

**ADVANCED MODELING FOR TRANSIT OPERATIONS AND
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ADVANCED MODELING FOR TRANSIT OPERATIONS AND SERVICE PLANNING

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INVESTOR IN PEOPLE

PREFACE

The idea for this book grew out of the organization of the Advanced Study Institute (ASI), which was sponsored by the Croucher Foundation (<http://www.croucher.org.hk/>) for the dissemination of knowledge and the formation of international scientific contacts on advances in modelling transit systems. While public transport (or transit) systems have arguably been in existence much longer than road traffic systems, the mathematical analysis techniques so necessary for the proper planning of transit operations have lagged far behind those for road traffic systems. For example, the body of literature available on the design of schedules for urban rail lines is minuscule in comparison to the literature on the coordination of traffic signals along an urban road.

On the other hand, transit professionals appear to have disregarded most of the wealth of insights that have been available in the literature for more than a decade. The literature on transit assignment is a good example. However, public transport operators, particularly in Hong Kong and Asia, are facing ever-greater pressure in competitive markets and transit systems are congested. The need to estimate passenger demand, to monitor the performance of individual services as well as the system as a whole, to support better planning and tighter operations management, and for external reporting has increased. The optimization of transit line frequencies and transit fares has become very important for operations and service planning. Reliability and control issues are also critical in making transit systems more efficient, supported by the introduction of Intelligent Transport Systems (ITS). As tightening constraints raise serious questions about the cost-effectiveness of existing public transport services, improvements which can be implemented in the short and long term are continuously sought. Collectively, these pressures have focused attention on advanced methods and new techniques for improving transit planning and operations.

In Hong Kong and other major cities in Asia, over 90% of people are using transit facilities for their daily travel. The recent rapid development and deployment of ITS makes it possible to improve the efficiency of transit operations. This book addresses the important and timely problems of how to improve transit operations and service planning by making use of new technologies and advanced modeling techniques. It will provide important references for determining the outcomes of introducing these technologies and methods, and thus assist transit professionals and scientists in resolving practical issues arising from the implementation of ITS. This book appears to be the first devoted exclusively to the topic of advanced modeling for transit operation and service planning.

This book consists of 12 chapters chosen to represent the broad base of contemporary themes in modeling transit systems. Scholars from America, Europe and Asia have contributed their knowledge to produce a unique compilation of recent developments in the field. Topics both in theory and innovative applications to real world problems are included. The book covers Transit Planning and Network Design, Transit Assignment Models and Solution Algorithms, Simulation of Passenger Behaviors, Effects of ITS on Passenger Choices and Transit Service Improvements, Modeling Multi-modal Transit and Urban Taxi Services.

Outline of the book contents:

- Chapter 1 - Initial Planning for Urban Transit Systems
- Chapter 2 - Public Transport Timetabling and Vehicle Scheduling
- Chapter 3 - Designing Public Transport Network and Routes
- Chapter 4 - Transit Path Choice and Assignment Model Approaches
- Chapter 5 - Schedule-Based Transit Assignment Models
- Chapter 6 - Frequency Based Transit Route Choice Models

Chapter 7 - Capacity Constrained Transit Assignment Models and Reliability Analysis
Chapter 8 - Dynasart-IP: Dynamic Traffic Assignment Meso-Simulator for
Intermodal Networks
Chapter 9 - Modeling Competitive Multi-Modal Services
Chapter 10 - Modeling Urban Taxi Services: A Literature Survey and an Analytical Example
Chapter 11 - The Estimation of Origin-Destination Matrices in Transit Networks
Chapter 12 - Models for Optimizing Transit Fares

Special appreciation is extended to Elsevier Science Ltd. who made possible the publication of all the contributions in the form of the present book in time to be available to participants attending the ASI workshop from 9th to 13th December 2002 in Hong Kong. Professor Mike Bell of Imperial College of Science, Technology & Medicine (U.K.) provided valuable oversight and guidance in enhancing the quality of the book. His support during this effort has been remarkable. Finally, I am thankful for the patience, availability, and dedication of the editorial staff at Elsevier Science Ltd., particularly Julie Neden and Chris Pringle.

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