COLLEGE OF ENGINEERING

Control Seminar

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Peripheral Vascular Resistance and Cardiovascular Autoregulation Monitoring Using a Wearable Piezoelectric Sensor Assembly

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3:30 – 4:30 pm 1500 EECS

ABSTRACT: Change in peripheral vascular resistance of the cardiovascular system, via contraction and dilation of the peripheral arteries, is one of the critical elements of the body's response to cardiovascular stress. However, such behavior can be directly monitored only in limited clinical settings using existing technology. We have recently constructed a wearable piezoelectric sensing assembly and associated estimation methods for tracking peripheral vascular resistance non-invasively. In this talk, I will discuss the basic sensor design and an estimator for peripheral artery properties based on local tissue dynamics. I will then introduce observations of peripheral vascular response to medical interventions in swine and human subjects as a component of closed-loop autoregulatory dynamics. Through identification of feedback dynamics from wearable and conventional physiological data, early prediction of intradialytic hypotension in hemodialysis patients is demonstrated.

BIO: Kenn Oldham is an Associate Professor of Mechanical Engineering at the University of Michigan. He received the Ph.D. in Mechanical Engineering from University of California at Berkeley in 2006 and BS in Mechanical Engineering from Carnegie Mellon University in 2000. His research focuses on design, modeling, estimation, and control of micro- and small-scale systems, especially those based on piezoelectric materials. Applications include micro-robotics, medical endoscopy, inertial sensing, and physiological monitoring. He is a recipient of the NSF CAREER Award and DARPA Young Faculty Award. He currently serves as the Associate Chair for Undergraduate Education for Mechanical Engineering. He is also an Associate Director for the Michigan Center for Integrative Research in Critical Care (M-CIRCC).

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