

College of Arts and Sciences
and Department of Mathematics and Statistics
invite you to a talk in the

Applications of Mathematics Colloquium Series

titled

Computer Control Of Advanced Automotive Engines

Speaker: **Mrdjan Jankovic,** Ford Research
Where: Cudahy Hall 313, Lake Shore Campus
When: Tuesday, April 10th, 4:30 pm

Refreshments 4:00 pm by the lecture room, Cudahy Hall 313

Abstract:

There is a very complex set of requirements imposed on today's automotive vehicles that include regulations on safety, emissions, fuel economy, end-of-life disposal, as well as customer preferences for fuel economy, availability, performance, and comfort. In response to this, automakers have incorporated high technology content by adding devices that are invariably computer controlled. Inside the powertrain, this content includes new engine optimization devices (variable valve timing and lift, direct injection, sequential turbo-charging, charge motion control valves), more efficient transmissions (six, seven, and eight speed, power-shift), hybrid-electric propulsion, etc.

The aim of this talk is to present the engine control system structure which is, by necessity, dominated by a feedforward component obtained through an elaborate process that includes mapping, optimization, and calibration. We shall describe methods to reduce the optimization effort and real time complexity, while preserving scheduling accuracy and realizing as close-to-optimal fuel economy as possible. These methods include on-line engine optimization with Simultaneously Perturbed Stochastic Approximation, mapping with Design of Experiments, and real time Kernel Interpolation. A computer controller is also the key component of the automotive after-treatment system used to reduce emissions. In this case, there is a feedback loop dominated by a long transport delay that limits its bandwidth. We analyze tradeoffs in control design and select the Smith Predictor controller for vehicle implementation. For the fuel economy optimization and after-treatment control problems simulation and experimental results are included to illustrate performance improvements.

About the speaker:

Mrdjan Jankovic received doctoral degree from Washington University, St. Louis. He has joined Ford Research in 1995 where he is currently a Senior Technical Leader in the Powertrain Controls Department. Dr. Jankovic coauthored one book, three book chapters, more than 100 technical papers/reports, and more than 40 US patents, with 15 implemented in Ford products worldwide. Dr. Jankovic is a Fellow of the IEEE.

For further details, contact the organizers:

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or consult <http://webpages.math.luc.edu/~lauve/appmathseminar/>

