

SEMINAR

Monday October 2, 2006
3:30 – 5:00pm

3:30 pm: Refreshments in ITS, 5th Floor Social Science Tower (across from elevator)

4:00 pm: Seminar, Room 220B Social Science Tower

A GENERIC APPROACH TO REAL-TIME FREEWAY NETWORK TRAFFIC SURVEILLANCE

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Abstract

The presentation addresses a generic macroscopic model-based approach to real-time freeway network traffic surveillance as well as a software tool RENAISSANCE that has recently been developed to implement the approach for field applications. On the basis of stochastic macroscopic freeway network traffic flow modeling, extended Kalman filtering, and a limited amount of traffic measurements, RENAISSANCE enables a number of real-time freeway network traffic surveillance tasks, including traffic state estimation and prediction, travel time estimation and prediction, queue tail/head/length estimation and prediction (queue tracking), and incident alarms. This presentation introduces the utilized macroscopic freeway network traffic flow model and a real-time traffic measurement model, upon which a complete dynamic system model for freeway network traffic is established with special attention to the handling of some important model parameters. An outline is given of various algorithms and the functional architecture of RENAISSANCE. Simulation testing results of the major RENAISSANCE functions are presented with respect to a hypothetical freeway network example. A number of real-data testing results concerning a 7-km German freeway stretch are presented, focusing on the RENAISSANCE traffic state estimation function under various circumstances regarding congestion, weather conditions and traffic incidents. Some recent real-data testing results of the traffic state estimator for a large-scale freeway network in Southern Italy is also presented. Finally, an outlook of further issues and RENAISSANCE applications is given.

Dr. Yibing Wang received his Ph.D. degree in automatic control engineering from Tsinghua University, P. R. China, in 1998. From 1999 to 2001, he was a postdoctoral researcher at the Dynamic Systems and Simulation Laboratory in the Department of Production Engineering and Management, Technical University of Crete, Greece. Since 2001, he has been a research fellow at the same laboratory. His research interests include freeway network traffic surveillance, ramp metering, route guidance of road networks, urban traffic control, and automated highway systems. He has published some 13 international journal papers and book chapters. He is a member of IEEE, an associate editor of IEEE Transactions on Intelligent Transportation Systems, and a member of the editorial advisory board of Transportation Research C.