

SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
Faculty of Engineering
Website: <http://www.ece.nus.edu.sg>

Area: Microelectronic Technologies & Devices

Host: Center for Intelligent Sensors and MEMS (CISM); Assoc Prof Lee Chengkuo

TOPIC	:	MEMS-Based Vibration-Energy-Harvesting from Human Motion
SPEAKER	:	Professor Eun Sok Kim, Department of Electrical and Computer Engineering, University of Southern California
DATE	:	18 September 2019, Wednesday
TIME	:	11am to 12pm
VENUE	:	E5-02-32, Engineering Block E5, Faculty of Engineering, NUS

ABSTRACT

There is an unmet need in powering wearable or implantable devices without a burden of replacing or recharging battery. One way to meet this need is through harvesting vibration energy from human's natural motion. Such energy harvesters can replace or supplement battery, and can rid of surgery needed to replace the battery for an implemented device such as a pacemaker. Our results show that there are many pathways to making the vibrational energy harvesters (VEHs) small and light in spite of the extremely low vibration frequency (1 – 4 Hz) and power inherent in human's natural motion.

This seminar presents unconventional approaches in generating electrical power from human movements (such as walking) without loading the person. Specifically, the following will be presented: (1) non-resonant devices based on proof-mass suspension with liquid bearing, (2) magnet levitation inside graphite package, (3) liquid spring, and (4) magnetic spring. The first three of the four approaches were recently invented in our lab, and have shown some great promises. In addition to the four approaches listed above, other promising approaches will be presented, not only for wearable or implantable devices but also for harvesting vibration energy from moving vehicles, walls, roads, bridges, etc.



Eun Sok Kim received the B.S., M.S., and Ph.D. degrees, all in electrical engineering, from the University of California, Berkeley, in 1982, 1987, and 1990, respectively.

In Fall 1999, he joined the University of Southern California, Los Angeles, where he is currently a Professor of the Ming Hsieh Department of Electrical and Computer Engineering. From July 1, 2009 to June 30, 2018, he chaired the Electrophysics division of the department. From Spring 1991 to Fall 1999, he worked at the Department of Electrical Engineering in the University of Hawaii at Manoa as a faculty member. Previously, he worked at IBM Research Laboratory, San Jose, CA, NCR Corp., San Diego, CA, and Xicor Inc., Milpitas, CA as a co-op student, design engineer, and summer-student engineer, respectively.

Prof. Kim is an expert in piezoelectric and acoustic MEMS, having published about 240 refereed papers and 15 issued US patents in the field, but has recently launched a research program on electromagnetic vibration-energy harvesting. He is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and the Institute of Physics (IOP). He serves as an editor for IEEE/ASME Journal of Microelectromechanical Systems. He has been awarded a Research Initiation Award (1991-1993) and a Faculty Early Career Development (CAREER) Award (1995-1999) by National Science Foundation. He received Outstanding EE Faculty of the Year Award at U. of Hawaii in May 1996 and the IEEE Transactions on Automation Science and Engineering 2006 Best New Application Paper Award.