IFAC World Congress 2017 open invited track on "Traffic modeling, estimation and control"

Claudio Roncoli * **Ketan Savla** ** **Carlos Canudas-de-Wit** ***

* *Dynamic Systems and Simulation Laboratory, Technical University of Crete, Chania, Greece (e-mail: croncoli@dssl.tuc.gr)*
** *Sonny Astani Department of Civil and Environmental Engineering, University of Southern California, Los Angeles, CA, USA (e-mail: ksavla@usc.edu)*
*** *GIPSA-Lab, CNRS, Dept. of Control Systems, Grenoble, France (e-mail: carlos.canudas-de-wit@gipsa-lab.fr)*

Abstract: Increasing travel demand, combined with relatively slower growth in physical capacity, is leading to increased congestion in several metropolitan areas. Rapid advancements in sensing, computing, and communication technologies, and their increasing adoption, are opening up possibilities to develop deeper insights into traffic dynamics, and to estimate and control traffic in real-time. The proper utilization of these new opportunities has the potential to improve the performance of traffic systems, reduce delays, minimize environmental impact, and increase safety. The objective of this open invited track is to gather representatives from academia to share and discuss ideas on the state of the art, novel theoretical approaches, and practical applications within the field of traffic modeling, estimation and control, especially in the context of emerging technologies.

1. IFAC TECHNICAL COMMITTEE FOR EVALUATION

The open invited track will be supported by the IFAC Technical Committee 7.4 Transportation systems.

2. DESCRIPTION OF THE TOPIC

Efficient and resilient traffic systems are important for good quality of life in cities. However, increasing demand, combined with relatively slower growth in physical capacity, leads to widespread traffic congestion on several urban roads and motorways. On the other hand, traffic control strategies such as ramp metering and traffic signal control have traditionally demonstrated potential to mitigate congestion, reduce delays, decrease air pollution, and increase traffic safety. In order to realize the full potential of these mechanisms, rigorous scientific study of several issues of interest to the automatic control community are required.

Traffic systems are dynamical systems characterized by several complexities such as large scale, network effects, uncertain inputs and disturbances, as well as high influence of human behavior, which make the tasks of modeling, estimation, and control extremely challenging. These topics have been of intense research interest over the last several decades, e.g., Treiber and Kesting (2013); Papageorgiou et al. (2003). However, rapid advancements in sensing, computing, and communication technologies, and their increasing penetration in traffic systems, is introducing new modalities for estimation and control in urban traffic: mobile phones are augmenting our capability to estimate traffic state, as well as providing real-time and en route traffic information and recommendations to drivers; conventional traffic control mechanisms are transitioning towards real-time feedback implementation in the form of adaptive traffic signal control and dynamic congestion pricing; and coordination between arterial and freeway traffic systems in response to traffic incidents. These phenomenon are collectively enriching traffic dynamics, and hence necessitate appropriate analytical tools, empirical studies, and experimental platforms (Canudas-de-Wit et al., 2015).

The objective of this open invited track is to gather representatives from academia and industry to share and discuss ideas on the state of the art, novel theoretical approaches, and practical applications concerning traffic modeling, estimation, control, and traffic data treatment, especially in the context of emerging technologies. This open invited track solicits papers on theoretical investigations of these aspects as well as papers describing field applications of traffic estimation and control strategies.

The areas of interest of this open invited track include, but are not limited to, the following topics:

(1) Development/Analysis of microscopic and macroscopic traffic flow models;
(2) Theoretical investigations on estimation and control techniques for traffic systems and networks;
(3) Development of local and network-wide estimation and control strategies;
(4) Development of dynamic incentive mechanisms;
(5) Development of traffic control strategies for sustainable mobility;
(6) Simulation and Tools;
(7) Field applications and case studies.

Proposal submitted to 20th IFAC World Congress. Received July 14, 2016.

REFERENCES

Canudas-de-Wit, C., Morbidi, F., Ojeda, L., Kibangou, A., Bellicot, I., and Bellemain, P. (2015). Grenoble Traffic Lab. An experimental platform for advanced traffic monitoring and forecasting. *IEEE Control Systems Magazine*, 35, 23–39.

Papageorgiou, M., Diakaki, C., Dinopoulou, V., Kotsialos, A., and Wang, Y. (2003). Review of road traffic control strategies. *Proceedings of the IEEE*, 91(12), 2043–2067.

Treiber, M. and Kesting, A. (2013). *Traffic Flow Dynamics*. Springer Berlin, Heidelberg.

Proposal submitted to 20th IFAC World Congress. Received July 14, 2016.