which is used to develop an understanding of how spatial knowledge evolves. The results indicate that the number of nodes (i.e., road intersections) known to individuals increases markedly in the early modelling stages – this reflects how those who have moved into an area from elsewhere are more likely to find new alternative routes to their destination than are individuals who have lived in the area for a long period of time; a refinement in routes across time is also indicated. The modelling results illustrate the importance of centrality of a region – in this case, London. It is thus suggested that as individuals move closer to central London, there is an increasing attraction to the leisure and retail centres it contains, and that the desire to explore other regions is thus diminished. Such approaches offer considerable potential for understanding how people navigate urban spaces, and how the choices they make evolve across time through a process of exploration of alternative routes and development of a wider knowledge of connections between areas.

In the third and final paper, Panagiotis *et al.* connect to the themes explored by Manley. The paper introduces the key concepts behind mobile electroencephalography (EEG) and

provides an in-depth review of recent research and the potential of mobile EEG in studying urban behaviour. Mobile EEG is defined as a technology for monitoring brain function and cognition; the paper considers its use in building our understanding of the neural processes connected to spatial perception and cognition. As an example, the paper considers interactions between the cognitive mechanisms which underlie navigation, the psychological state of pedestrians, and the impact of the urban experience; as the authors outline, these may be crucial in understanding travel through urban environments and route choice. This contention aligns with other research which suggests that pedestrians often do not take the shortest path and that multiple factors such as prior knowledge or the complexity of routes are likely to influence travel decisions. The paper concludes by outlining a programme of research to utilise mobile EEG to seek to better understand interactions between the emotional state of individuals and environmental factors such as air quality, and the influences of the environment on spatial decision-making.

The three papers offer quite different perspectives on the use of urban spaces. Collectively, they provide examples of the rich and developing state of research into urban behaviours, making connections between multiple disciplines including Geography, Urban Planning, and Cognitive and Computer Sciences. They also highlight diverse technologies and spatially-rich datasets which can, in combination, be used to build a sophisticated understanding of where individuals travel, the influences on the travel choices they make, and the ways in which they perceive the environments around them. The papers provide important examples of recent exciting research into urban behaviours. They demonstrate some of the considerable potential for multidisciplinary research in developing new conceptual understandings of how urban spaces are used, and in enhancing these spaces and the ways in which they are experienced.

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