

KIOS Distinguished Lecture Series

Traffic Flow Control: Closing the loop

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LECTURE ABSTRACT

Current transportation networks are operating mostly as open loop dynamical systems with very limited measurements and highly inaccurate control actions especially during incidents. Connectivity and associated technologies will change this status by providing the measurements and information that is needed to develop effective control systems for traffic management and control.

In this talk I present a strategy for highway traffic flow control during incidents and bottlenecks that is based on a combined lane change and variable speed control to eliminate capacity drops during incidents and bottlenecks, improve mobility, reduce the number of stops and forced lane changes and in addition reduce emissions. We present the analysis using the cell transmission model and then demonstrate the efficacy of the approach using a validated microscopic traffic simulation model for I-710 where the traffic is non-homogeneous due to the high volume of trucks and the impact of incidents is more pronounced. I will also summarize some new approaches on feedback using load-balancing and optimum vehicle routing.

Petros A. Ioannou received the B.Sc. degree with First Class Honors from University College, London, England, in 1978 and the M.S. and Ph.D. degrees from the University of Illinois, Urbana, Illinois, in 1980 and 1982, respectively. In 1982, Dr. Ioannou joined the Department of Electrical Engineering-Systems, University of Southern California, Los Angeles, California. He is currently a Professor in the same Department and holds the A.V. 'Bal' Balakrishnan Chair. He is the Director of the Center of Advanced Transportation Technologies, the Associate Director for Research of METRANS, a University Transportation Center and the Director of the Graduate Master Program on Financial Engineering. He holds a courtesy appointment with the Department of Aerospace and Mechanical Engineering and the Department of Industrial Engineering. His research interests are in the areas of adaptive control, nonlinear systems, vehicle dynamics and control, optimization, freight and marine transportation and intelligent transportation systems. Dr. Ioannou was the recipient of the Axelby Best Paper Award by the IEEE Control System Society in 1984 and the recipient of a 1985 Presidential Young Investigator Award for his research in Adaptive Control. In 2009 he received the IEEE Intelligent Transportation System (ITS) Society (ITSS) Outstanding ITS Application Award and the IET Heaviside Medal for Achievement in Control by the Institution of Engineering and Technology (IET). In 2012 he received the IEEE ITSS Outstanding ITS Research Award and in 2015 the 2016 IEEE Transportation Technologies Field Award. In 2016, he received the IEEE Control System Society Transition to Practice Award for his work on Adaptive Cruise Control that is commercialized by Ford Motor Company in the mid 90's, 4 years before any other car manufacturer.

Dr. Ioannou is a Fellow of IEEE, Fellow of the International Federation of Automatic Control (IFAC), Fellow of the Institution of Engineering and Technology (IET) and Fellow of AAAS. He is the author/co-author of 8 books and over 400 research papers.

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