Vibration and Acoustic Transducers (VATrans) Laboratory

Search for Active Applications of Vibration and Acoustic Phenomena

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Education

Ph.D. 1995 Univ. of Texas, Austin (ME)
M.S. 1986 KAIST (ME)
B.S. 1984 Seoul Nat'l Univ. (ME)

Experience

1998~ present Professor, Pohang University of Science and Technology
1996~1998 Member of Research Staff, Samsung Adv. Inst. of Tech.
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Many studies have been done on the vibration and acoustic phenomena. The usual purpose of engineers for these studies is to reduce vibration itself and its effects or unwanted sounds (noise). The research works in this laboratory are, however, focused on the applications of vibrations and sounds.

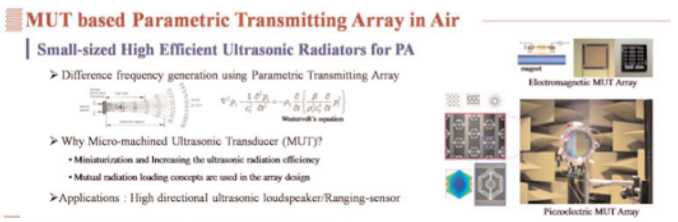
One good example among the applications of vibrations and sounds is the loudspeaker. As can be seen in a loudspeaker, a transducer may be found in such active applications of vibrations and sounds. For this reason, the research area of this laboratory includes modeling of transducers as well as analyses and measurements of vibrations and sounds.

Transducers are defined as devices or machines that convert one form of energy into another form. Hence, in order to analyze and design transducers, the coupling phenomena between various forms of energies should be understood. Electromechanical coupling phenomena such as piezoelectricity and electromagnetic forces are focused to study here in VATrans Lab.

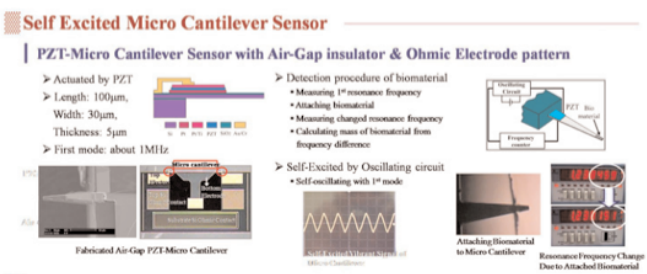
The following show the more-detailed research areas studied in the laboratory:

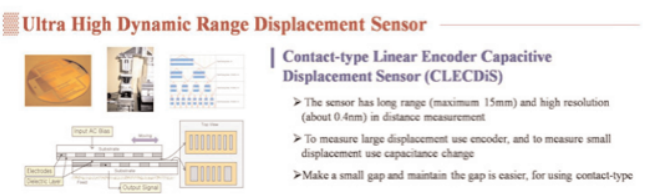
- **Analysis and Modeling of Transducers and Ambient Components**
  - Modeling of transduction materials and their applications
  - Dynamic simulations of systems with transducers

- **Nonlinear Acoustics and Ultrasonic Loudspeakers**
  - Nonlinear acoustic phenomena and their numerical simulations for designing acoustic transducers
  - Radiation theory and design of ultrasonic loudspeakers
  - Ultrasonic radiation/imaging devices



- **Sensors for Bio-Objects**
  - Protein/DNA sensors based on the mass micro-balancing
  - Measurement system for bonding forces of adhesive bio-materials
  - Sensors and applications of micro/nano scale physics





- **Machines/Devices to Manipulate Micro/Nano Objects**
  - Long-range nano-precision displacement Sensors
  - Ultra-precision actuators
  - Machines/Equipments with Grippers for manipulating nano-objects

Major Publications

- Sangkyu Lee, Yeolho Lee, Haksue Lee and Wonkyu Moon, "Improvements in electrical properties of piezoelectric microcantilever sensors by reducing parasitic effects", Journal of micromechanics and microengineering, Vol. 21, 085015
- Sungjoon Choi, Haksue Lee, and Wonkyu Moon, "A micro-machined piezoelectric flexural-mode hydrophone with air backing: Benefit of air backing for enhancing sensitivity", Journal of the Acoustical Society of America, Vol.128, No.3, pp.1033-1044, 2010.
- Yonghwan Hwang, Yub Je, Dawnielle Farrar, James E. West, S. Michael Yu, Wonky Moon, "Piezoelectric properties of polypoptide-PMMA molecular composites fabricated by contact charging", Polymer, Vol 52, Issue 13, pp.2723-2728
- Sangkyu Lee, Jinam Kim, wonkyu moon, Jinhwan Choi, Ilhan Park, Daesung Bae, "A Multi-body-Based Dynamic Simulation Method for Electrostatic Actuators", Nonlinear Dynamics, Vol.54, No.1-2, pp.53-68, 2008
- Haksue Lee, Daesil Kang, Wonkyu Moon, "A micro-machined source transducer for a parametric array in air", JASA2009, Vol.125, No.4, pp.1879-1893, 2009
- Sungjoo Kim, Wonkyu Moon, "A Micro-Pull-Off Test Machine for Reliable Measurement of Adhesive Forces on Micro/Nano-Scale Areas", The Journal of Adhesion, Vol.87, No.2, pp.139-153