

UTC INSTITUTE FOR ADVANCED SYSTEMS ENGINEERING

Seminar Series

Monday March 26th, 2018

1:00 – 2:00PM

UConn, Storrs Campus – ITEB 336

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Practical Adaptive Control

Adaptive Control is viewed as a game changer in many application domains where real-time feedback control is essential to ensure the desired performance. Adaptive controllers, whose distinguishing feature is a parameter estimator that prescribes the rule for changing the control parameters in real-time, have been studied extensively over the past forty years, with fundamental properties of stability and robustness well understood. Guidelines for analysis and synthesis for adaptive controllers have been laid out for linear and (specific classes of) nonlinear systems, continuous and discrete-time systems, single-input and multi-input systems, and deterministic and stochastic systems. So what's missing? There are glaring gaps in adaptive control theory that remain to be closed for adaptive control to be a viable, practical, and easily implementable methodology. Guarantees have to be provided that ensure robustness to a wide variety of non-parametric perturbations. Guidelines have to be in place for a systematic design of all free parameters in the controller. Bounds have to be derived, not only for steady-state behavior, but also for transient characteristics. Implementation issues will have to be satisfactorily addressed. The ability to accommodate actuator constraints in terms of bandwidth, magnitude limits, and rate limits has to be precisely characterized. Design of semi-autonomous adaptive systems that integrates humans either in-the-loop or on-the-loop has to be explored. Recently, there have been breakthroughs in Adaptive Control that have led to reducing the above gaps. This talk will outline the basic principles of the now classical adaptive control theory, but also highlight these recent results and show how they contribute towards making adaptive control practical.

Anuradha Annaswamy

Dr. Anuradha Annaswamy is the Director of the Active-Adaptive Control Laboratory at MIT and a Senior Research Scientist in the Department of Mechanical Engineering. Her research interests pertain to adaptive control theory and applications to aerospace, automotive, and propulsion systems, cyber physical systems, and CPS applications to Smart Grids, Smart Cities, and Smart Infrastructures. Dr. Annaswamy received her PhD in Electrical Engineering from Yale in 1985. Her current research is supported by NSF, Boeing, Ford-MIT Alliance, Department of Energy, and Air-Force Research Laboratory.

Dr. Annaswamy is the author of over a hundred journal publications and numerous conference publications, co-author of a graduate textbook on adaptive control (2004), co-editor of several reports. She has served as the Vice President for Conference Activities (2014-15), and is currently serving as the VP for Technical Activities (2017-18) in the Executive Committee of the IEEE CSS. She is the Deputy Editor of the Elsevier publication Annual Reviews in Control (2016-present)

Upcoming Distinguished Lectures

Magnus Egerstedt,
Long Duration Autonomy
With Applications to
Persistent Environmental
Monitoring,
April 2, 2018

Upcoming Seminars

Christine Zhang,
United Technologies Research
Center – Software Systems,
April 9, 2018

Jingang Yi,
Rutgers University,
April 16, 2018

Website:

www.utc-iase.uconn.edu

Email:

utc-iase@engr.uconn.edu

Phone:

860.486.3355



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