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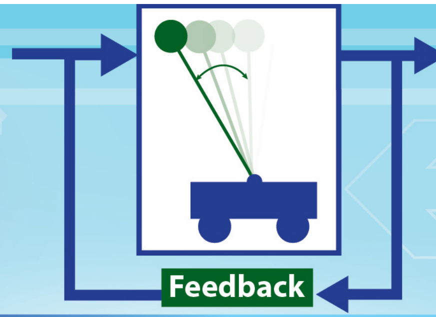
Control Seminar



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Intercalated Injection for Dual Retrospective Adaptive Control of Nonminimum-Phase Systems

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University of Michigan
Department of Aerospace Engineering

Friday, September 16, 2016

3:30 – 4:30 pm • 1500 EECS

ABSTRACT: Adaptive control is a promising approach to feedback control of systems with high levels of uncertainty due to unmodeled physics and unpredictable changes. By responding to the characteristics of the actual plant and environment, adaptive control can overcome the performance/robustness tradeoff of robust control. In practice, however, adaptation must be sufficiently fast and accurate despite limited prior modeling information. This talk will focus on recent developments in retrospective cost adaptive control (RCAC) for command following and disturbance rejection. In particular, we will present dual RCAC (DRCAC), which uses concurrent closed-loop identification to estimate the key modeling information needed by RCAC, including nonminimum-phase zeros. This information is used to construct a target model for a closed-loop transfer function that arises from intercalated injection of a virtual exogenous controller perturbation. DRCAC depends on optimization of a biquadratic cost function, whose minimizer provides both the controller update and the required modeling information.

This research was performed by current students Yousaf Rahman, Antai Xie, Frant Sobolic, Ankit Goel, Ming Yu, and Ahmad Ansari.

BIO: My interests include identification, estimation, and control for aerospace applications. My research has focused on active noise and vibration control, motion control, and spacecraft attitude control. My current interests are in the theory and application of nonlinear system identification, large-scale state estimation for data assimilation, and adaptive control. I am the director of the Noise, Vibration, and Motion Control Laboratory, which includes instrumentation and testbeds for control applications. A 6-degree-of-freedom electric shaker table under all-digital control is used for vibration and motion control applications. Current research is focusing on minimal-modeling adaptive control algorithms for systems with uncertain dynamics and unknown disturbance spectra.

I was Editor-in-Chief of the IEEE Control Systems Magazine from August 2003 to December 2011.

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