【特別セミナー Special Seminar】 The seminar is in English.

MEMS 研究者として起業家として，今，最もアクティブな教授の 1 人，David A. Horsley 先生による
コンシューマーエレクトロニクス向け圧電超音波 MEMS に関する講演
Invited talk on piezoelectric ultrasonic MEMS for consumer applications by Prof. David A. Horsley, who is one the of the most active professors as a MEMS researcher and an entrepreneur

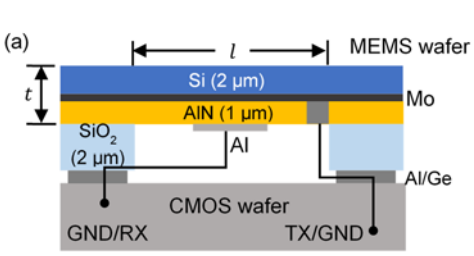
Piezoelectric Micromachined Ultrasonic Transducers in Consumer Electronics; The Next Little Thing?

日　時：2017 年 4 月 28 日（金曜日）　16:20～17:50
28 April 2017 (Friday)　16:20～17:50
参加無料，事前申込不要　Admission free, No advanced registration required
場　所：東北大学　青葉山キャンパス　マイクロ・ナノマシニング研究教育センター　3 階　セミナー室
Tohoku University, Aobayama Campus, Micro-Nanomachining Research & Education Center (MNC), 3rd floor, Seminar room
（田中(秀)研究室ウェブサイト「アクセス」ページの地図上 A14 の建物）
（Building A14 on the map at http://www.mems.mech.tohoku.ac.jp/access/index_e.html）
主　催：田中(秀)研究室，マイクロ・ナノマシニング研究教育センター
Organized by S. Tanaka Laboratory and MNC, Tohoku University

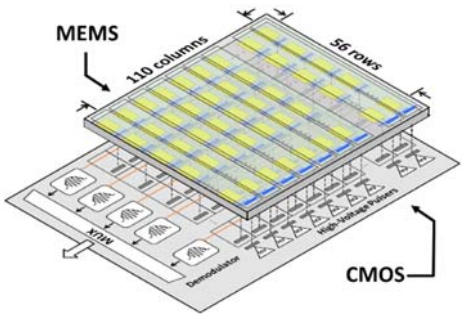
講　師：
Prof. David A. Horsley　(Professor, Department of Mechanical and Aerospace Engineering, UC Davis)

Prof. David A. Horsley received his PhD in Mechanical Engineering from the University of California, Berkeley, in 1998. From 1998 to 2003, he held research and development positions at Dicon Fiberoptics and Hewlett Packard Laboratories and helped to co-found Onix Microsystems, a manufacturer of fiber-optic switching components. Since 2003, he has been a Professor in the Department of Mechanical and Aerospace Engineering at the University of California, Davis, and he is a Co-Director of the Berkeley Sensor and Actuator Center (BSAC), the National Science Foundation's Industrial/University Collaborative Research Center (I/UCRC) focused on MEMS research. Professor Horsley is co-founder and CTO of Chirp Microsystems Inc., a manufacturer of ultrasonic sensors using MEMS technology, and a co-founder of Picosense Inc, a developer of low-noise magnetoresistive sensors. He was the Co-Chair of the 2016 IEEE Sensors Conference and the 2017 TRF Napa Microsystems Workshop. Dr. Horsley is a recipient of the National Science Foundation's CAREER Award, the Outstanding Junior Faculty Award at UC Davis, the 2016 NSF I/UCRC Association's Schwarzkopf Award for Tech.

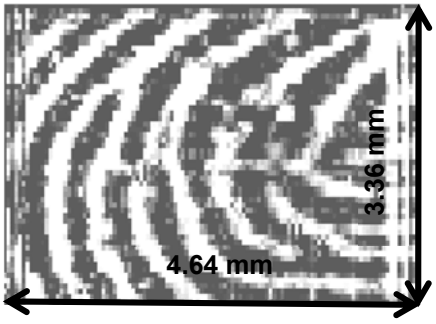
要　旨：
Micromachined ultrasonic transducers (MUTs) are best known for their use in medical imaging, a field where imaging performance dominates over features such as transducer size, weight, power consumption and cost. In comparison, these features are the main drivers for the success of the MEMS sensors used in consumer electronics and automotive applications, such as pressure sensors, accelerometers, gyroscopes, and microphones. These MEMS sensors replaced their conventional counterparts in existing applications and, more important, enabled novel and unexpected applications (such as smart phones, toys, fitness trackers, etc.) where low cost, small size, light weight, and ultra-low power consumption are critical.
In this talk, I will describe MEMS ultrasonic sensors based on piezoelectric MUTs (PMUTs) intended for consumer electronics applications such as range-finding and fingerprint sensing. A common characteristic of these applications is that they require manufacturing at high volume with relatively low cost. We have developed air-coupled ultrasonic sensors based on PMUTs that operate at 10 microwatts. Relative to optical sensors, these ultrasonic sensors have the advantage of very low power consumption and long range (> 1 m). In related research, we demonstrated a 500 DPI ultrasonic fingerprint sensor that has similar resolution to Apple's TouchID sensor but the added advantages that it is capable of imaging wet or oily fingers and can image the dermis beneath the surface of the finger.



(a) PMUT cross-section



(b) Ultrasonic fingerprint sensor



(c) Ultrasonic fingerprint image