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Intelligent Transportation Systems – Problems and Perspectives

Preface

The term "intelligent transport system" is used to name the integration of control, information and communication technologies with transport infrastructure. ITS covers all modes of transport and takes into account the dynamic interaction of all constituents of the transport system. A transport system can be considered effective if it is capable of linking all sources of data in the system to produce valuable information. This information is the basis for control and management decisions which are made by transport users and operators. The potential of Intelligent Transport Systems lies in their wide variety of applications in different modes of transport.

The editors aim was to present the discussion of problems encountered in the deployment of ITS. This discussion places emphasis on the early tasks of designing and proofing the concept of integration of technologies in ITS. The book comprises two parts.

The first part concentrates on the design problems of urban ITS. It is divided into five chapters.

The first chapter reviews the challenges of incorporating ICT for establishing a smart transport system as an autonomic entity and to ensure a high reliability of functioning. Reliability is essential since most other services of the living environment smart city, rely on transport systems. The chapter gives an overview on the state of research based on current literature and recent publications of the authors.

The next chapter emphasizes the problems of designing the ITS for transition to "green" transport. The definition of the environmentally friendly transport is outlined using EU and UN transport policy documents. The term management system is stressed as vital for reaching the goals of such transport. Different aspects of managing the data flow within the system are discussed. Especially the interface between vehicles and infrastructure as the source of data for elaboration of control decisions is presented.

Żochowska and Karoń in Chap. "ITS Services Packages as a Tool for Managing Traffic Congestion in Cities" discuss strategies for managing congestion using packages of ITS services. Congestion management is a vital problem in urban transport systems greatly contributing to the efficiency of ITS. The authors

present their concept of combining services to enhance the utilization of collected data in the transport system. This requires a close cooperation and coordination between planners, designers and traffic engineers. The chapter also presents the concept of an integrated approach to this issue in the context of the theory of traffic flow.

The following chapter gives a detailed account of using artificial intelligence methods for determining flow volumes in traffic networks. The aim of the study was to compare the short-term forecasting models based on Bayesian networks (BN) and artificial neural networks (NN), which can be used in traffic control systems especially incorporated into modules of Intelligent Transport Systems.

In the last chapter of the first part the problem of transport line capacities is reviewed. Capacity dimensioning is an important element of resource management in ITS. Mathematical model for optimal capacity sizing of N different transport types (capacity types) is explained, minimizing the total expansion cost. Instead of nonlinear polynomial convex optimization technique, that could be very exhausted, the network optimization method is applied. Using this approach an efficient algorithm for three different capacity types is developed and outlined.

The second part of the book consists of three chapters featuring case studies representative for the different modes of transport. These are freight transport, rail transport and aerospace transport encompassing also space stations.

Freight transport ensures the supply of materials for production and the dispatch of ready products to customers. Just-in-time supply chains, door-to-door transport impose challenges on the design of an efficient transport systems. The introduction of ICT ease the problems and also bring new issues to resolve during deployment. Authors classify the risks of development and deployment of transport systems serving industrial enterprises.

Młyńczak et al. in the following chapter introduce the components of the European Rail Traffic Management System (ERTMS). This system is one of the important components ensuring interoperability of the European rail system. The vital components, their features and functions are discussed. The overall structure of the ERTMS is illustrated.

The last chapter elaborates on the subject of deployment of ITS services in aerospace engineering. Intelligent control must be able to process flying object data under rapidly varying operating conditions, to form conclusions, make decisions, and manage the objects flight. This requires a rigorous interaction between control systems and the transport infrastructure, which can be provided by the integration of ICT. The outline of this integrated system is presented in the chapter.

The content of the book presents the problems of deployment of ITS from a slightly infected perspective. This is the influence of long term State imposed transport policies, which were resistant to the introduction of new technologies for transport control and management. The authors of the book work in Croatia, Germany, Romania, Russia, Saudi Arabia, Ukraine, United Kingdom and Poland. This multi national perspective constitutes a valuable incentive for elaborating common solutions for integration of ICT in transport.

The book provides ideas for deployment which may be developed by scientists and engineers engaged in the design of Intelligent Transport Systems. It can also be used in the training of specialists, students and post-graduate students in universities and transport high schools.

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