PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 9061

, "Front Matter: Volume 9061," Proc. SPIE 9061, Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2014, 906101 (6 May 2014); doi: 10.1117/12.2064759

SPIE.

Event: SPIE Smart Structures and Materials + Nondestructive Evaluation and Health Monitoring, 2014, San Diego, California, United States

PROCEEDINGS OF SPIE

Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2014

**Jerome P. Lynch
Kon-Well Wang
Hoon Sohn**
Editors

**10–13 March 2014
San Diego, California, United States**

Sponsored by
SPIE

Cosponsored by
American Society of Mechanical Engineers (United States)

Cooperating Organizations
Intelligent Materials Forum (Japan)
Jet Propulsion Laboratory (United States)
National Science Foundation (United States)

Published by
SPIE

Part One of Two Parts

Volume 9061

Proceedings of SPIE 0277-786X, V. 9061

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2014,
edited by Jerome P. Lynch, Kon-Well Wang, Hoon Sohn, Proc. of SPIE Vol. 9061, 906101
© 2014 SPIE · CCC code: 0277-786X/14/\$18 · doi: 10.1117/12.2064759

Proc. of SPIE Vol. 9061 906101-1

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2014*, edited by Jerome P. Lynch, Kon-Well Wang, Hoon Sohn, Proceedings of SPIE Vol. 9061 (SPIE, Bellingham, WA, 2014) Article CID Number.

ISSN: 0277-786X

ISBN: 9780819499875

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

Copyright © 2014, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/14/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID Number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID Number.

Contents

Part One

xvii *Conference Committee*

SESSION 1	KEYNOTE SESSION
9061 02	Surface acoustic wave action on microfluidic channels and microparticles (Keynote Paper) [9061-1] E. R. Dauson, K. B. Gregory, D. W. Greve, I. J. Oppenheim, Carnegie Mellon Univ. (United States)
SESSION 2a	ACOUSTIC AND ULTRASONIC METHODS FOR SHM
9061 04	On the use of the EMI for the health monitoring of bonded elements [9061-3] V. Gulizzi, Univ. degli Studi di Palermo (Italy) and Univ. of Pittsburgh (United States); P. Rizzo, Univ. of Pittsburgh (United States); A. Milazzo, Univ. degli Studi di Palermo (Italy)
9061 05	Damage identification in two-dimensional structures using Lamb waves [9061-4] M. Menzer, M. Kuna, Technische Univ. Bergakademie Freiberg (Germany)
9061 07	A passively tunable acoustic metamaterial lens for damage detection applications [9061-6] H. Zhu, F. Semperlotti, Univ. of Notre Dame (United States)
9061 08	A preliminary study on the prediction of damaged areas on ordinary concrete and lightweight concrete using electromechanical impedance technique with different frequency ranges [9061-7] K. J. Cho, S. Na, J. G. Jang, H. K. Lee, KAIST (Korea, Republic of)
SESSION 2b	CONDITION MONITORING OF TRANSPORTATION INFRASTRUCTURE
9061 09	Real-time weigh-in-motion measurement using fiber Bragg grating sensors [9061-8] Y. Huang, North Dakota State Univ. (United States); L. Palek, R. Strommen, B. Worel, Minnesota Dept. of Transportation (United States); G. Chen, Missouri Univ. of Science and Technology (United States)
9061 0A	A participatory sensing approach to characterize ride quality [9061-9] R. Bridgelall, North Dakota State Univ. (United States)
9061 0C	Performance of a movable flexible pipe-encapsulated FBG sensor developed for shape monitoring of multi-layered pavement structure [9061-11] H. Wang, W. Liu, Z. Zhou, Dalian Univ. of Technology (China)

SESSION 3a SHM OF CIVIL ENGINEERING SYSTEMS

- 9061 OE **ASR damage detection in concrete from ultrasonic methods** [9061-13]
P. Gong, Carnegie Mellon Univ. (United States); M. E. Patton, Carnegie Mellon Univ. (United States) and Mark E. Patton Ltd. (United States); D. W. Greve, J. B. Harley, Carnegie Mellon Univ. (United States); W. R. Junker, Consultant (United States); C. Liu, I. J. Oppenheim, Carnegie Mellon Univ. (United States)
- 9061 OF **The design and construction of a scour monitoring system** [9061-14]
S. R. Day, A. Flatau, S. M. Na, Univ. of Maryland, College Park (United States); R. A. Swartz, Michigan Technological Univ. (United States)
- 9061 OH **A damage detection model for unbonded post-tensioning tendons based on relative strain variation in multi-strand anchors** [9061-16]
A. B. M. Abdullah, J. A. Rice, H. R. Hamilton, Univ. of Florida (United States)
- 9061 OI **Scavenging vibration energy from seismically isolated bridges using an electromagnetic harvester** [9061-17]
Q. Lu, C. Loong, C.-C. Chang, E. G. Dimitrakopoulos, Hong Kong Univ. of Science and Technology (Hong Kong, China)
- 9061 OJ **Field testing of prototype systems for the non-destructive measurement of the neutral temperature of railroad tracks** [9061-18]
R. Phillips, Rail Inspection, LLC (United States); F. Lanza di Scalea, C. Nucera, Univ. of California, San Diego (United States); M. Fateh, Federal Railroad Administration (United States); J. Choros, John A. Volpe National Transportation Systems Ctr. (United States)

SESSION 3b ACTIVE SENSING FOR STRUCTURES

- 9061 OL **Enhanced vibration based energy harvesting using embedded acoustic black holes** [9061-20]
L. Zhao, F. Semperlotti, Univ. of Notre Dame (United States); S. C. Conlon, The Pennsylvania State Univ. (United States)
- 9061 OM **Effects of adhesive thickness on Lamb wave generation and sensing using bonded PWASs** [9061-21]
M. M. Islam, H. Huang, The Univ. of Texas at Arlington (United States)
- 9061 ON **Impedance-based damage identification enhancement via tunable piezoelectric circuitry** [9061-22]
J. Kim, K. W. Wang, Univ. of Michigan (United States)
- 9061 OQ **Characterization of vibration transfer paths in nose gearboxes of an AH-64 Apache** [9061-25]
A. K. M. A. Islam, Youngstown State Univ. (United States) and NASA Glenn Research Ctr. (United States); P. J. Dempsey, NASA Glenn Research Ctr. (United States); J. Feldman, C. Larsen, Etegent Technologies, Ltd. (United States)
- 9061 OS **Lift-off effect compensation for magnetic impedance-based damage detection** [9061-27]
Q. Shuai, J. Tang, Univ. of Connecticut (United States)

SESSION 4a SHM OF WIND TURBINES

- 9061 0U **Operational model updating of spinning finite element models for HAWT blades** [9061-29]
A. Velazquez, R. A. Swartz, Michigan Technological Univ. (United States); K. J. Loh, Y. Zhao,
V. La Saponara, R. J. Kamisky, C. P. van Dam, Univ. of California, Davis (United States)

SESSION 4b TRUSS AND TENSEGRITY STRUCTURES

- 9061 0V **Nonlinear damage identification of breathing cracks in Truss system** [9061-30]
J. Zhao, H. DeSmidt, The Univ. of Tennessee Knoxville (United States)
- 9061 0W **Minimal mass design of tensegrity structures** [9061-31]
K. Nagase, Wakayama Univ. (Japan); R. E. Skelton, Univ. of California, San Diego (United States)

SESSION 5a NANOENGINEERED SENSING TECHNOLOGY I

- 9061 0X **Compressive strain measurement using RFID patch antenna sensors** [9061-32]
C. Cho, X. Yi, Y. Wang, M. M. Tentzeris, Georgia Institute of Technology (United States);
R. T. Leon, Virginia Polytechnic Institute and State Univ. (United States)
- 9061 0Y **Crack identification based on thin-film full-bridge strain sensors** [9061-33]
S. T. E. Tung, Y. Yao, B. Glisic, Princeton Univ. (United States)
- 9061 0Z **In situ phase change characterization of PVDF thin films using Raman spectroscopy**
[9061-34]
M. T. Riosbaas, K. J. Loh, Univ. of California, Davis (United States); G. O'Bryan, B. R. Loyola,
Sandia National Labs. (United States)

SESSION 5b NON-CONTACT MEASUREMENTS I

- 9061 11 **Application of image analysis and time-frequency analysis for tracking the rotating blades vibration** [9061-36]
Y.-T. Huang, W.-Y. Hsiung, National Taiwan Univ. (Taiwan); Y.-S. Yang, National Taipei Univ.
of Technology (Taiwan); C.-H. Loh, National Taiwan Univ. (Taiwan)
- 9061 13 **The dual cantilever flutter phenomenon: a novel energy harvesting method** [9061-169]
J. D. Hobeck, Univ. of Michigan (United States); D. Geslain, Institut Catholique d'Arts et
Métiers (France); D. J. Inman, Univ. of Michigan (United States)
- 9061 14 **Air-coupled guided wave detection and wavenumber filtering to full-field representation of delamination in composite plates** [9061-39]
N. Testoni, L. De Marchi, A. Marzani, Univ. degli Studi di Bologna (Italy)

SESSION 6a NANOENGINEERED SENSING TECHNOLOGY II

- 9061 15 **Dynamic characterization of a soft elastomeric capacitor for structural health monitoring applications** [9061-40]
H. Saleem, S. Laflamme, Iowa State Univ. (United States); F. Ubertini, Univ. degli Studi di Perugia (Italy)
- 9061 16 **Thin film sensor network for condition assessment of wind turbine blades** [9061-41]
S. Laflamme, H. Saleem, C. Venkatesh, U. Vaidya, P. Sarkar, H. Sauder, Iowa State Univ. (United States)
- 9061 17 **Modeling the electromechanical and strain response of carbon nanotube-based nanocomposites** [9061-42]
B. M. Lee, K. J. Loh, Univ. of California, Davis (United States); A. R. Burton, Sandia National Labs. (United States) and Univ. of Michigan (United States); B. R. Loyola, Sandia National Labs. (United States)
- 9061 18 **Design and characterization of a piezoelectric sensor for monitoring scour hole evolution** [9061-43]
F. Azhari, C. Tom, J. Benassini, K. J. Loh, F. A. Bombardelli, Univ. of California, Davis (United States)
- 9061 19 **Cracks monitoring and characterization using $\text{Ba}_{0.64}\text{Sr}_{0.36}\text{TiO}_3$ flexoelectric strain gradient sensors** [9061-44]
W. Huang, S. Yang, N. Zhang, F.-G. Yuan, X. Jiang, North Carolina State Univ. (United States)

SESSION 6b NON-CONTACT MEASUREMENTS II

- 9061 1B **Noncontact visualization of nonlinear ultrasonic modulation for reference-free fatigue crack detection** [9061-46]
H. J. Lim, B. Song, B. Park, P. Liu, H. Sohn, KAIST (Korea, Republic of)
- 9061 1D **Noncontact monitoring of fatigue crack growth using high frequency guided waves** [9061-49]
B. Masserey, Univ. of Applied Sciences (Switzerland); P. Fromme, Univ. College London (United Kingdom)

SESSION 7a SENSOR FUSION FOR SHM OF CIVIL STRUCTURES

- 9061 1F **Multi-metric model-based structural health monitoring** [9061-51]
H. Jo, The Univ. of Arizona (United States); B. F. Spencer Jr., Univ. of Illinois at Urbana-Champaign (United States)
- 9061 1G **Response estimation of a building subject to a large earthquake using acceleration data of a single floor recorded by a sensor agent robot** [9061-52]
A. Mita, Y. Shinagawa, Keio Univ. (Japan)

- 9061 1H **Multisensor fusion for system identification** [9061-53]
S.-H. Sim, S. Cho, Ulsan National Institute of Science and Technology (Korea, Republic of); J.-W. Park, Univ. of Illinois at Urbana-Champaign (United States); H. Kim, Ulsan National Institute of Science and Technology (Korea, Republic of)
- 9061 1I **System identification of civil engineering structures with multiple inputs by decoupling output signals** [9061-54]
J. Li, The Univ. of Kansas (United States); M. Ruiz-Sandoval, Univ. Autónoma Metropolitana (Mexico); B. F. Spencer Jr., A. S. Elnashai, Univ. of Illinois at Urbana-Champaign (United States)
- 9061 1J **Targeted deployment of scour monitoring sensors for at-risk bridges** [9061-85]
I. Anderson, M. Dewoolkar, D. M. Rizzo, J. Frolik, D. Huston, The Univ. of Vermont (United States)

SESSION 7b STATISTICAL LEARNING FOR SMART STRUCTURES

- 9061 1K **A robust baseline removal method for guided wave damage localization** [9061-56]
C. Liu, J. B. Harley, M. Bergés, D. W. Greve, W. R. Junker, I. J. Oppenheim, Carnegie Mellon Univ. (United States)
- 9061 1L **Extraction of a series of novel damage sensitive features derived from the continuous wavelet transform of input and output acceleration measurements** [9061-57]
K. Balafas, A. S. Kiremidjian, Stanford Univ. (United States)
- 9061 1M **Toward characterizing the effects of environmental and operational conditions on diffuse-field ultrasonic guided-waves in pipes** [9061-58]
M. Eybpoosh, M. Berges, H. Y. Noh, Carnegie Mellon Univ. (United States)
- 9061 1O **BOES: Building Occupancy Estimation System using sparse ambient vibration monitoring** [9061-60]
S. Pan, A. Bonde, Carnegie Mellon Univ. (United States); J. Jing, L. Zhang, Tsinghua Univ. (China); P. Zhang, H. Y. Noh, Carnegie Mellon Univ. (United States)

SESSION 8a THIN-FILM CRACK SENSORS

- 9061 1Q **Measurement of Kirchhoff's stress intensity factors in bending plates** [9061-62]
D. Bäcker, M. Kuna, C. Häusler, Technische Univ. Bergakademie Freiberg (Germany)
- 9061 1R **An asynchronous sensor skin for structural health monitoring applications** [9061-63]
N. Sharp, Purdue Univ. (United States); A. Kuntz, C. Brubaker, S. Amos, W. Gao, G. Gupta, A. Mohite, C. Farrar, D. Mascareñas, Los Alamos National Lab. (United States)

SESSION 8b ROBOTIC PLATFORMS FOR SENSING

- 9061 1S **A study on a robot chasing a human using Kinect while identifying walking parameters using the back view** [9061-64]
S. Konno, A. Mita, Mita Lab. (Japan)

SESSION 9a WIRELESS SENSOR NETWORKS FOR SHM

- 9061 1U **Development of an extensible dual-core wireless sensing node for cyber-physical systems** [9061-69]
M. Kane, Univ. of Michigan (United States); D. Zhu, Georgia Institute of Technology (United States); M. Hirose, Univ. of Michigan (United States); X. Dong, Georgia Institute of Technology (United States); B. Winter, Michigan Technological Univ. (United States); M. Höckell, Leibniz Univ. Hannover (Germany); J. P. Lynch, Univ. of Michigan (United States); Y. Wang, Georgia Institute of Technology (United States); A. Swartz, Michigan Technological Univ. (United States)
- 9061 1V **Quasi-static self-powered sensing and data logging** [9061-67]
N. Lajnef, S. Chakraborty, R. Burgueño, W. Borchani, Michigan State Univ. (United States)
- 9061 1W **Compressive sensing based wireless sensor for structural health monitoring** [9061-68]
Y. Bao, Z. Zou, H. Li, Harbin Institute of Technology (China)
- 9061 1X **Dynamic interrogation of wireless antenna sensor** [9061-66]
J. Yao, S. Tjuatja, H. Huang, J. Sanders, The Univ. of Texas at Arlington (United States)
- 9061 1Y **Integrated wireless sensor network and real time smart controlling and monitoring system for efficient energy management in standalone photovoltaic systems** [9061-70]
A. Abou-Elnour, A. Thabt, S. Helmy, Y. Kashf, Y. Hadad, M. Tarique, O. Abo-Elnor, Ajman Univ. of Science and Technology (United Arab Emirates)

SESSION 9b CARBON NANOTUBE-BASED SENSING

- 9061 20 **"Smart Skin" optical strain sensor using single wall carbon nanotubes** [9061-72]
P. Sun, J.-H. Kim, S. M. Bachilo, R. B. Weisman, S. Nagarajaiah, Rice Univ. (United States)
- 9061 21 **The importance of interfacial resistance on the thermal behavior of carbon nanofiber/epoxy composites** [9061-73]
F. Gardea, M. Naraghi, D. C. Lagoudas, Texas A&M Univ. (United States)
- 9061 23 **Free-standing carbon nanotube composite sensing skin for distributed strain sensing in structures** [9061-35]
A. R. Burton, Univ. of Michigan (United States); K. Minegishi, M. Kurata, Kyoto Univ. (Japan); J. P. Lynch, Univ. of Michigan (United States)

SESSION 10a FIBER OPTIC-BASED SENSING METHODS I

- 9061 25 **Fiber optic sensing system for in-situ simultaneous monitoring of water stage, quality, and temperature** [9061-77]
Y. Huang, North Dakota State Univ. (United States)

SESSION 10b MULTIFUNCTIONAL MATERIAL SENSORS

- 9061 26 **Strain and damage self-sensing cement composites with conductive graphene nanoplatelet** [9061-80]
S. D. Pang, National Univ. of Singapore (Singapore); H. J. Gao, National Univ. of Singapore (Singapore) and Nautic Group Pte Ltd. (Singapore); C. Xu, S. T. Quek, H. Du, National Univ. of Singapore (Singapore)
- 9061 27 **Poling of PVDF matrix composites for integrated structural load sensing** [9061-81]
G. Haghiastiani, M. A. Greminger, P. Zhao, Univ. of Minnesota, Duluth (United States)
- 9061 28 **Development of micro-sized slip sensors using dielectric elastomer for incipient slippage** [9061-82]
D.-Y. Hwang, B. Kim, H.-J. Cho, Z. Li, Y. Lee, J.-D. Nam, H. Moon, H. R. Choi, J. C. Koo, Sungkyunkwan Univ. (Korea, Republic of)
- 9061 29 **Morphing electroadhesive interface to manipulate uncooperative objects** [9061-83]
L. Savioli, G. Sguotti, A. Francesconi, F. Branz, Univ. degli Studi di Padova (Italy); J. Krahn, C. Menon, Simon Fraser Univ. (Canada)

Part Two

SESSION 11a ID AND HEALTH MONITORING OF CIVIL STRUCTURES

- 9061 2A **Analyzing the dynamic response of rotating blades in small-scale wind turbines** [9061-84]
W.-Y. Hsiung, Y.-T. Huang, C.-H. Loh, National Taiwan Univ. (Taiwan); K. J. Loh, R. J. Kamisky, D. Nip, C. van Dam, Univ. of California, Davis (United States)
- 9061 2B **On estimating the accuracy of monitoring methods using Bayesian error propagation technique** [9061-86]
D. Zonta, F. Bruschetta, C. Cappello, R. Zandonini, Univ. degli Studi di Trento (Italy); M. Pozzi, Carnegie Mellon Univ. (United States); M. L. Wang, Northeastern Univ. (United States); B. Glisic, Princeton Univ. (United States); D. Inaudi, D. Posenato, Smartec SA (Switzerland); Y. Zhao, Intelligent Instrument System, Inc. (United States)
- 9061 2D **Global assessment of a cable-stayed bridge model using SNLSE approach** [9061-88]
H. Huang, Y. Sun, Tongji Univ. (China)
- 9061 2E **Experimental validation of a modal flexibility-based damage detection method for a cyber-physical system** [9061-89]
R. E. Martinez-Castro, E. L. Eskew, S. Jang, Univ. of Connecticut (United States)
- 9061 2F **Substructure parameter estimation for shear structures with limited measurements and unknown structural mass** [9061-90]
D. Zhang, H. Li, Y. Bao, Harbin Institute of Technology (China)

SESSION 11b NEXT-GENERATION SENSOR AND TECHNOLOGIES

- 9061 2G **Numerical and experimental characterizations of piezoresistive MEMS strain sensors** [9061-91]
H. Saboonchi, D. Ozevin, Univ. of Illinois at Chicago (United States)
- 9061 2H **Very low frequency/high sensitivity triaxial monolithic inertial sensor** [9061-92]
F. Acernese, Univ. degli Studi di Salerno (Italy) and Istituto Nazionale di Fisica Nucleare (Italy); R. De Rosa, Istituto Nazionale di Fisica Nucleare (Italy) and Univ. degli Studi di Napoli Federico II (Italy); G. Giordano, Univ. degli Studi di Salerno (Italy); R. Romano, F. Barone, Univ. degli Studi di Salerno (Italy) and Istituto Nazionale di Fisica Nucleare (Italy)
- 9061 2I **Modeling and sensitivity analysis of a MEMS vibratory rotation rate sensor** [9061-93]
S. A. M. Lajimi, E. Abdel-Rahman, G. Heppler, Univ. of Waterloo (Canada)
- 9061 2K **Development of metamaterial based low cost passive wireless temperature sensor** [9061-95]
H. Karim, M. A. I. Shuvo, D. Delfin, Y. Lin, A. Choudhuri, R. C. Rumpf, The Univ. of Texas at El Paso (United States)
- 9061 2L **The effect of environmental conditions on designing of a photonic crystal force sensor** [9061-96]
L. Li, T. Li, W. Song, G. Zhang, Y. Li, Harbin Institute of Technology (China)
- 9061 2M **Capacitance-based damage detection sensing for aerospace structural composites** [9061-97]
P. Bahrami, N. Yamamoto, Y. Chen, H. Manohara, Jet Propulsion Lab. (United States)
- 9061 2N **Optimal design of a mechanically decoupled six-axis force/torque sensor based on the principal cross coupling minimization** [9061-98]
M.-K. Kang, Yonsei Univ. (Korea, Republic of); S. Lee, Univ. of Maryland, Baltimore County (United States); J.-H. Kim, Yonsei Univ. (Korea, Republic of)

SESSION 12a WIND LOADS ON COMPLEX STRUCTURAL SYSTEMS

- 9061 2P **Predicting full-field dynamic strain on a three-bladed wind turbine using three-dimensional point tracking and expansion techniques** [9061-100]
J. Baqersad, C. Niezrecki, P. Avitabile, Univ. of Massachusetts Lowell (United States)

SESSION 12b RAILWAY HEALTH MONITORING

- 9061 2Q **Implementation of a piezoelectric energy harvester in railway health monitoring** [9061-101]
J. Li, S. Jiang, J. Tang, Univ. of Connecticut (United States)
- 9061 2R **Fault detection in railway track using piezoelectric impedance** [9061-102]
M. Cremins, Q. Shuai, J. Xu, J. Tang, Univ. of Connecticut (United States)

SESSION 13a SMART BUILDING TECHNOLOGY I

- 9061 2S **Affordable and personalized lighting using inverse modeling and virtual sensors** [9061-103]
C. Basu, B. Chen, J. Richards, A. Dhinakaran, A. Agogino, Univ. of California, Berkeley (United States); R. Martin, NASA Ames Research Ctr. (United States)
- 9061 2T **Control algorithm of lighting color for LED considering human's negative feeling** [9061-104]
Y. Yamagishi, A. Mita, Keio Univ. (Japan)
- 9061 2U **Practical homeostasis lighting control system using sensor agent robots for office space** [9061-105]
M. Tokiwa, A. Mita, Keio Univ. (Japan)
- 9061 2V **A model for earthquake acceleration monitoring with wireless sensor networks in a structure** [9061-106]
T. Fujiwara, Y. Nakamura, Hakodate National College of Technology (Japan); K. Jinno, T. Matsubara, H. Uehara, Toyohashi Univ. of Technology (Japan)

SESSION 13b DATA PROCESSING METHODS FOR SHM

- 9061 2W **Compressed sensing techniques for arbitrary frequency-sparse signals in structural health monitoring** [9061-107]
Z. Duan, J. Kang, Harbin Institute of Technology (China)
- 9061 2Y **A new extension of unscented Kalman filter for structural health assessment with unknown input** [9061-109]
A. Al-Hussein, A. Haldar, The Univ. of Arizona (United States)

SESSION 14a FIBER OPTIC-BASED SENSING METHODS II

- 9061 30 **Research on fatigue damage detection for wind turbine blade based on high-spatial-resolution DPP-BOTDA** [9061-99]
J. Xu, Y. Dong, H. Li, Harbin Institute of Technology (China)
- 9061 31 **Distributed strain monitoring for bridges: temperature effects** [9061-112]
R. Regier, N. A. Hoult, Queen's Univ. (Canada)
- 9061 33 **On the use of electrical and optical strain gauges paired to magnetostrictive patch actuators** [9061-114]
F. Braghin, S. Cinquemani, G. Cazzulani, L. Comolli, Politecnico di Milano (Italy)
- 9061 34 **Development and implementation of an automatic integration system for fibre optic sensors in the braiding process with the objective of online-monitoring of composite structures** [9061-115]
W. Hufenbach, M. Gude, A. Czulak, M. Kretschmann, Technische Univ. Dresden (Germany)

SESSION 14b APPLICATIONS OF PIEZOELECTRIC-BASED HEALTH MONITORING

- 9061 35 **Fourier-based design of acoustic strain rosettes** [9061-116]
M. Carrara, M. Ruzzene, Georgia Institute of Technology (United States)
- 9061 36 **Single mode Lamb wave phased array beamforming with hybrid PZT-SLDV sensing**
[9061-117]
Z. Tian, L. Yu, Univ. of South Carolina (United States)
- 9061 37 **Simulation of shear wave propagation induced by acoustic radiation force** [9061-118]
J.-W. Jung, J.-W. Hong, KAIST (Korea, Republic of); H.-K Lee, K. Choi, SAMSUNG Electronics
Co., Ltd. (Korea, Republic of)
- 9061 38 **Thermoacoustic effects on layered structures for the evaluation of structural parameters**
[9061-119]
O. A. Bareille, Ecole Centrale de Lyon (France); D. Chronopoulos, Univ. of Nottingham
(United Kingdom); M. N. Ichchou, Ecole Centrale de Lyon (France); B. Troclet, EADS Astrium
(France)
- 9061 39 **Recent trends in reinforcement corrosion assessment using piezo sensors via electro
mechanical impedance technique** [9061-120]
T. Visalakshi, S. Bhalla, A. Gupta, B. Bhattacharjee, Indian Institute of Technology Delhi
(India)

SESSION 15a SMART BUILDING TECHNOLOGY II

- 9061 3B **Evaluating damage potential of cryogenic concrete using acoustic emission sensors and
permeability testing** [9061-122]
R. B. Kogbara, Texas A&M Univ. at Qatar (Qatar); B. Parsaei, Texas A&M Univ. (United
States); S. R. Iyengar, Texas A&M Univ. at Qatar (Qatar); Z. C. Grasley, Texas A&M Univ.
(United States) and Virginia Polytechnic Institute and State Univ. (United States);
E. A. Masad, Texas A&M Univ. at Qatar (Qatar) and Texas A&M Univ. (United States);
D. G. Zollinger, Texas A&M Univ. (United States)
- 9061 3C **Design of strain sensors based on the resistivity-percolation curves and piezoresistivity
curves of different conductive composites** [9061-123]
H. Xiao, J. Jiang, H. Li, G. Wang, Harbin Institute of Technology (China)
- 9061 3D **Identification of fatigue cracks through separating dynamic responses** [9061-124]
G. Yan, K. Zhao, The Univ. of Texas at El Paso (United States); R. Q. Feng, Southeast Univ.
(China); J. R. Yi, The Univ. of Texas at El Paso (United States)
- 9061 3E **Using multi-taper method to improve the accuracy of substructure identification for shear
structures** [9061-125]
D. Zhang, H. Li, Y. Bao, Harbin Institute of Technology (China)
- 9061 3F **Development of structural health assessment system for steel and reinforced concrete
structures using acceleration data** [9061-126]
Y. Suzuki, A. Mita, Keio Univ. (Japan)

SESSION 15b ADAPTIVE STRUCTURES AND CONTROLLED SYSTEMS

- 9061 3H **Design and optimization of a morphing aileron control surface using FMC actuators** [9061-128]
E. B. Doepke, M. K. Philen, R. L. West, Virginia Polytechnic Institute and State Univ. (United States)
- 9061 3I **Health monitoring of fluid dampers for vibration control of structures: experimental investigation** [9061-129]
D. Konstantinidis, McMaster Univ. (Canada); N. Makris, Univ. of Patras (Greece); J. M. Kelly, Univ. of California, Berkeley (United States)
- 9061 3J **Miniature cryogenic valves for a Titan Lake sampling system** [9061-130]
S. Sheritt, W. Zimmerman, N. Takano, L. Avellar, Jet Propulsion Lab. (United States)
- 9061 3L **Shape Memory Alloy (SMA)-based launch lock** [9061-132]
M. Badescu, X. Bao, Y. Bar-Cohen, Jet Propulsion Lab. (United States)
- 9061 3M **Experimental evaluation of a neural-oscillator-driven active mass damper system** [9061-133]
D. Iba, J. Hongu, Kyoto Institute of Technology (Japan)
- 9061 3N **Finite element analysis of seal mechanism using SMA for Mars sample return** [9061-134]
X. Bao, P. Younse, Jet Propulsion Lab. (United States)

POSTER SESSION

- 9061 3O **Genetic mechanism for building evolution reflecting stress histories of residents and environmental factors** [9061-136]
S. Nishikawa, A. Mita, Keio Univ. (Japan)
- 9061 3P **High-temperature measurement using Cu-plating fiber Bragg grating for metal smart structure applications** [9061-137]
T. Chang, Jilin Univ. (China); L. Jia, Q. Sui, Shandong Univ. (China); H. Cui, Jilin Univ. (China)
- 9061 3Q **Watt-linkage based sensors for low frequency motion measurement and control of spacecrafts and satellites** [9061-138]
F. Acernese, G. Giordano, R. Romano, F. Barone, Univ. degli Studi di Salerno (Italy)
- 9061 3R **Advances in Barkhausen noise analysis** [9061-139]
N. Meyendorf, S. Hillmann, U. Cikalova, J. Schreiber, Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren (Germany)
- 9061 3T **Natural frequency identification of smart washer by using adaptive observer** [9061-141]
H. Ito, M. Okugawa, Aichi Institute of Technology (Japan)

- 9061 3U **A novel ionizing radiation sensor utilizing radiophotoluminescence in silver-doped phosphate glass** [9061-142]
H. Nanto, Kanazawa Institute of Technology (Japan); Y. Miyamoto, Chiyoda Technol Corp. (Japan); T. Ohno, T. Ikeguchi, K. Hirasawa, Y. Takei, T. Kurobori, Kanazawa Univ. (Japan); T. Yamamoto, Chiyoda Technol Corp. (Japan); T. Iida, Osaka Univ. (Japan)
- 9061 3V **Design of overload vehicle monitoring and response system based on DSP** [9061-143]
Y. Yu, Y. Liu, X. Zhao, Dalian Univ. of Technology (China)
- 9061 3W **A novel high pressure high temperature vessel used to conduct long-term stability measurements of silicon MEMS pressure transducers** [9061-144]
D. Wisniewski, Meggitt Sensing Systems (United States)
- 9061 3X **Design of active whole-spacecraft vibration isolation based on voice-coil motor** [9061-145]
W. Chi, D. Cao, W. Huang, Harbin Institute of Technology (China)
- 9061 3Y **An FFT-based approach for dynamic response prediction of non-periodic systems** [9061-146]
V. Rahneshin, M. Chierichetti, Worcester Polytechnic Institute (United States)
- 9061 3Z **Scanning capability analysis of laser impulse radar** [9061-147]
D. Chen, Jiangsu Automation Research Institute (China); H. Sun, Jiangsu Automation Research Institute (China) and Nanjing Univ. of Science and Technology (China); Y. Han, Jiangsu Automation Research Institute (China)
- 9061 41 **Parametric study of laser scanner for breathing cracked rotor damage identification** [9061-149]
J. Zhao, H. DeSmidt, The Univ. of Tennessee Knoxville (United States)
- 9061 46 **Galfenol-based directional magnetostrictive patch transducer for guided Lamb wave techniques** [9061-155]
B. Yoo, S.-M. Na, A. B. Flatau, D. J. Pines, Univ. of Maryland, College Park (United States)
- 9061 49 **Implementation of a self-sensing piezoelectric actuator for vibro-acoustic active control** [9061-159]
A. Pelletier, P. Micheau, A. Berry, Univ. de Sherbrooke (Canada)
- 9061 4A **Bio-inspired flow sensors using carbon nanomaterials** [9061-162]
E. Berg, A. Darge, M. Philen, Virginia Polytechnic Institute and State Univ. (United States)
- 9061 4B **A robotic reproduction of the dynamic sonar sensing in Horseshoe bats** [9061-163]
B. Goodman, R. Castro, Hampton Univ. (United States); Y. Fu, R. Mueller, M. Philen, Virginia Polytechnic Institute and State Univ. (United States)
- 9061 4C **Structural characteristic responses for finite element model updating of structures** [9061-164]
L. Zhou, South China Univ. of Technology (China); L. Wang, Jinan Univ. (China); J. Ou, Harbin Institute of Technology (China) and Dalian Univ. of Technology (China)

- 9061 4D **Detection and calculation of reflected spectral shifts in fiber-Bragg gratings (FBG) in polarization maintaining optical fiber** [9061-165]
J. Quintana, V. Gonzalez, The Univ. of Texas at El Paso (United States)

Author Index

Conference Committee

Symposium Chairs

Victor Giurgiutiu, University of South Carolina (United States)
Christopher S. Lynch, University of California, Los Angeles
(United States)

Symposium Co-chairs

Jayanth N. Kudva, NextGen Aeronautics, Inc. (United States)
Theodoros E. Matikas, University of Ioannina (Greece)

Conference Chair

Jerome P. Lynch, University of Michigan (United States)

Conference Co-chairs

Kon-Well Wang, University of Michigan (United States)
Hoon Sohn, KAIST (Korea, Republic of)

Conference Program Committee

Dumitru Caruntu, The University of Texas-Pan American (United States)
Fabio Casciati, Università degli Studi di Pavia (Italy)
Chih-Chen Chang, Hong Kong University of Science and Technology
(Hong Kong, China)
Genda Chen, Missouri University of Science and Technology
(United States)
Alison B. Flatau, University of Maryland, College Park (United States)
Yozo Fujino, The University of Tokyo (Japan)
Branko Glisic, Princeton University (United States)
Faramarz Gordaninejad, University of Nevada, Reno (United States)
Xiaoyan Han, Wayne State University (United States)
Benjamin Kyle Henderson, Air Force Research Laboratory
(United States)
Jung-Wuk Hong, KAIST (Korea, Republic of)
Neil Hoult, Queen's University (Canada)
Haiying Huang, The University of Texas at Arlington (United States)
Ying Huang, North Dakota State University (United States)
Shinae Jang, University of Connecticut (United States)
Jeong-Tae Kim, Pukyong National University (Korea, Republic of)
Junhee Kim, Dankook University (Korea, Republic of)
Masahiro Kurata, Kyoto University (Japan)

Simon Laflamme, Iowa State University (United States)
Francesco Lanza di Scalea, University of California, San Diego
 (United States)
Wei-Hsin Liao, The Chinese University of Hong Kong
 (Hong Kong, China)
Yingzi Lin, Northeastern University (United States)
Chin-Hsiung Loh, National Taiwan University (Taiwan)
Kenneth J. Loh, University of California, Davis (United States)
Sami F. Masri, The University of Southern California (United States)
Akira Mita, Keio University (Japan)
Tomonori Nagayama, The University of Tokyo (Japan)
Yiqing Ni, The Hong Kong Polytechnic University (Hong Kong, China)
Hae Young Noh, Carnegie Mellon University (United States)
Irving J. Oppenheim, Carnegie Mellon University (United States)
Wieslaw M. Ostachowicz, The Szwedowski Institute of Fluid-Flow
 Machinery (Poland)
Jinping Ou, Dalian University of Technology (China)
Shamim N. Pakzad, Lehigh University (United States)
Jin-Song Pei, The University of Oklahoma (United States)
Michael K. Philen, Virginia Polytechnic Institute and State University
 (United States)
Paul Reynolds, University of Exeter (United Kingdom)
Massimo Ruzzene, Georgia Institute of Technology (United States)
Liming W. Salvino, Office of Naval Research Global (United States)
Jeffrey T. Scruggs, University of Michigan (United States)
Fabio Semperlotti, University of Notre Dame (United States)
Sung-Han Sim, Ulsan National Institute of Science and Technology
 (Korea, Republic of)
Billie F. Spencer Jr., University of Illinois at Urbana-Champaign
 (United States)
Wieslaw Jerzy Staszewski, AGH University of Science and Technology
 (Poland)
Lizhi Sun, University of California, Irvine (United States)
R. Andrew Swartz, Michigan Technological University (United States)
Masayoshi Tomizuka, University of California, Berkeley (United States)
Ming L. Wang, Northeastern University (United States)
Xingwei Wang, University of Massachusetts Lowell (United States)
Yang Wang, Georgia Institute of Technology (United States)
Chung-Bang Yun, Ulsan National Institute of Science and Technology
 (Korea, Republic of)
Yunfeng Zhang, University of Maryland, College Park (United States)
Li Zhou, Nanjing University of Aeronautics and Astronautics (China)
Daniele Zonta, Università degli Studi di Trento (Italy)

Session Chairs

- 1 Keynote Session
Jerome P. Lynch, University of Michigan (United States)
Hoon Sohn, KAIST (Korea, Republic of)
Kon-Well Wang, University of Michigan (United States)
- 2a Acoustic and Ultrasonic Methods for SHM
Fabio Semperlotti, University of Notre Dame (United States)
Haeng-Ki Lee, KAIST (Korea, Republic of)
- 2b Condition Monitoring of Transportation Infrastructure
Ying Huang, North Dakota State University (United States)
- 3a SHM of Civil Engineering Systems
Sung-Han Sim, Ulsan National Institute of Science and Technology (Korea, Republic of)
R. Andrew Swartz, Michigan Technological University (United States)
- 3b Active Sensing for Structures
Jiaze He, North Carolina State University (United States)
Kon-Well Wang, University of Michigan (United States)
- 4a SHM of Wind Turbines
R. Andrew Swartz, Michigan Technological University (United States)
- 4b Truss and Tensegrity Structures
Yunfeng Zhang, University of Maryland, College Park (United States)
Sung-Han Sim, Ulsan National Institute of Science and Technology (Korea, Republic of)
- 5a Nanoengineered Sensing Technology I
Bryan R. Loyola, Sandia National Laboratories, California (United States)
Jerome P. Lynch, University of Michigan (United States)
- 5b Non-Contact Measurements I
Mohammad Reza Jahanshahi, Jet Propulsion Laboratory (United States)
Hoon Sohn, KAIST (Korea, Republic of)
- 6a Nanoengineered Sensing Technology II
Kenneth J. Loh, University of California, Davis (United States)
Simon Laflamme, Iowa State University (United States)

- 6b Non-Contact Measurements II
Hoon Sohn, KAIST (Korea, Republic of)
Yang Wang, Georgia Institute of Technology (United States)
- 7a Sensor Fusion for SHM of Civil Structures
Emma Hudson, University of Exeter (United Kingdom)
Sung-Han Sim, Ulsan National Institute of Science and Technology
(Korea, Republic of)
- 7b Statistical Learning for Smart Structures
Hae Young Noh, Carnegie Mellon University (United States)
Yang Wang, Georgia Institute of Technology (United States)
- 8a Thin-Film Crack Sensors
Ying Huang, North Dakota State University (United States)
David L. Mascarenas, Los Alamos National Laboratory (United States)
- 8b Robotic Platforms for Sensing
Yang Wang, Georgia Institute of Technology (United States)
- 9a Wireless Sensor Networks for SHM
Haiying Huang, The University of Texas at Arlington (United States)
Yuequan Bao, Harbin Institute of Technology (China)
- 9b Carbon Nanotube-Based Sensing
Satish Nagarajaiah, Rice University (United States)
Jerome P. Lynch, University of Michigan (United States)
- 10a Fiber Optic-Based Sensing Methods I
Ying Huang, North Dakota State University (United States)
Branko Glisic, Princeton University (United States)
- 10b Multifunctional Material Sensors
Majid Behrooz, University of Nevada, Reno (United States)
Yingzi Lin, Northeastern University (United States)
- 11a ID and Health Monitoring of Civil Structures
Chin-Hsiung Loh, National Taiwan University (Taiwan)
Daniele Zonta, Università degli Studi di Trento (Italy)
- 11b Next-Generation Sensor and Technologies
Didem Ozevin, University of Illinois at Chicago (United States)
Shantanu Chakrabarty, Michigan State University (United States)
- 12a Wind Loads on Complex Structural Systems
Shamim N. Pakzad, Lehigh University (United States)
Neil A. Hoult, Queen's University (Canada)

- 12b Railway Health Monitoring
Jiong Tang, University of Connecticut (United States)
- 13a Smart Building Technology I
Daniele Zonta, Università degli Studi di Trento (Italy)
Jung-Wuk Hong, KAIST (Korea, Republic of)
- 13b Data Processing Methods for SHM
Dumitru Caruntu, The University of Texas-Pan American (United States)
Hyung-Jo Jung, KAIST (Korea, Republic of)
- 14a Fiber Optic-Based Sensing Methods II
Neil A. Hoult, Queen's University (Canada)
- 14b Applications of Piezoelectric-Based Health Monitoring
Jung-Wuk Hong, KAIST (Korea, Republic of)
Manuel Collet, LTDS, Ecole Centrale de Lyon, CNRS (France)
- 15a Smart Building Technology II
Akira Mita, Keio University (Japan)
Jong-Jae Lee, Sejong University (Korea, Republic of)
- 15b Adaptive Structures and Controlled Systems
Nicos Makris, University of Patras (Greece)
Emma Hudson, University of Exeter (United Kingdom)