

# The Department of Civil and Environmental Engineering at the University of Houston presents...

## Structural Connection Monitoring



### **Gangbing Song, Ph.D.**

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**Friday, September 10, 2021**

2:45pm-3:45pm

Classroom Business Building (CBB) - Room 104

Zoom Link <https://uh-edu-cougarnet.zoom.us/j/97712218687>

### **Abstract**

In this talk, the author will report his recent innovative research in connection monitoring using piezoceramic transducers and other methods, and applications to civil engineering. The talk first reviews the importance of connection monitoring and briefly surveys the literature. An introduction to the basics of piezoelectric effect and piezoceramic transducers is then presented. To monitor structural connections, the active sensing approach and impedance approach using piezoceramic transducers are employed. With the active sensing, the time-reversal based method and the wavelet-packet-analysis based method are developed to monitor the structural connections. The fractal contact theory is used to develop an approach to model the stress wave across the interface of a connection. The successful applications of connection monitoring include bolt loosening monitoring, pre-load monitoring of rock bolts, and monitoring of crack development in welded joints. In addition, the connection monitoring using percussion, vision, and touch based approaches is also developed and reviewed in this seminar.

### **Bio**

Dr. G. Song is the founding Director of the Smart Materials and Structures Laboratory and a Professor of Mechanical Engineering, Civil and Environmental Engineering (joint), and Electrical & Computer Engineering (joint) at the University of Houston. Dr. Song is a recipient of the NSF CAREER award in 2001. Dr. Song received his Ph.D. and MS degrees from the Department of Mechanical Engineering at Columbia University in the City of New York in 1995 and 1991, respectively. Dr. Song received his B.S. degree in 1989 from Zhejiang University, P.R.China. He has expertise in smart materials and structures, structural vibration control, piezoceramics, ultrasonic transducers, structural health monitoring and damage detection. He has developed two new courses in smart materials and published more than 500 papers, including 300 peer reviewed journal articles. His google H-index is 59. Dr. Song is also an inventor or co-inventor of 24 US patents and. He has received research funding in smart materials and related research from NSF, DoE, NASA, Department of Education, Texas Higher Education Board, TSGC (Texas Space Grant Consortium), UTMB (University of Texas Medical Branch), OSGC (Ohio Space Grant Consortium), OAI (Ohio Aerospace Institute), ODoT (Ohio Department of Transportation), HP, OptiSolar, GE, and Cameron. In addition to his research effort, Dr. Song has passion in improving teaching using technology. He is a leader in internet enabled remote experiment/laboratory and a pioneer in systematically implementing remote experiments in engineering education. He received the prestigious Outstanding Technical Contribution Award from the Aerospace Division of ASCE, the Excellence in Research & Scholarship Award at Full Professor Level from UH, the Celebrating Excellence Award for Excellence in Education from ISA (International Society of Automation), the IEEE Educational Activities Board Meritorious Achievement Award in Informal Education, among others. Dr. Song is a member of ASCE, ASME, and IEEE. Dr. Song served as the General Chair of the Earth and Space Conference 2010, Aerospace Division, ASCE.