



SYSTEMS, CONTROLS, AND ROBOTICS SEMINAR SERIES



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4:00 p.m. / 100 Harrington Education Classroom Center

Adaptive Local Loop Shaping and Inverse-based Youla-Kucera Parameterization with Application to Precision Control

ABSTRACT

In this talk, we discuss adaptive local loop-shaping ideas based on Youla-Kucera parameterization, i.e. all stabilizing controller parameterization, for precision motion control. Local loop shaping is performed in flexible add-on fashion to a baseline stabilizing controller. We address loop shaping for rejection of periodic disturbances and active vibration rejection. We will also discuss the connection of these problems from the view point of internal model principle, and provide new solutions of them with improved loop-shaping properties. One particular advantage of the proposed approach is separation of the closed-loop stability and servo performance yielding an intuitive and performance-orientated design guidance. The presented algorithms are verified by simulation and experimentation of positioning of a recording head of hard disk drives, active suspension and a wafer scanner test bed, which is an essential equipment in the semiconductor industry.

BIO

Masayoshi Tomizuka received his B.S. and M.S. degrees in Mechanical Engineering from Keio University, Tokyo, Japan and his Ph. D. degree in Mechanical Engineering from the Massachusetts Institute of Technology in February 1974. In 1974, he joined the faculty of the Department of Mechanical Engineering at the University of California at Berkeley, where he currently holds the Cheryl and John Neerhout, Jr., Distinguished Professorship Chair. At UC Berkeley, he teaches courses in dynamic systems and controls. His current research interests are optimal and adaptive control, digital control, signal processing, motion control, and control problems related to robotics, machining, manufacturing, information storage devices and vehicles. He served as Program Director of the Dynamic Systems and Control Program of the Civil and Mechanical Systems Division of NSF (2002-2004). He served as Technical Editor of the ASME Journal of Dynamic Systems, Measurement and Control, J-DSMC (1988-93), and Editor-in-Chief of the IEEE/ASME Transactions on Mechatronics (1997-99). He is a Fellow of the ASME, the Institute of Electric and Electronics Engineers (IEEE), the International Federation of Automatic Control (IFAC) and the Society of Manufacturing Engineers. He is the recipient of the Best J-DSMC Best Paper Award (1995, 2010), the DSCD Outstanding Investigator Award (1996), the Charles Russ Richards Memorial Award (ASME, 1997), the Rufus Oldenburger Medal (ASME, 2002) and the John R. Ragazzini Award (2006).

Refreshments will be served at 4:00 p.m.