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Title: The Zero Dynamics of a Nonlinear System: from the Origin to the Latest Progresses of a Long Successful Story

Biography

Alberto Isidori, obtained his degree in EE from the University of Rome in 1965. Since 1975, he is Professor of Automatic Control at this University. His research interests are primarily in analysis and design of nonlinear control systems. He is the author of the highly-cited book “Nonlinear Control Systems”. He is the recipient of the “Georgio Quazza Medal” (in 1996) from the IFAC, of the “Ktesibios Award”, from the Mediterranean Control Association (in 2000) and of the “Bode Lecture Award”, from the CSS of IEEE (in 2001). In 2009, he received the “Galileo Galiei Award”, from the Italian Rotary Clubs, in recognition of his contributions to the progress of Engineering sciences in Italy. In 2009 he received the Doctor of Science Honorary Degree from the KTH of Sweden. He received best paper awards from the “IEEE Transactions on Automatic Control” and “Automatica”, twice from both journals. In 1986 he was elected Fellow of IEEE and in 2005 he was elected Fellow of IFAC. He is currently President of IFAC.

Abstract

The concept of zero dynamics of a nonlinear system was introduced about thirty years ago as nonlinear analogue of the concept of transmission zero of a system. The main original motivation for introducing this concept was the ambition to develop systematic methods asymptotic stabilization, with guaranteed region of attraction, when the dynamics in question are globally asymptotically stable. But soon after a variety of other applications showed up, in the context of feedback linearization, feedback equivalence to passive systems, non-interacting control with stability, output regulation. Essentially, all applications consider SISO systems (or, at most, “square” MIMO systems), require the system to be preliminarily reduced to a special normal form by means of appropriate change of coordinates, and assume the dynamics in question to be globally asymptotically stable. The analysis of systems having more inputs than outputs, of systems in which normal forms cannot be defined, and of systems in which the zero dynamics are unstable is still a substantially unexplored