

UNIVERSITY OF RHODE ISLAND

Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Location: Lippitt Hall 204

Time: Monday, February 26, 2018, 1:00pm
(refreshments at 12:50 p.m.)

Novel Control Design Techniques with Computational Efficiency and Optimality

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Abstract: Most real-world engineered systems exhibit highly complex dynamical behaviors, such as uncertainties, nonlinearities, delays, and switches. This, together with the requirement of stringent controlled performance, makes the underlying control design problems rather complicated and challenging. Moreover, many control design problems are computationally intractable, which could be too complex to solve. Thus, developing an effective robust control design technique that can simultaneously render stringent controlled performance and computational efficiency becomes urgently desirable.

In this talk, I will present our recent research work on novel control design techniques with computational efficiency and optimality. Two advanced control schemes, including the hybrid impulsive switching control and the exact-memory delay control, are proposed for two different types of control system designs, i.e., the switched control systems and the time-delay control systems, respectively. Two engineering applications on hybrid missile autopilot design and networked DC motor control systems are used to illustrate the usefulness and advantages of the proposed design techniques. One of the most important novelties of the proposed approaches lies in that the associated robust control synthesis problems can be effectively formulated as convex constrained optimization problems, and globally optimal control solutions can thus be easily obtained via convex optimizations. These proposed results have opened up a new research pathway in the field of robust optimal control, they would shift the current research direction from improving numerical non-convex optimization algorithms to developing new controller structures.

Bio-Sketch: Chengzhi Yuan received his B.S. and M.S. both in Automatic Control from South China University of Technology, Guangzhou, China, in 2009 and 2012, respectively. He received his Ph.D. in Mechanical Engineering from North Carolina State University, Raleigh, NC, USA, in May 2016. He joined the Department of Mechanical, Industrial and Systems Engineering at The University of Rhode Island (URI) as an assistant professor in Aug. 2016. He is the director of the Intelligent Control and Robotics Laboratory at URI (ICRL@URI). His research interests and expertise span over broad areas of dynamic systems, control theory, and system identification, with particular focuses on hybrid system modeling and control, robust analysis and control, multi-agent distributed control, and cooperative intelligent learning control. Applications of his research cover multidisciplinary engineering problems, such as large-scale heterogeneous vehicles formation control, multi-robot coordination, and multi-sensor human gait recognition. He has authored over 50 publications in refereed scientific and engineering journals and conference proceedings. He has served extensively as associate editor, (co-)chair, program committee member in conferences supported by ASME and IEEE. <http://egr.uri.edu/mcise/meet/cyuan/>