Shear Wave Dispersion Ultrasound Vibrometry: Principle & Signal Processing

Time: 3:00 – 4:00p.m.
Date: 29th October 2008
Venue: FJ301, The Hong Kong Polytechnic University
Language: English
Guest: Professor Yi ZHENG,
Speaker: Dept of Electrical and Computer Engineering,
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Abstract

Based on the ultrasound stimulated Vibro-acoustography technique (Science 280:82-85, 1998), we can conduct shear wave dispersion ultrasound vibrometry (SDUV). It has many potential applications for tissue characterization. The goal of this work is to develop a method that allows non-uniform sampling and simultaneously detects all harmonics of tissue motion induced by the broadband excitation pulses so that the shear wave can be rapidly estimated with minimized bias and distortion. Long tonebursts of ultrasound repeated at frequency $f_e$ generate shear waves at $f_e$ and its harmonics. Resulting tissue motion is detected by pulse echo ultrasound interleaved with the broadband excitation tonebursts. We use a high pulse repetition frequency (PRF) and throw away the samples corrupted by interference every $1/f_e$ second. Such non-uniform samples can be accommodated by Kalman filter. The experimental results of using 7.5 MHz ultrasound frequency and $f_e$ of 156.25 Hz demonstrated the reliability of this method.

Guest Speaker Bio:

Professor Yi Zheng received his B.E. degree in Computer Engineering from Chongqing University, Chongqing, China, in 1982, the M.S. degree and Ph.D. degree in electrical engineering from Iowa State University, Ames, IA in 1985 and 1987, respectively. From 1983 to 1986, he was involved with signal processing of the Very Large Array (VLA) antenna, National Radio Astronomy Observatory (NRAO). He worked on signal and image processing projects at the Nondestructive Evaluation Center, Ames Laboratory, Ames, IA, from 1985 to 1987. He was a visiting professor at IBM, Rochester, MN from 1990 to 1991. He was an adjunct scientist/special project associate at the Ultrasound Research laboratory, Mayo Foundation/Clinic from 1991 to 2001. Dr. Zheng jointed the faculty of St. Cloud State University in 1987 and he served as the department chair from 1997 to 2004. Dr. Zheng is currently professor and director of graduate program of Electrical and Computer Engineering Department, St. Cloud State University, St. Cloud, MN. Dr. Zheng has been a consultant for industrial companies in the areas of sensors and embedded systems, applied electromagnetic and RF circuits, signal processing and communications, and ultrasound. Dr. Zheng has worked with many industrial projects with Medtronic, Motorola, IBM, Life Touch Studio, Tech80, Infrared Solution, IMI Vision, Force10 Network Inc, etc. Currently, Dr. Zheng is also senior scientist of Force10 Network Inc to develop new technologies for 25 Gbps or higher serial channel for backplanes of high speed network devices.

All are welcome!

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