17th Workshop on Algorithmic Approaches for Transportation Modelling, Optimization, and Systems

ATMOS 2017, September 7–8, 2017, Vienna, Austria

Edited by
Gianlorenzo D'Angelo
Twan Dollevoet

Editors

Gianlorenzo D'Angelo
Gran Sasso Science Institute
L'Aquila
Italy
gianlorenzo.dangelo@gssi.it

Twan Dollevoet
Erasmus University Rotterdam
Rotterdam
The Netherlands
dollevoet@ese.eur.nl

ACM Classification 1998
F.2 Analysis of Algorithms and Problem Complexity, G.1.6 Optimization, G.2.1 Combinatorics, G.2.2 Graph Theory, G.2.3 Applications

ISBN 978-3-95977-042-2

Published online and open access by
Schloss Dagstuhl – Leibniz-Zentrum für Informatik GmbH, Dagstuhl Publishing, Saarbrücken/Wadern, Germany. Online available at http://www.dagstuhl.de/dagpub/978-3-95977-042-2.

Publication date
September, 2017

Bibliographic information published by the Deutsche Nationalbibliothek
The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at http://dnb.d-nb.de.

License
This work is licensed under a Creative Commons Attribution 3.0 Unported license (CC-BY 3.0): http://creativecommons.org/licenses/by/3.0/legalcode.

In brief, this license authorizes each and everybody to share (to copy, distribute and transmit) the work under the following conditions, without impairing or restricting the authors' moral rights:

- Attribution: The work must be attributed to its authors.

The copyright is retained by the corresponding authors.

Digital Object Identifier: 10.4230/OASIcs.ATMOS.2017.0

OASIcs – OpenAccess Series in Informatics

OASIcs aims at a suitable publication venue to publish peer-reviewed collections of papers emerging from a scientific event. OASIcs volumes are published according to the principle of Open Access, i.e., they are available online and free of charge.

Editorial Board

- Daniel Cremers (TU München, Germany)
- Barbara Hammer (Universität Bielefeld, Germany)
- Marc Langheinrich (Università della Svizzera Italiana – Lugano, Switzerland)
- Dorothea Wagner (*Editor-in-Chief*, Karlsruher Institut für Technologie, Germany)

ISSN 2190-6807

http://www.dagstuhl.de/oasics

Contents

Preface
Gianlorenzo D'Angelo and Twan Dollevoet 0:vii

Delivery networks and time-dependent routing

Revenue Maximization in Online Dial-A-Ride
Ananya Christman, Christine Chung, Nicholas Jaczko, Marina Milan, Anna Vasilchenko, and Scott Westvold 1:1–1:15

Truthful Mechanisms for Delivery with Agents
Andreas Bärtschi, Daniel Graf, and Paolo Penna 2:1–2:17

Dynamic Time-Dependent Routing in Road Networks Through Sampling
Ben Strasser 3:1–3:17

Improved Oracles for Time-Dependent Road Networks
Spyros Kontogiannis, Georgia Papastavrou, Andreas Paraskevopoulos, Dorothea Wagner, and Christos Zaroliagis 4:1–4:17

Public transport optimization

Integrating Passengers' Assignment in Cost-Optimal Line Planning
Markus Friedrich, Maximilian Hartl, Alexander Schiewe, and Anita Schöbel 5:1–5:16

Robustness Tests for Public Transport Planning
Markus Friedrich, Matthias Müller-Hannemann, Ralf Rückert, Alexander Schiewe, and Anita Schöbel 6:1–6:16

Routing and traffic signal optimization in public transit

Public Transit Routing with Unrestricted Walking
Dorothea Wagner and Tobias Zündorf 7:1–7:14

Faster Transit Routing by Hyper Partitioning
Daniel Delling, Julian Dibbelt, Thomas Pajor, and Tobias Zündorf 8:1–8:14

Optimizing traffic signal settings for public transport priority
Robert Scheffler and Martin Strehler 9:1–9:15

Timetable and stopping pattern optimization

Analysis of Strengths and Weaknesses of a MILP Model for Revising Railway Traffic Timetables
Fahimeh Khoshniyat and Johanna Törnquist Krasemann 10:1–10:17

Strong Relaxations for the Train Timetabling Problem Using Connected Configurations
Frank Fischer and Thomas Schlechte 11:1–11:16

17th Workshop on Algorithmic Approaches for Transportation Modelling, Optimization, and Systems (ATMOS 2017).
Editors: Gianlorenzo D'Angelo and Twan Dollevoet
Open Access Series in Informatics
OASICS Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

An Improved Algorithm for the Periodic Timetabling Problem
Marc Goerigk and Christian Liebchen 12:1–12:14

Optimizing Train Stopping Patterns for Congestion Management
Tatsuki Yamauchi, Mizuyo Takamatsu, and Shinji Imahori 13:1–13:15

Shortest paths

Flight Planning in Free Route Airspaces
Casper Kehlet Jensen, Marco Chiarandini, and Kim S. Larsen 14:1–14:14

Cost Projection Methods for the Shortest Path Problem with Crossing Costs
Marco Blanco, Ralf Borndörfer, Nam Dũng Hoàng, Anton Kaier, Pedro M. Casas, Thomas Schlechte, and Swen Schlobach 15:1–15:14

An Experimental Comparison of Uncertainty Sets for Robust Shortest Path Problems
Trivikram Dokka and Marc Goerigk 16:1–16:13

ATMOS 2017 Best Paper Award

Look-Ahead Approaches for Integrated Planning in Public Transportation
Julius Pätzold, Alexander Schiewe, Philine Schiewe, and Anita Schöbel 17:1–17:16

Preface

Running and optimizing transportation systems give rise to very complex and large-scale optimization problems requiring innovative solution techniques and ideas from mathematical optimization, theoretical computer science, and operations research. Since 2000, the series of Algorithmic Approaches for Transportation Modelling, Optimization, and Systems (ATMOS) workshops brings together researchers and practitioners who are interested in all aspects of algorithmic methods and models for transportation optimization and provides a forum for the exchange and dissemination of new ideas and techniques. The scope of ATMOS comprises all modes of transportation.

The 17th ATMOS workshop (ATMOS'17) was held in connection with ALGO'17 and hosted by Technische Universität Wien in Vienna, Austria, on September 7–8, 2017. Topics of interest were all optimization problems for passenger and freight transport, including, but not limited to, demand forecasting, models for user behavior, design of pricing systems, infrastructure planning, multi-modal transport optimization, mobile applications for transport, congestion modelling and reduction, line planning, timetable generation, routing and platform assignment, vehicle scheduling, route planning, crew and duty scheduling, rostering, delay management, routing in road networks, and traffic guidance. Of particular interest were papers applying and advancing techniques like graph and network algorithms, combinatorial optimization, mathematical programming, approximation algorithms, methods for the integration of planning stages, stochastic and robust optimization, online and real-time algorithms, algorithmic game theory, heuristics for real-world instances, and simulation tools.

All submissions were reviewed by at least three referees and judged on originality, technical quality, and relevance to the topics of the workshop. Based on the reviews, the program committee selected seventeen submissions to be presented at the workshop, which are collected in this volume. Together, they quite impressively demonstrate the range of applicability of algorithmic optimization to transportation problems in a wide sense. In addition, Daniel Delling kindly agreed to complement the program with an invited talk.

Based on the program committee's reviews, Julius Pätzold, Alexander Schiewe, Philine Schiewe, and Anita Schöbel won the Best Paper Award of ATMOS'17 with their paper "Look-Ahead Approaches for Integrated Planning in Public Transportation".

We would like to thank the members of the Steering Committee of ATMOS for giving us the opportunity to serve as Program Chairs of ATMOS'17, all the authors who submitted papers, Daniel Delling for accepting our invitation to present an invited talk, the members of the Program Committee and the additional reviewers for their valuable work in selecting the papers appearing in this volume, and the local organizers for hosting the workshop as part of ALGO'17. We also acknowledge the use of the EasyChair system for the great help in managing the submission and review processes, and Schloss Dagstuhl for publishing the proceedings of ATMOS'17 in its OASIcs series.

August, 2017

Gianlorenzo D'Angelo
Twan Dollevoet

17th Workshop on Algorithmic Approaches for Transportation Modelling, Optimization, and Systems (ATMOS 2017).
Editors: Gianlorenzo D'Angelo and Twan Dollevoet
Open Access Series in Informatics
OASICS Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

Organization

Program committee

Ralf Borndörfer	Zuse-Institute Berlin, Germany
Valentina Cacchiani	University of Bologna, Italy
Gianlorenzo D'Angelo (co-chair)	Gran Sasso Science Insitute, Italy
Mattia D'Emidio	University of L'Aquila and Gran Sasso Science Institute, Italy
Twan Dollevoet (co-chair)	Erasmus University Rotterdam, The Netherlands
Stefan Funke	University of Stuttgart, Germany
Marc Goerigk	Lancaster University, United Kingdom
Spyros Kontogiannis	University of Ioannina, Greece
Matúš Mihalák	Maastricht University, The Netherlands
Matthias Müller-Hannemann	Martin Luther University Halle-Wittenberg, Germany
Paola Pellegrini	IFSTTAR, France
Natalia Rezanova	Danish State Railways – DSB, Denmark
Pieter Vansteenwegen	KU Leuven, Belgium

Steering committee

Alberto Marchetti-Spaccamela	Universita di Roma "La Sapienza", Italy
Anita Schöbel	Georg-August-Universität Göttingen, Germany
Dorothea Wagner	Karlsruhe Institute of Technology (KIT), Germany
Christos Zaroliagis (chair)	University of Patras, Greece

List of additional reviewers

Francesco Cellinese, Serafino Cicerone, Luca Forlizzi, Dimitris Fotakis, Daniele Frigioni, Stefano Leucci, Thomas Mendel, Alfredo Navarra, Miriam Schlöter, Giacomo Scornavacca, Lorenzo Severini, Georgios Stamoulis, Yllka Velaj, Cosimo Vinci, Christos Zaroliagis

Local organizing committee

Stefan Szeider (chair), Robert Ganian (co-chair), Martin Nöllenburg (co-chair), Doris Dicklberger, Wolfgang Dvořák, Fabian Klute, Andreas Müller, Nysret Musliu, Sebastian Ordyniak, Günther Raidl, Mihaela Rozman, Stefan Woltran

17th Workshop on Algorithmic Approaches for Transportation Modelling, Optimization, and Systems (ATMOS 2017).
Editors: Gianlorenzo D'Angelo and Twan Dollevoet

Open Access Series in Informatics
OASICS Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany