IEEE PHILADELPHIA CHAPTER OF CONTROL SYSTEMS SOCIETY
AND
VILLANOVA CENTER FOR ANALYTICS OF DYNAMIC SYSTEMS (VCADS)
PRESENT

PRECISION MOTION CONTROL FOR MANUFACTURING APPLICATIONS

BY
DR. ANDREW ALLEYNE

DISTINGUISHED LECTURER, IEEE CONTROL SYSTEM SOCIETY
RALPH AND CATHERINE FISHER PROFESSOR OF ENGINEERING, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

April 22, 2019: 7-8 PM; Tolentine Hall, Rm. 305, Villanova University, 800 Lancaster Ave., Villanova, PA

Abstract: Manufacturing is one of the key pillars of a modern society. Many aspects of manufacturing center on the precision motion of the machines doing the material removal or addition. This talk will discuss advanced motion control schemes and their applications to manufacturing applications. In particular, we will motivate the use of high performing motion control schemes with precision manufacturing applications at the micro-scale. The key to high precision is the incorporation of feedforward information along with typical feedback algorithms. Iterative Learning Control (ILC) is a popular method to determine signal-based feedforward control. Two different additive fabrication techniques will be examined and the role of precision control highlighted. One is a micro-extrusion system used for tissue scaffold fabrication. Another is an electro-hydrodynamic Jet (or *e-Jet*) printing that uses electric fields to drive ionic transport. After the demonstration of manufacturing processes, a brief introduction to Iterative Learning Control (ILC) will be given. ILC is a novel adaptive technique that allows us to learn repeated trajectories and maximize precision in the automation machinery used for fabrication. After an overview, the rest of the talk will discuss recent developments in ILC for both single axis and multi-axis systems. We demonstrate performance benefits with results in manufacturing applications.

Biography: Professor Alleyne received his Mechanical and Aerospace Engineering B.S.E. from Princeton University in 1989. He received his M.S. and Ph.D. degrees in Mechanical Engineering in 1992 and 1994, respectively, from UC Berkeley. He joined the University of Illinois, Urbana-Champaign in 1994. He currently holds the Ralph M. and Catherine V. Fisher Professorship in the College of Engineering and is the Director for the NSF Engineering Research Center on Power Optimization for Electro-Thermal Systems (POETS). He is the recipient of an NSF CAREER award, has been an IEEE Distinguished Lecturer, and a National Research Council (NRC) Associate. He is a Fellow of IEEE and ASME. He has received the Gustus Larson Award, the Charles Stark Draper Award for Innovative Practice, The Yasundo Takahashi Education Award and the Henry Paynter Outstanding Investigator Award from ASME. The American Automatic Control Council awarded him the Control Engineering Practice Award. He was a Fulbright Fellow to the Netherlands and has held visiting Professorships at TU Delft, University of Colorado, ETH Zurich, and Johannes Kepler University. He has held several editorial positions for ASME, IEEE, and the International Federation of Automatic Control and been active in external advisory boards for universities, industry and government including the Scientific Advisory Board for the U.S. Air Force and the National Academies Board on Army Research and Development. He chaired the ASME Dynamic Systems and Controls Division and is a member of the IEEE Controls Systems Society Board of Governors. His record of campus service includes the Associate Dean for Research in the College of Engineering and the Associate Head for Undergraduate Programs in Mechanical Science and Engineering. In addition to research and service, he has a keen interest in education and has earned the UIUC College of Engineering Teaching Excellence Award, the UIUC Campus Award for Excellence in Undergraduate Education and the UIUC Campus Award for Excellence in Graduate Student Mentoring.

Registration: free (https://events.vtools.ieee.org/m/194913).