



Washington University in St. Louis

SCHOOL OF ENGINEERING & APPLIED SCIENCE

Preston M. Green Department of Electrical & Systems Engineering

Seminar Announcement

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Naval Postgraduate School

Friday, December 2, 2016

Green Hall, Room 0120

2:00 P.M.

Some Numerical Methods for Optimal Control

Abstract: Optimal control of nonlinear systems is a challenging problem due to various reasons such as the system nonlinearity and the curse of dimensionality. This presentation provides an overview of some numerical methods developed at Naval Postgraduate School for both open-loop and closed-loop optimal control. Some Galerkin-based numerical formulations are presented for solving nonlinear optimal control problems. It is a family of direct methods that calculate optimal trajectories by discretizing the system dynamics using Galerkin numerical techniques and approximate the cost function with Gaussian quadrature. In the second half of the talk, the focus is on a causality free method of solving Hamilton-Jacobi-Bellman equations for closed-loop optimal control. A sparse grid is used to mitigate the curse of dimensionality for problems that cannot be solved using a traditional dense grid.

Bio: Wei Kang received B.S. and M.S. degrees from Nankai University, China, in 1982 and 1985, respectively, and a Ph.D. degree from the University of California at Davis in 1991, all in mathematics. In 1991-1994, he held a faculty position at Washington University in St. Louis. Since 1994, he has been with the faculty of Applied Mathematics at US Naval Postgraduate School, where he is currently a professor. He was a Director of American Institute of Mathematics (2008-2011) for business and international collaborations. He was a visiting scientist at Intel (2005). He is a fellow of IEEE. Professor Kang's research interests include computational mathematics and control systems, power systems, bifurcations and normal forms, H-infinity control, manufacturing and process control, autonomous vehicles, and space systems. He has served as an associate editor for several journals including IEEE Transactions on Automatic Control and Automatica. He was a plenary speaker at several international conferences organized by SIAM and IFAC. He is the recipient of several awards including the Best Paper Award of the 6th ICCARV in 2000, and the Carl E. and Jessie W. Menneken Faculty Award bestowed by NPS Foundation in 2003. Professor Kang was elected in 2016 as the Program Director of SIAM Activity Group on Control and System Theory. He is a Co-chair of the 2013 and 2017 SIAM Conference on Control and Its Applications.