Smart and Sustainable Advanced Manufacturing using Mechatronics

Presenter
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Abstract
Better, faster, cheaper. These are words that characterize the pressures faced by today’s advanced manufacturing industry. We want manufacturing processes to deliver better quality and functionality, we demand higher throughput to reduce time to market, and we expect the processes to be low cost (not just economically but also environmentally). What does all this mean for the machines that facilitate such advanced manufacturing processes? It means that they must deliver tighter tolerances while traveling and higher speeds and accelerations; they must maintain low energy consumption and still be affordable. Essentially, they must provide much more for much less!

This presentation will give an overview of ongoing work at the Mechatronics and Sustainability Research Lab at the University of Michigan aimed at addressing the challenges of achieving smart and sustainable advanced manufacturing by adopting a mechatronics-based (i.e., synergistic) approach to the design and control of manufacturing machines. It will demonstrate that identifying and capitalizing on the “sweet spots” of the machine dynamics, augmented with advanced control techniques, could lead to the realization of lower cost and more energy efficient manufacturing machines without sacrificing speed and accuracy. The outcomes of this research could have a significant impact on the design and control of a wide range of advanced manufacturing and metrology machines, ranging from ultra-precision machine tools and silicon wafer scanners to micro coordinate measurement machines and 3D printers.

Biosketch
Chinedum Okwudire joined the mechanical engineering faculty at the University of Michigan in 2011. Prior to joining Michigan, he was the mechatronic systems optimization team leader at DTL (Mori Seiki, Ltd.) based in Davis, CA. Chinedum received his Ph.D. degree in Mechanical Engineering from the University of British Columbia (UBC) in 2009. During the course of his Ph.D., he worked closely with the mechatronics team of Siemens Automation in Germany on the performance improvement of linear motor-driven machines. He holds an M.A.Sc. degree (2005) and a B.Sc. degree (2003) in Mechanical Engineering from UBC and Middle East Technical University, respectively. He has received a number of awards including the Graduate Teaching Award and Walter C. Koerner Fellowship at UBC, and the German Academic Exchange Fellowship. He is a recent recipient of the NSF CAREER award.