Mechanical Engineering Department Seminar

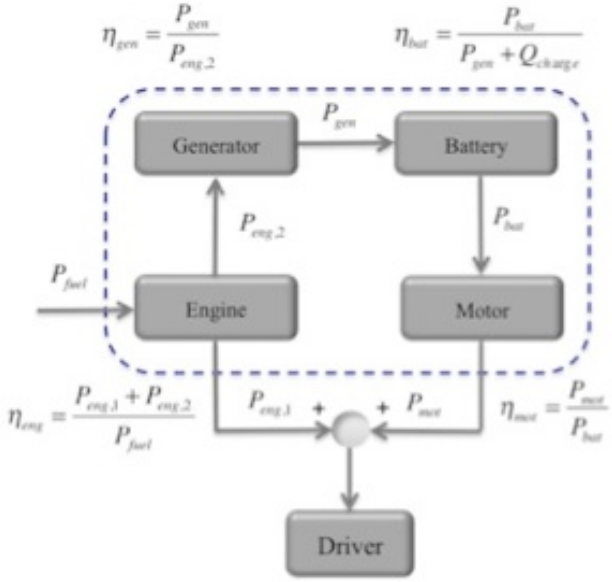
3:35pm October 30, 2013
1130 Mechanical Engineering

A Multiobjective Optimization Framework for Online Optimal Control of Hybrid Electric Vehicles

Andreas A. Malikopoulos

R&D Staff, Alvin M. Weinberg Fellow; Energy and Transportation Science Division, Oak Ridge National Laboratory

Hybrid electric vehicles (HEVs) have attracted considerable attention due to their potential to reduce petroleum consumption and greenhouse gas emissions. Implementing online a power management control policy to distribute the power demanded by the driver optimally to the available subsystems, e.g., the internal combustion engine, motor, generator, and battery, constitutes a challenging control problem and has been the object of intense study for the last decade. This talk will address the development of a theoretical framework that can be used online to derive the optimal control policy for any given driving style. The stochastic control problem is treated as a multiobjective optimization problem of the one-stage expected costs of the subsystems, and it is shown that the control policy yielding the Pareto optimal solution is an optimal control policy. The talk will conclude with highlighting current research efforts towards making intelligent vehicles with the aim of (1) becoming eco-friendly, (2) realizing the optimum performance and efficiency based on consumers' needs and preferences, and (3) learning how traffic information can positively impact the environment.



Bio: Andreas A. Malikopoulos received a Diploma in Mechanical Engineering from the National Technical University of Athens, Greece, in 2000. He received M.S. and Ph.D. degrees from the Department of Mechanical Engineering at the University of Michigan, Ann Arbor, in 2004 and 2008, respectively. His research interests span several fields, including analysis, optimization, and control of stochastic systems; stochastic optimal control; nonlinear optimization and convex analysis; large-scale optimization; and learning in complex systems. The emphasis is on applications related to energy and intelligent transportation. Before joining Oak Ridge National Laboratory, he was a Senior Researcher with General Motors Global Research & Development, conducting research in the areas of stochastic optimization and control of advanced propulsion systems. He was selected by the National Academy of Engineering to participate at the annual 2010 German-American Frontiers of Engineering Symposium, and the 2012 NAKFI conference, *The Informed Brain in a Digital World.*