Transportation Planning

Applied Optimization

Volume 64

The titles published in this series are listed at the end of this volume.

Transportation Planning

State of the Art

Edited by

Michael Patriksson

Department of Mathematics,
Chambers University of Technology, Gothenburg, Sweden

and

Martine Labbé

ISRO and SMG,
Université de Bruxelles, CP 210-01,
Bruxelles, Belgium

KLUWER ACADEMIC PUBLISHERS
NEW YORK, BOSTON, DORDRECHT, LONDON, MOSCOW

eBook ISBN: 0-306-48220-7
Print ISBN: 1-4020-0546-6

Created in the United States of America

Visit Kluwer Online at: http://kluweronline.com
and Kluwer's eBookstore at: http://ebooks.kluweronline.com

Contents

Preface

This book collects selected presentations of the 6^{th} Meeting of the EURO Working Group on Transportation, which took place at the Department of Mathematics at Chalmers University of Technology, Göteborg (or, Gothenburg), Sweden, September 9–11, 1998. [The EURO Working Group on Transportation was founded at the end of the 7th EURO Summer Institute on Urban Traffic Management, which took place in Cetraro, Italy, June 21–July, 1991. There were around 30 founding members of the Working Group, a number which now has grown to around 150. Meetings since then include Paris (1993), Barcelona (1994), and Newcastle (1996).] About 100 participants were present, enjoying healthy rain and a memorable conference dinner in the Feskekôrka.

The total number of presentations at the conference was about 60, coming from quite diverse areas within the field of operations research in transportation, and covering all modes of transport:

- Deterministic traffic equilibrium models (6 papers)
- Stochastic traffic equilibrium models (5 papers)
- Combined traffic models (3 papers)
- Dynamic traffic models (7 papers)
- Simulation models (4 papers)
- Origin–destination matrix estimation (2 papers)
- Urban public transport models (8 papers)
- Aircraft scheduling (1 paper)
- Ship routing (2 papers)
- Railway planning and scheduling (6 papers)
- Vehicle routing (3 papers)
- Traffic management (3 papers)
- Signal control models (3 papers)
- Transportation systems analysis (5 papers)

Among these papers, 14 were eventually selected to be included in this volume. A further selection of papers from the Meeting are being edited for a special issue of Transportation Research, B, devoted to public transport problems.

The 14 papers are described shortly as follows. *Chapter 1,* written by Bar-Gera and Boyce, describes a very promising approach to the traffic assignment problem which is founded on a fundamental property of user equilibrium flows, that for each origin the flows describe an ayclic subnetwork. *Chapter 2*, written by Larsson et al., illustrates that when combining time delays and money outlays into a generalized cost, user equilibrium flows resulting from the conversion time $\rightarrow$ money will be different from the result of using the conversion money $\rightarrow$ time. A convex programming formulation is presented for the latter case, together with an algorithm for its solution. *Chapter 3,* written by Watling, proposes a variation of the stochastic user equilibrium (SUE) model to represent day–to–day stochastic variations in travel demands, and shows that the effect of such variations is a relatively stable mean link flow, but an increased link flow and total travel cost variance. *Chapter 4,* written by Cantarella and Binetti, analyzes the additive Gammit SUE model which is based on a Gamma distribution of route cost perception. This model satisfies stipulated conditions on probabilistic route-choice models, and is shown to yield results close to probit-based SUE models. *Chapter 5,* written by Cassir and Bell, presents a methodology for evaluating the reliability of transportation networks, which could be used to support the design of networks that are robust to everyday disturbances. In the case of the logit SUE route-choice model, reliability measures related to travel times are shown to be available efficiently, and are illustrated by means of numerical examples. *Chapter 6,* written by Coppola, notes that in previous models of parking management policies, parking search time is a neglected attribute which in reality should be a function of parking demand. A joint, nested logit model of mode and parking choice is then developed, and evaluated with data taken from an EC project. *Chapter 7,* written by Xiang et al., describes a general multi-modal traffic equilibrium model which embraces the classical four-step procedure into one combined model, including controls and stochastic travel costs. The main motivation for developing such a comprehensive model is to support the assessment of demand management strategies. *Chapter 8,* written by Lebacque and Khoshyaran, adapts the continuous Lighthill-Whitham-Richards model to dynamic traffic assignment. Included in the adaptation are specifications of partial and inhomogenous flows on links as well as several alternatives for intersection modeling. *Chapter 9,* written by Hughes, describes the application of the AIMSUN2 microscopic traffic simulation package to a section of a congested urban freeway in Auckland, New Zealand. Preliminary results show a good reproduction of speed and flow relationships, but less so for transient effects. *Chapter 10,* written by

Niittymäki, develops a fuzzy traffic signal control model for a signal control scenario with several conflicting optimization criteria. Several approaches to the fuzzification and defuzzification phases of fuzzy traffic signal control are discussed. *Chapter 11,* written by Carrese and Gori, describes a coordinated process for the design of a bus transit network, including both lines and frequences. Heuristic methods construct the final plan through the sequential identification of a skeleton network, the main transit lines, and feeder lines. The model is applied to the Rome transit network system. *Chapter 12*, written by Smith et al., describes a descent algorithm for bilevel optimization in multi-modal equilibrium transportation models for the optimization of traffic control parameters. Convergence towards equilibrium points is ensured, and an intuitive motivation for the convergence of the control parameters towards points satisfying necessary optimality conditions are provided. *Chapter 13,* written by Allal et al., describes a demand-responsive park & ride transport system. Its real-time aspects are analyzed, and simulations results are reported. *Chapter 14,* written by Berri, analyzes household car ownership in seven countries, characterized by different economic and cultural contexts, by means of demographic modeling. Differences in long term forecasting results between countries and zones are explained by two main factors: the history of car ownership development and population density.

The Swedish Communications Research Board (KFB) supported the conference financially, as did Chalmers, for which we are greatful. We would like to thank the participants of the Meeting for making it enjoyable, and the referees for their duly work.

MICHAEL PATRIKSSON, GÖTEBORG, DECEMBER 2000