UNIVERSITY OF CALIFORNIA

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MESA (Mechatronics, Embedded Systems and Automation) Lab
Presents
A Research Seminar at The
# Applied Fractional Calculus (AFC) Workshop Series

Date/Time/Place: 05/19/2014, 4-6PM, MESA Lab (Room 820), 4225 N. Hospital Rd., Atwater, CA 95301. T: 209-2284398

Title: A Brief Literature Survey on the Preview Control Systems and the Computed Torque Method

Abstract: The preview control and computed torque control are two modern control techniques emerged in the 70's last century. As the name implies, the preview control method takes advantage of the pre-knowledge of the future information of the overall system so as to make the plant track a pre-determined reference signal, which provide superior performance over the control systems developed for pure noise rejection. The computed torque control is a control technique developed for the robot control. It is a special application of the feedback linearization of nonlinear systems, and appears in robust control, adaptive control and learning controls, etc. It provides a framework of bring together the classic independent joint control and some modern design techniques. This presentation gives brief introduction, survey and tutorial on these two control techniques, from which future works can benefit from the utilization of them.

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Speaker's short biography:
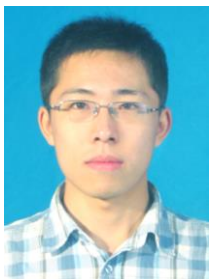
Zhuo Li is a PhD candidate in the department of Electrical Engineering at UC Merced. He received the B.S. in Automation from University of Science and Technology of China (USTC), and the M.S. in Electrical Engineering from Temple University, Philadelphia. He had some industrial working experience in China Unicom, Mercury System Inc, and Lam research, etc; and a broad research experience on many EE related topics. His current study and research focuses on the fractional order process controls.

Key references:

[1]. Masayoshi Tomizuka, "Optimal Continuous Finite Preview Problem", IEEE Trans. Automat. Contr., vol. AC-20, no. 3, pp. 362–365, 1975

[2]. R. Kelly, V. Santibáñez and A. Loría "Control of Robot Manipulators in Joint Space", Springer, 2005.

Integer-Order Calculus   Fractional-Order Calculus

Fractional Order Mechanics!

Hooke's law: $F = kx$
Newton's fluid: $F = kx'$ $F(t) = kx^{(\alpha)}(t)$
Newton's 2nd law: $F = kx''$

Going in-between: interpolation of operators:

$$\ldots, \quad \frac{d^{-2}f}{dt^{-2}}, \quad \frac{d^{-1}f}{dt^{-1}}, \quad f, \quad \frac{df}{dt}, \quad \frac{d^2f}{dt^2}, \quad \ldots$$