Preface: special issue on advanced traffic and transportation systems

Lelitha D. Vanajakshi · Gitakrishnan Ramadurai ·
Karthik K. Srinivasan

Published online: 29 September 2013
© Indian Institute of Technology Madras 2013

Traffic and transportation systems impact our everyday lives significantly. By nature, the transportation system is a complex system. This complexity presents a challenge to engineering scientists and applied mathematicians. This special issue will focus on the engineering science and applied mathematics oriented contributions related to traffic and transportation systems. The topics in this special issue cover a wide range of areas in transportation and traffic modeling. The papers highlight the coming together of technology and human factors and how this impacts the transportation system.

A key issue in transportation is safety. There are two papers in this special issue that addresses traffic safety. Darbha and Rajagopal outline the major safety issues associated with sudden breaking operations of automated vehicles. With recent developments in the area of driverless cars and with the imminent possibility of automated vehicles sharing space with human drivers, there is an urgent need to understand fundamental issues with respect to safety of such systems. This paper is a seminal contribution in this regard. The other paper on safety focusses on driver drowsiness detection and remediation. Dasgupta et al. propose a system to monitor the loss of attention of drivers due to drowsiness. The system includes a hardware system coupled with image processing algorithms that is shown to work under demanding conditions often encountered inside a moving vehicle. It is an excellent example of innovative interdisciplinary solutions to transportation problems.

The next three papers focus on transportation planning. Sikder et al. provide a comprehensive review of spatial transferability of travel forecasting models. The review is

comprehensive and presents both theoretical and practical considerations. Several important open issues are identified and the paper promises to be an important reference to both transportation planning researchers and practitioners. Gopisetty and Srinivasan present a joint model for trip frequency and vehicle ownership based on data from Chennai city, India. The presence of both two wheelers and four wheelers among households in developing countries and their varying impact on trip frequency requires joint models that can capture this endogeneity. The paper highlights the importance of capturing this endogeneity and presents practical implications of the model results for management decisions. The third paper on planning by Aziz and Ukkusuri explores a novel idea of using tradable credit schemes to minimize and manage vehicular emissions. This paper is timely because of the urgent need to address global warming impacts of transportation emissions. The mathematical model presented in the paper also explores a more acceptable trade-off between traditional objectives of minimizing travel time along with reduced emissions.

The final two papers in this special issue deal with traffic flow modeling and capacity estimation. Ranju and Ramadurai present a review of state-of-the-art of macroscopic traffic flow models. Unlike earlier reviews that have covered traffic flow models in general, the focus here is on macroscopic models. Since the last review that appeared over a decade ago, the field has seen the emergence of new higher-order macroscopic models as well as different models for capturing flow along links and at nodes. This review is timely and is likely to encourage more research into advanced macroscopic traffic flow models. Puwala et al. estimate the capacity of eight-lane divided urban expressway in the presence of mixed-traffic flow conditions. The paper argues that expressways in India behave and operate differently when compared with countries

L. D. Vanajakshi (✉) · G. Ramadurai · K. K. Srinivasan
Department of Civil Engineering, IIT Madras, Chennai, India
e-mail: lelitha@iitm.ac.in

where traffic composition is homogeneous. The paper makes another important contribution to the steadily growing field of road capacity under mixed-traffic flow. The paper also highlights an emerging concept of dynamic passenger car unit (PCU) values where the values change based on the level of traffic congestion.

We take this opportunity to thank all the authors who have contributed to this special issue. We trust you would

find this issue as exciting and enriching as we found bringing this special issue to fruition. We thank the reviewers for the timely reviews and for the constructive comments which helped to considerably improve the quality of the manuscripts. We also thank the Journal Editors for providing us this opportunity to bring out this special issue on an important area in engineering science and applied mathematics.