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Presents

Performance Limitations in Path Tracking for Linear Systems

by Prof. Rick Middleton

University of Newcastle

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Abstract:

It is well known, that anti-stable zero dynamics (that is, non-minimum phase behaviour), limits the ability of any causal stabilising control to achieve arbitrarily good trajectory tracking performance. There have recently been extensions in several directions to reduce or remove this limitation. One direction has been the use of 'preview control', whereby, advance knowledge of a reference trajectory is used to reduce limitations on the achievable trajectory tracking performace. More recently, there have been a series of works by Aguiar, Hespanha, Kokotovic and others on another approach, namely a path tracking approach, wherein the control objective is specified as a 'spatial only' trajectory, that is, there is no associated temporal specification. In this case, previous work has been able to establish constructively, that several performance limitations can be removed. In this talk, we re-examine this approach from a linear systems perspective, and categorise which classes of paths and plants permit arbitrarily good path tracking performance. In particular, we are able to demonstrate equivalence to a constrained reachability problem, and demonstrate convex optimisation algorithms for solution of this problem.

About the Speaker:

Professor Richard H. Middleton was born on 10th December 1961 in Newcastle Australia. He received his B.Sc. (1983), B.Eng. (HonsI) (1984) and Ph.D. (1987) from the University of Newcastle, Australia. He has had visiting appointments at the University of Illinois at Urbana-Champaign, the University of Michigan and the Hamilton Institute (National University of Ireland Maynooth). In 1991 he was awarded the Australian Telecommunications and Electronics Research Board Outstanding Young Investigator award. In 1994 he was awarded the Royal Society of New South Wales Edgeworth-David Medal. He received the M.A. Sargent Award from the Electrical College of Engineers Australia in 2004. He has served as an associate editor of the IEEE Transactions on Automatic Control, the IEEE Transactions on Control System Technology, and Automatica, as Head of Department of Electrical and Computer Engineering at the University of Newcastle and as a panel member and sub panel chair for the Australian Research Council. He was elected to the grade of Fellow of the IEEE starting 1999. He is currently a Professor in the School of Electrical Engineering and Computer Science at the University of Newcastle; Director of the ARC Centre for Complex Dynamic Systems and Control; and Vice President (Conference Activities) of the IEEE Control System Society. His research interests include a broad range of Control Systems Theory and Applications.