



Hamilton Institute

Bounds on the Achievable Performance of Control
Systems subject Data-rate Constraints

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Abstract:

Practical control systems often use non-transparent communication links and, thus, communication constraints arise. In this talk we will consider control systems subject to average data-rate limits. By focusing on a class of conceptually simple source coding schemes, we will obtain a framework that allows one to deal with average data-rate limits in control systems. In particular, the talk will focus on a situation where a noisy linear system has been designed assuming transparent feedback and, due to implementation constraints, a source coding scheme has to be designed so as to minimize the effects of data-rate limits in the feedback path. For this problem, and using the proposed class of source coding schemes, we will give an analytic upper bound on the best achievable performance for a given average data-rate constraint. We will also study the interplay between stability and average data-rates for the considered architecture. It will be shown that the proposed class of coding schemes can achieve mean square stability at average data-rates that are guaranteed to be at most 1.254 bits per sample away from the absolute minimum established by Nair and Evans' Data Rate Theorem. This rate penalty is compensated by the sheer simplicity of our approach. This work is the result of collaboration with Dr. M.S. Derpich (Universidad Tecnica Federico Santa Maria, Chile) and Dr. J. Ostergaard (Aalborg University, Denmark).

Bio:

Eduardo I. Silva was born in Valdivia, Chile, in 1979. He received a M.Sc. degree in Electronics Engineering from the Universidad Tecnica Federico Santa Maria, Valparaiso, Chile, in 2004. He worked as a research academic at the same university during 2005. He received the Ph.D. degree in Electrical Engineering from The University of Newcastle, Australia, in March 2009. Since November 2008, he works as a research academic at the Universidad Tecnica Federico Santa Maria, Chile. His research interests include performance limitations in MIMO control, networked control systems, signal processing and power electronics.

Venue: Seminar Room, Hamilton Institute, Rye Hall, NUI Maynooth

Time: 2.00 - 3.00pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie

