ISPRS Int. J. Geo-Inf. **2015**, *4*, 2583-2585; doi:10.3390/ijgi4042583

OPEN ACCESS

ISPRS International Journal of
Geo-Information
ISSN 2220-9964
www.mdpi.com/journal/ijgi/

Editorial

GIS for Sustainable Urban Transport

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Academic Editor: Wolfgang Kainz

Received: 12 November 2015 / Accepted: 16 November 2015 / Published: 23 November 2015

The world is urbanizing at a very fast pace. Modern geography, particularly geo-information systems (GIS) and global positioning systems (GPS) are reshaping the way urban and transport planners are collecting, exploring, synthesizing, analyzing, evaluating and presenting their data. Transport GIS (or GIS-T) applications have become mainstream in leading conferences and high-level publications.

Sustainable transport relates to creating transport systems that promote sustainability in terms of increasing social inclusion, reducing environmental externalities and being economically feasible. It involves the transport, as well as the land use system. In the field of sustainable transport, GI science is typically used to aid the development of concepts and methodologies for clean and sustainable mobility. Whether looking at location–allocation models of public bicycle systems, mapping children's routes to school, land use – transport interaction or calculating levels of accessibility to jobs for the urban poor, modern time GPS and GIS technologies are myriad.

The six articles in this Special Issue are a good illustration of the use of GIS for transport analysis and planning. We see application of typical GIS strengths, such as digital map production (articles 1 and 2) [1,2], dynamic modelling (article 3) [3], spatial inventory of facilities/events (articles 1, 2, 4, 5 and 6) [1,2,4–6], spatial data integration (articles 1, 2 and 5) [1,2,5] and spatial analysis (articles 1, 2, 4 and 6) [1,2,4,6], where it can be noted that several authors are using these GIS capabilities in combination and in integration with various statistical techniques (articles 1, 3 and 5) [1,3,5].

Claudia Soares *et al*. [1] analyzed traffic safety for vulnerable road users by mapping accident location data (so called black spots), performing kernel density analyses and combining the results, through GIS overlays, with characteristics of surrounding areas and more traditional statistical regression to arrive at conclusions on which factors best explain high levels of traffic accidents. By their method they demonstrate the strengths of GI based data integration.

Alistair Ford *et al*. [2] developed a GIS tool to evaluate accessibility of different transport modes using generalized cost. In their model, which is based on publicly available data, the differences in accessibility provided by different transport modes can be evaluated. They demonstrate the use of GIS as a versatile tool to integrate land use and transport system components in an accessibility metric, allowing the analysis of different infrastructure development scenarios in terms of their effect on accessibility without the need to run a traditional data intensive 4-step transport model.

Simone Becker Lopes *et al*. [3] have looked at how GIS based spatial regression models can be used to forecast travel demand. By introducing global and local spatial variables into a trip generation model, they were able to generate better results than using a traditional non-spatial multiple linear regression approach. They demonstrate that it is important to include spatial dependence into regression models and that different spatial statistical procedures that are available in the GIS environment allow for such inclusion. Such models however, need further development to be able to deal with the dynamics of fast growing cities in order to make more reliable forecasts.

Raymond Hung *et al*. [4] have been looking at the use of one of the important new spatial data acquisition techniques, laser scanning, for the management of underground railway operations. They introduce alternative methods that are able to replace the signals of Global Navigation Satellite Systems, which are absent in underground environments. The application of these methods will allow more accuracy in the positioning of railway system assets that are stationary (like tunnel outlines, cables, *etc*.), but also assets that are moving, such as trains. The real-time monitoring of such assets will be potentially of great use for the management of the underground railway system.

Eunsu Lee and Peter Oduor [5] have looked at the problem of traffic assignment, the part of the transport modelling process in which forecasted traffic is assigned to specific sections of the network. They have developed a number of geospatial algorithms that consider different kinds of network impedances, categorized into absolute and relative impedance, depending on the situation to be modelled. In this way, the model becomes more versatile to deal with particular network conditions that affect impedance, such as the Volume-Capacity ratio, the type of road and the potential closing of lanes and bridges. They use a GIS based platform to deal with these different kinds of impedance, which allows for more precise modelling and manipulation of multi-attribute impedance and a more realistic traffic assignment.

Zhengdong Huang and Xuejun Liu [6] have addressed the issue of how to optimize the location of bus stops within multi-modal networks in a large and fast developing city in China. To this end they deployed a GIS based coverage model that works with weighted nodal travel demand data and allows optimization of bus stop locations through a hierarchical process. By introducing three different types of bus stops, each with a different characteristic in terms of their importance in the network, a more effective location analysis can be performed.

The articles in this Special Issue show that the geo-spatial components of our transport systems form an excellent concept for analysis and linkage of otherwise unrelated data sets. The hybrid application of several spatial analytical and statistical techniques provides new insights and shows great promise for the future expansion of this emerging field.

Author Contributions

Mark H.P. Zuidgeest and Mark J.G. Brussel summarized the contributions and wrote the editorial. All authors read and edited drafts, and approved the final manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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