Washington University in St. Louis

SCHOOL OF ENGINEERING & APPLIED SCIENCE

Preston M. Green Department of Electrical & Systems Engineering

Seminar Announcement

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Friday, December 9, 2016
Green Hall, Room 0120
10:00 A.M.

Enabling High Performance Sensors for Healthcare and Biomedical Applications Through Active Packaging and Package-Sensor Co-Design

Abstract: The growing ubiquity of miniaturized sensors is ushering in the Internet of Things (IoT) revolution which promises to fundamentally change how we monitor and control the systems that surround us. But before we can realize the promise of "smart cities" and "intelligent transportation," there is still much more work to be done to reduce the size and weight and increase the battery life of these sensors while maintaining a performance level suitable for these applications. System-on-chip (SoC) and system-in-package (SiP) solutions are heavily under investigation for reducing the size and weight of these sensors, but many of these approaches only view the package as a passive carrier with the active circuitry or sensors residing solely in the dies that lie within them. Sensor package development has thus become regarded in academic circles as a cost-sensitive, industry-focused activity.

In this talk, I hope to motivate some ways that the package of some of these IoT-enabling sensors may contribute actively to the functionality of the sensor system. I will start with a specific example from a miniature inertial measurement unit (IMU) in full production used for precision alignment during surgery and show some of the performance limitations of this system that arise from the interaction of the package and the individual sensors inside. From there, I will discuss how adding some active functionality in the package itself could help overcome some of these performance limitations. This same idea will then be extended to discuss a variety of sensors in other healthcare and biomedical applications, ranging from easy-to-use, precision lab testing systems to sensors embedded in the human body itself. This presentation will also include a discussion of some of the materials and manufacturing processes that will enable such packages and satisfy the demand for the IoT vision of "50 billion interconnected objects by 2020."

Bio: Eugene Hwang received his B.S. (2006) in Electrical Engineering and Computer Sciences from the University of California, Berkeley and his M.S. (2010) and Ph.D. (2012) from the School of Electrical and Computer Engineering at Cornell University. Following his graduate work, he started his industrial career in the Micromachined Systems and Technology group at Analog Devices, Inc. first as a product development engineer (2011-2013) and currently as a Staff Design Engineer in the MEMS/Sensors Advanced Development Group. He has contributed to the successful product release of multiple high-performance MEMS inertial sensors and is currently leading the investigation into new wireless sensor technologies for the medical, industrial, and automotive markets. He was elected MEMS Designer of the Year in 2015 as part of the MEMS and Sensor Innovation Awards hosted by the MEMS Industry Group. He has been serving as a reviewer for IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, ACS Nano, IEEE Sensors Journal, Applied Physics Letters, Journal of Micro Electro Mechanical Systems, and has been serving as a Technical Program Committee Member for IEEE Sensors since 2012.

Host: Dr. Xuan 'Silvia' Zhang