

MAE Seminar Series, Spring 2008

April 4, Friday, 11:00 – 12:00

Riddick 450

Using Accelerometers for Enhanced Tuning and Operation of Drive Trains for Modern Mechatronic Systems

Masayoshi Tomizuka

Cheryl and John Neerhout, Jr. Distinguished Professor

Department of Mechanical Engineering

University of California, Berkeley, CA, USA 94720-1740

Abstract

This talk explores the advantages of sensing rich approaches to the design and operation of the power transmission mechanism or drive train under servo control. The drive train is a fundamental part of any motion control system, and it includes elements such as actuator (motor), gears, shaft and end-effector. In most cases, the control of such drive trains are based on the motor shaft encoder output while the objective of control is accurate positioning of the end-effector. Sensors to measure the state of the end-effector will enhance the design and operation of drive trains. Two such cases will be presented: 1) the use of vision image and other sensors such as accelerometers and gyros for end-effector sensing, and 3) sensor-based controller tuning of indirect drive train using accelerometers on the load side. For each of the two cases, the advantages are demonstrated by experiments.

About the speaker

Masayoshi Tomizuka was 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. 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), Editor-in-Chief of the IEEE/ASME Transactions on Mechatronics (1997-99). He served as President of the American Automatic Control Council (1998-99). He is a Fellow of the ASME, the Institute of Electric and Electronics Engineers (IEEE) and the Society of Manufacturing Engineers. He is the recipient of the Charles Russ Richards Memorial Award (ASME, 1997), the Rufus Oldenburger Medal (ASME, 2002) and the John R. Ragazzini Award (2006).