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Editorial

Advances in Mobility Theories, Methodologies, and Applications

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Progress in traffic and mobility is illustrated most clearly by the rapid development of the transportation industry, including the vehicle production. Linked with the infrastructure, this explains one of the main challenges to the science of information and intelligent technology. Nowadays, our daily life and work are related closely to traffic and mobility. The investigation of advanced theories and methodologies and their applications for modern traffic and mobility is used to improve the efficiency and safety. Thus the developing of advanced theories and methodologies which are dedicated to the modern traffic and mobility is essential. Accordingly, transport problems including traffic jam, accidents, and pollution emissions have become subjects which have influence on the social and business developments. Recently, mathematical modeling and simulation methods have obtained substantial attention because of their potential for a powerful technology which is applied now to solve problems of traffic and mobility.

Since, in the course of the last decades, the traffic demand has grown continually than the construction of the infrastructure, traffic jams in many countries have become a severe problem. Because, however, also the vehicle speed increases, the road safety has become an important and socially relevant subject. In addition, the environmental impact and the energy consumption which are caused by the traffic systems wake up big public worry. Although transport operations have exceptionally been improved in the course of the last decades, transport engineers and scientists still search solutions for how the traffic system could be treated more efficiently and how transport operations can be improved by new technologies and new methodologies. The increasing demand for mobility, comfort, and economic efficiency should be satisfied by the methods which are based on the use of mathematical tools and advanced transport-engineering applications.

Because transport is an integral component of the human life, it is hardly necessary to emphasize the importance of the transport in our daily lives. The interaction between the vehicles, the drivers, and the infrastructure (including highways, controlling devices, sign-posting, and index marks) has been modeled in an exact mathematical approach. Nevertheless, traffic phenomena are complicated and nonlinear, depending on the interaction of a large number of vehicles.

Observations of the real traffic have revealed extensive nonlinear phenomena: the formation of transportation jams, stop-and-go waves, hysteresis, and phase transitions. Based on a variety of substantial approaches, car-following models, traffic wave theory (hydrodynamic analogy), and queuing theory have been generated to research traffic flow theory and to achieve traffic safety and transportation efficiency.

Because the vehicle speed increased, traffic accidents became more severe. Road safety has become an important and socially relevant subject which has an impact on the social and business development. Another question of the study of the transport is how one can improve the demand for efficient movement. Consequently, strategies are suggested to the technology, education, and enforcement to create a safe transport situation.

Transport planning is a field which is involved with the assessment and the design of transport facilities, including

streets, highways, footpaths, bicycle lanes, and lines of the public transport lines. Transport planning recognizes the critical connections with other social aims and plays a basic role for a vision of the future of state, region, and community.

ITS is a set of concepts and services for the transport technology by the use of innovative technologies, like wireless communications, computer technologies, floating car data/floating cellular data, sensing technologies, inductive loop detection, and video vehicle detection. Some advanced applications are emergency vehicle notification systems, automatic road enforcement, variable speed limits, collision avoidance systems, and dynamic traffic light sequence.

In order to compensate for the unfavorable human behavior that might cause safety problems, advanced driver assistance systems (ADAS) have been considered as a crucial subsystem of ITS, which use advanced technologies of information and message technologies in order to support driver with their driving tasks. The ADAS could cover a row of subsystems, beginning from the systems of providing transportation information up to the systems of controlling vehicle operation. For example, the adaptive cruise control (ACC) can support the driver with keeping a suitable distance to the vehicle ahead; the lane-departure-warning system (LDW) warns the driver if he/she leaves unintentionally the track.

This special issue focuses on the recent advances in traffic and mobility in the context of modern transport system and the discussion of various traffic problems. The main topics of the special issue include assistive mobility systems, vehicle active safety and intelligent vehicle, vehicle design challenges, eco-driving and energy-efficient vehicles, cooperative vehicle-infrastructure systems, driving behavior and driver assistance system, management of fleets of electrical vehicles and hybrid power systems, intelligent transport system (ITS), and modeling, simulation, and control of traffic system.

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