Mechanical Engineering
UNIVERSITY OF CALIFORNIA, BERKELEY

Department of Mechanical Engineering
Russell Severance Springer Lecture Series
presents

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April 13 – April 27, 2017
10:00 – 11:00 am
521 Cory Hall

DATES	TOPICS
April 13	"Data fusion algorithms for Density Reconstruction in Road Transportation Networks"

This talk addresses the problem of density reconstruction in traffic networks with heterogeneous information sources. The network is partitioned in cells in which vehicles flow from their origin to their destination. The state of the network is represented by the densities of vehicles in each cell. Density estimation is of crucial importance in future Intelligent Transportation Systems for monitoring, control, and navigation purposes. However, deploying fixed sensors for this purpose can be very expensive. Therefore, most of fixed sensors networks are rather sparse. On the contrary, recent technologies have enormously increased the availability of relatively inexpensive Floating Car Data. A data fusion algorithm is then proposed to incorporate the two sources of information into a single observer of density of vehicles. The efficiency of the proposed algorithm is shown in a real scenario using data from the Grenoble Traffic Lab GTL* fixed sensor network and INRIX Floating Car Data on the Rocade Sud in Grenoble. Current work targeting the same objectives but for the whole Grenoble network will be also discussed.

April 20 "Using the Averaged Link Transmission Model for efficient control design of Large-Scale Urban Networks"

In this lecture, we first formalize the mathematic sense in which the solutions of the continuous-time signalized T-periodic Link Transmission Model (LTM) are approximated by the solutions of its averaged version. In particular, we shown that the error norm between the solutions of the signalized and the averaged models is bounded, in both a finite and infinite time-intervals, by constant proportional to the ratio, between the traffic light time-cycle, and the considered road segment (link) length. This result confirms the intuition that the precision of the averaged models improves with the increase of traffic light frequencies and link road lengths. Then, we show that this model can be used to design efficient optimal controllers. We present an one-step head optimal controller, which can be formulated as a Linear program problem. Some animated simulations, using the microscopic simulator AIMSUM, of the Grenoble downtown will be also presented.

April 27 "Fun-to-Drive by Feedback"

This lecture is devoted to new challenging control problems arising in the automotive industry as a consequence of the customer-driven performance specifications adopted by car builders which have dramatically increased the number of new proposed automated features where feedback interacts with the driver. The notion of "Fun-to-Drive by Feedback" relates, here, to the ability to design a control scheme resulting in good ride comfort behavior as well as acceptable safe operation. The lecture shows how control techniques can be used to solve some of these problems, and discusses how these subjective notions can be formalized thanks to concepts such as passivity and model matching control. We present a series of examples concerning systems that provide assisted automated devices (assisted clutch synchronization, steer-by-wire system, and advanced inter-distance control, including vehicle-to-vehicle dynamical models), in which these aspects are assessed. The talk is based ona semi-plenary of the CDC'05.

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