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Automatic
Control and
Systems
Engineering

The Department of Automatic Control & Systems Engineering
is pleased to announce the following seminar:

Tuning a plant without a model

Professor Franco Blanchini

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Thursday, 28 April 2016 at 15:00

LT01, Sir Henry Stephenson Building

Abstract

Given a static plant described by a differentiable input-output function, which is completely unknown, but whose Jacobian takes values in a known polytope in the matrix space, we consider the problem of tuning (i.e., driving to a desired value) the output, by suitably choosing the input. We show that, if the polytope is robustly non-singular (or has full rank, in the non-square case), then a suitable tuning scheme drives the output to the desired point.

In the continuous-time case, the proof of the result exploits a Lyapunov-like function and applies a well known game-theoretic result, concerning the existence of a saddle point for a min-max zero-sum game. We show that, when the plant output is represented in an implicit form, the same result can be obtained, resorting to a different Lyapunov-like function. We also deal with the case in which proper input or output constraints must be enforced during the transient.

In the discrete-time case, the saddle point game-theoretic result cannot be applied, due to the lack of concavity of the functional for the maximizer. Nevertheless, we show that a suitable tuning scheme still exist under robust non-singularity (or full rank) assumptions: the computation of the tuning law is then based on a convex-optimization problem to be solved on line.

Several examples are proposed as applications of the technique.

Biography

Franco Blanchini was born on 29 December 1959, in Legnano (Italy). He is the Director of the Laboratory of System Dynamics at the University of Udine. He was Program Vice-Chairman of the Conference Joint CDC-ECC 2005, Seville, Spain; Program Vice-Chairman of the Conference CDC 2008, Cancun, Mexico; Program Chairman of the Conference ROCOND, Aalborg, Denmark, June 2012 and Program Vice-Chairman of the Conference CDC 2013, Florence, Italy. He is co-author of the book "Set theoretic methods in control", Birkhäuser. He is the recipient of the 2001 ASME Oil & Gas Application Committee Best Paper Award and of the 2002 IFAC survey paper prize for the article "Set Invariance in Control - a survey", Automatica, November 1999. He has been an Associate Editor for Automatica from 1996 to 2006. He has been an Associate Editor for IEEE Transactions on Automatic Control from 2012 to 2015.

*Light refreshments will be served in the
foyer of the Sir Henry Stephenson Building following the seminar*