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EDITORIAL

Special issue on intelligent transportation systems

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1 Introduction

Intelligent transportation systems (ITS) are often associated with road traffic. In reality, also the other transport modes are becoming intelligent transportation systems. This happens within the boundaries of those modes, i.e. on their own, as well as at the interconnection of multiple modes. The latter also lead to a single large intelligent transportation system, with intelligent intra-modal and inter-modal interfaces. This has particular relevance towards public and collective transport systems using trains, buses and aircraft. Further improvement of the service level, patronage and modal share of those systems (against the overwhelming private road traffic, or as an absolute growth) heavily relies on ITS; and the development of ITS requires advanced models and operations, such as those presented here.

The past often showed that research and technology development have been running on parallel tracks. As a result, models for ITS are often oversimplified, and hardly reflect the actual functioning of the available technology, complexity in analysis of control approaches hardly goes beyond rule-based or human intervention, and many technologies and actions are applied in practice without a thorough analysis of their impact on traffic and transportation systems.

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The idea to promote contacts, communication, and cooperation between private and academic sectors to develop and foster joint research and development, and to facilitate the exchange of knowledge and experience between partners initiated the organization of a series of conferences on models and technologies for intelligent transportation systems (MT ITS). This started in Rome (Italy) in 2009 and continued in Leuven (Belgium) in 2011 and Dresden (Germany) in 2013. On those conferences there has always been a significant share of studies centered on applied research and presentation of successful deployment of ITS in real life, balancing road traffic ITS with systems for collective transport.

During the MT ITS 2013 in Dresden there were 50 presentations, among which about 30 regarded collective transport modes. The conference was a success in merging the point of view of industry partners and academic researchers with many inspiring research directions sketched. This special issue contains a selection of those papers presented at the 3rd international conference on models and technologies for intelligent transportation systems, and for collective transport systems. A thorough two-stage review process had been adopted to select the papers, leading to ten possible candidates for publication. Six contributions were finally selected for publication in Public Transport: Planning and Operations.

Overall, the special issue represents an overview of original research contributions and research areas, which are briefly described in this editorial. We appreciate the support of all the authors and the referees.

This editorial frames the six contributions in a common view. Mainly, what we observe from this selection is that there are a number of clear common trends. ITS now spans four dimensions of transport systems, which range from the planning, over prediction, to operational control, and methodologies and tools for operations analysis. Those four scopes are investigated for different modes such as ground transit, air traffic, and railways.

2 The Contributions

2.1 Planning

Determining a timetable for railway operations is giving a structure along which an ITS can operate. This has been a classic problem in operations research. The paper *A state-of-the-art realization of cyclic railway timetable computation* by Michael Kümmling, Peter Großmann, Karl Nachtigall, Jens Opitz and Reyk Weiß proposes an innovative way to solve this problem by means of SAT solvers. The application of such tools to large scale networks with mixed traffic would provide a base for fully automatic timetabling.

2.2 Operational prediction and optimization

Improving operations means understanding what is happening and what will happen in the short term future. The paper *Predictive modelling of running and dwell times in railway traffic* by Pavle Kecman and Rob M. P. Goverde deals with statistical

models which can determine major trends and predict train operations based on recorded data. The prediction is crucial for performing possible optimization of operations.

ITS range as far as air operations. In those systems, capacity on the ground as well as capacity in the air is scarce and many stakeholders are given. Moreover, safety regulations are extremely strict. For the problem of controlling air traffic in the vicinity of a terminal airport, models and algorithms are put forward within the paper *Air traffic optimization models for aircraft delay and travel time minimization in terminal control areas* by Marcella Samà, Andrea D'Ariano, Paolo D'Ariano and Dario Pacciarelli enabling to explore the tradeoff between delay and travel time.

2.3 Implementation

Buses waiting at a traffic light are a typical situation of multiple (intelligent) transportation systems interacting. But how to manage them at best? What can be the best way to implement pre-signalling so that both transit and traffic have high level of service, depending on the respective flows? The paper *Pre-signals for bus priority: basic guidelines for implementation* by S. Ilgin Guler and Monica Menendez deals with practical issues and timing ranges related to the variability of flows, in the perspective of the implementation of a pre-signalling system for bus priority at intersections.

2.4 Models and tools for data analysis

Rail transport challenges road transport in urban areas in terms of speed and capacity. Despite some differences, *Analyzing railroad congestion in a dense urban network through the use of a road traffic network fundamental diagram concept* by Pierre-Antoine Cuniasse, Christine Buisson, Joaquin Rodriguez, Emmanuel Teboul, David de Almeida investigates how to apply an innovative tool for road traffic analysis to railroad congestion, reporting on a very busy transport network in the urban area of Paris.

The required step to improve operations based on data is to actually have it collected, and made available. The paper *Data driven improvements in public transport: the Dutch example* by Niels van Oort, Daniel Sparing, Ties Brands and Rob M. P. Goverde reports on a series of developments, systems, tools which form a comprehensive access point to public transport data in the Netherlands. Based on the publicly available data, opportunities for improving are identified and discussed, to be included in the planning and operational phase.