

PROCEEDINGS OF SPIE

Health Monitoring of Structural and Biological Systems 2007


Tribikram Kundu
Editor

19–22 March 2007
San Diego, California, USA

Sponsored and Published by
SPIE—The International Society for Optical Engineering

Cosponsored by
American Society of Mechanical Engineers (USA)

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

Volume 6532
 The International Society
for Optical Engineering

Proceedings of SPIE—The International Society for Optical Engineering, 9780819466532, v. 6532

SPIE is an international technical society dedicated to advancing engineering and scientific applications of optical, photonic, imaging, electronic, and optoelectronic technologies.

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 *Health Monitoring of Structural and Biological Systems 2007*, edited by Tribikram Kundu, Proceedings of SPIE Vol. 6532 (SPIE, Bellingham, WA, 2007) Article CID Number.

ISSN 0277-786X
ISBN 9780819466532

Published by
SPIE—The International Society for Optical Engineering
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone 1 360/676-3290 (Pacific Time) · Fax 1 360/647-1445
<http://www.spie.org>

Copyright © 2007, The 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 <http://www.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/07/\$18.00.

Printed in the United States of America.

Contents

xi	<i>Symposium Committee</i>
xiii	<i>Conference Committee</i>
xv	<i>Introduction</i>

SESSION 1 SHM FOR AEROSPACE APPLICATIONS

- 653203 **An integrated strategy for detection and imaging of damage using a spatially distributed array of piezoelectric sensors** [6532-02]
J. E. Michaels, T. E. Michaels, Georgia Institute of Technology (USA)
- 653204 **Detection of fatigue cracks and torque loss in bolted joints** [6532-03]
C. K. Coelho, S. Das, A. Chattopadhyay, A. Papandreou-Suppappola, P. Peralta, Arizona State Univ. (USA)
- 653205 **Detection and quantification of fatigue damage in aircraft structural components** [6532-04]
C. A. Rideout, S. J. Ritchie, Positron Systems, Inc. (USA)
- 653206 **Integrated surface and plate acoustic wave sensors for health monitoring** [6532-05]
C.-K. Jen, National Research Council of Canada (Canada); K.-T. Wu, McGill Univ. (Canada); M. Kobayashi, J.-H. Kuo, National Research Council of Canada (Canada); N. Mrad, Defence R&D Canada (Canada)

SESSION 2 GUIDED WAVES FOR SHM I

- 653207 **Ultrasonic plate waves for fatigue crack detection in multi-layered metallic structures** [6532-06]
E. Lindgren, Air Force Research Lab. (USA); J. C. Aldrin, Computational Tools (USA); K. Jata, B. Scholes, J. Knopp, Air Force Research Lab. (USA)
- 653208 **Impact of ultrasonic guided wave transducer design on health monitoring of composite structures** [6532-07]
H. Gao, J. L. Rose, The Pennsylvania State Univ. (USA)

Pagination: 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 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.

- 653209 **Instantaneous crack detection under changing operational and environmental variations** [6532-08]
S. B. Kim, Carnegie Mellon Univ. (USA); H. Sohn, KAIST (South Korea)
- 65320A **Sensitivity limitations for guided wave structural health monitoring** [6532-09]
P. D. Wilcox, A. J. Croxford, G. Konstantinidis, B. W. Drinkwater, Univ. of Bristol (United Kingdom)
- 65320B **On piezoelectric Lamb wave-based structural health monitoring using instantaneous baseline measurements** [6532-10]
S. R. Anton, Virginia Polytechnic Institute and State Univ. (USA); G. Park, C. R. Farrar, Los Alamos National Lab. (USA); D. J. Inman, Virginia Polytechnic Institute and State Univ. (USA)

SESSION 3 GUIDED WAVES FOR SHM II

- 65320C **Impedance-based structural health monitoring considering temperature effects** [6532-11]
K.-Y. Koo, S. Park, J.-J. Lee, C.-B. Yun, Korea Advanced Institute of Science and Technology (South Korea); D. J. Inman, Virginia Polytechnic Institute and State Univ. (USA)
- 65320D **SAFE modeling of waves for the structural health monitoring of prestressing tendons** [6532-12]
I. Bartoli, Univ. of California, San Diego (USA); A. Marzani, Univ. degli Studi di Bologna (Italy); F. Lanza di Scalea, Univ. of California, San Diego (USA); P. Rizzo, Univ. of Pittsburgh (USA); E. Viola, E. Sorri, Univ. degli Studi di Bologna (Italy); R. Phillips, Univ. of California, San Diego (USA)
- 65320F **Electro-mechanical analogies for modeling the structural impedance response** [6532-14]
A. Zagrai, New Mexico Institute of Mining and Technology (USA)
- 65320G **Guided wave phased array beam steering in composite plates** [6532-15]
F. Yan, J. L. Rose, The Pennsylvania State Univ. (USA)
- 65320H **Simultaneous multipoint acousto-ultrasonic sensing based on fiber wave Bragg grating sensors** [6532-16]
J.-P. Lee, T. Junji, H. Tsuda, National Institute of Advanced Industrial Science and Technology (Japan)

SESSION 4 GUIDED WAVES FOR SHM OF PIPES AND RODS

- 65320I **Guided wave based structural health monitoring of piping systems** [6532-17]
F. Schubert, B. Frankenstein, K.-J. Froehlich, M. Kuettnner, Fraunhofer Institute for Nondestructive Testing (Germany)
- 65320J **Parametric studies on attenuation of cylindrical guided waves** [6532-18]
W.-B. Na, J.-T. Kim, J. Lee, D.-S. Hong, Pukyong National Univ. (South Korea)

SESSION 5 GUIDED WAVES FOR SHM III

- 65320L **Ultrasonic magnetostrictive transducers for guided ultrasonic waves in thin wires** [6532-20]
M. M. Kropf, B. R. Tittmann, The Pennsylvania State Univ. (USA)

- 65320M **An improved technique for locating the point of impact from the acoustic emission data** [6532-73]
T. Kundu, S. Das, Univ. of Arizona (USA); K. V. Jata, Air Force Research Lab. (USA)
- 65320N **Analytical and experimental evaluation of piezoelectric wafer active sensors performances for Lamb waves based structural health monitoring in composite laminates** [6532-22]
G. S. Bottai, Univ. of South Carolina (USA); N. A. Chrysochoidis, Univ. of Patras (Greece); V. Giurgiutiu, Univ. of South Carolina (USA); D. A. Saravanos, Univ. of Patras (Greece)
- 65320O **Sensitivity comparisons of layered Rayleigh wave and Love wave acoustic devices** [6532-23]
M. K. Pedrick, Luna Innovations, Inc. (USA); B. R. Tittmann, Pennsylvania State Univ. (USA)
- 65320P **Application of Gabor transform on cylindrical guided waves to detect defects in underground pipes** [6532-24]
R. Ahmad, T. Kundu, Univ. of Arizona (USA)

SESSION 6 DAMAGE DETECTION

- 65320Q **Application of Hilbert-Huang transformation for detection of damage in concrete** [6532-25]
H.-C. Wu, Wayne State Univ. (USA); P. F. Pai, Univ. of Missouri, Columbia (USA); K. Warnemuende, Wayne State Univ. (USA)
- 65320R **An improved DPSM technique for modelling ultrasonic fields in cracked solids** [6532-26]
S. Banerjee, T. Kundu, Univ. of Arizona (USA); D. Placko, École Normale Supérieure de Cachan (France)
- 65320S **Advanced signal processing for structural identification: experimental studies** [6532-27]
J. Zhang, Kyoto Univ. (Japan) and Univ. of California, San Diego (USA); T. Sato, Kobe Gakuin Univ. (Japan); T. C. Hutchinson, Univ. of California, San Diego (USA)
- 65320T **Analysis of bearing vibration signatures using empirical mode decomposition and Hilbert-Huang transform** [6532-28]
S. Haran, Arkansas State Univ. (USA); L. W. Salvino, Naval Surface Warfare Ctr. (USA); M. A. Davidson, Arkansas State Univ. (USA)
- 65320U **Application of information fusion and Shannon entropy in structural damage detection** [6532-29]
Y. Bao, H. Li, Harbin Institute of Technology (China)

SESSION 7 NONLINEAR METHODS IN SHM

- 65320V **Chaotic and ambient vibration analysis of composite lap joint damage** [6532-30]
L. Pecora, J. Nichols, M. Seaver, S. Trickey, S. Motley, Naval Research Lab. (USA)
- 65320W **Development of higher-order spectra for randomly excited quadratic nonlinear systems: Volterra functional series approach** [6532-33]
P. Marzocca, Clarkson Univ. (USA); J. M. Nichols, M. Seaver, S. T. Trickey, Naval Research Lab. (USA); A. Milanese, Clarkson Univ. (USA)

- 65320X **Characterizing the auto-bispectrum as a detector of nonlinearity in structural systems** [6532-31]
J. M. Nichols, Naval Research Lab. (USA); A. Milanese, P. Marzocca, Clarkson Univ. (USA)
- 65320Y **Identification of damage in a suspension component using narrowband and broadband nonlinear signal processing techniques** [6532-32]
M. Haroon, D. E. Adams, Purdue Univ. (USA)
- 65320Z **Damage identification through generalized correlations between measurements** [6532-34]
L. A. Overbey, M. D. Todd, Univ. of California, San Diego (USA)
- 653210 **Tailored deterministic and stochastic excitations for structural health monitoring via evolutionary algorithms** [6532-35]
C. C. Olson, M. D. Todd, Univ. of California, San Diego (USA)

SESSION 8 NOVEL INSTRUMENTATION AND SENSING I

- 653211 **Flexible ultrasonic array sensors for health monitoring** [6532-37]
M. Kobayashi, National Research Council of Canada (Canada); K.-T. Wu, L. Song, Q. Liu, McGill Univ. (Canada); C.-K. Jen, National Research Council of Canada (Canada)
- 653212 **Development of a composite UAV wing test-bed for structural health monitoring research** [6532-38]
J. A. Oliver, J. B. Kosmatka, Univ. of California, San Diego (USA); C. R. Farrar, G. Park, Los Alamos National Lab. (USA)
- 653213 **Effect on detection sensitivity for smart washer configuration and ambient temperature characteristics on bolted joint** [6532-39]
M. Okugawa, T. Tanaka, Gifu National College of Technology (Japan)

SESSION 9 NOVEL INSTRUMENTATION AND SENSING II

- 653214 **The influence of the radius of the electrodes employed in Coulomb excitation of acoustic waves in piezoelectric materials** [6532-40]
A. Habib, E. Twerdowski, M. von Buttlar, R. Wannemacher, W. Grill, Univ. of Leipzig (Germany)
- 653215 **Investigating a stepped ultrasonic phased array transducer for the evaluation and characterization of defects** [6532-41]
M. Bohenic, E. Blickley, B. R. Tittmann, M. Kropf, The Pennsylvania State Univ. (USA)
- 653216 **Wireless energy transmission for structural health monitoring embedded sensor nodes** [6532-42]
M. J. Nothnagel, G. Park, C. R. Farrar, Los Alamos National Lab. (USA)
- 653217 **Directional strain measurement using fiber-optic polarimetric sensor** [6532-43]
W.-C. Wang, Southern Taiwan Univ. of Technology (Taiwan) and Univ. of Washington (USA); P. Reinhall, Univ. of Washington (USA)

- 653218 **Finite element model correlation of a composite UAV wing using modal frequencies** [6532-44]
J. A. Oliver, J. B. Kosmatka, Univ. of California, San Diego (USA); F. M. Hemez, C. R. Farrar, Los Alamos National Lab. (USA)

SESSION 10 CIVIL INFRASTRUCTURE APPLICATIONS

- 653219 **Health monitoring with optical fiber sensors: from human body to civil structures** [6532-45]
É. Pinet, C. Hamel, FISO Technologies Inc. (Canada); B. Glišić, D. Inaudi, SMARTEC S.A. (Switzerland); N. Miron, Roctest Ltd. (Canada)
- 65321B **Nondestructive inspection of reinforced concrete reefs submerged in seawater** [6532-47]
H.-S. Kim, C.-G. Kim, National Fisheries Research and Development Institute (South Korea); J. Woo, W.-B. Na, Pukyong National Univ. (South Korea)
- 65321C **Model updating for Binzhou Yellow River Highway Bridge considering uncertainties** [6532-48]
S. Li, H. Li, Harbin Institute of Technology (China); J. Ou, Harbin Institute of Technology (China) and Dalian Univ. of Technology (China)
- 65321D **Dynamic assessment of undersea pipeline bedding condition** [6532-49]
X. Q. Zhu, H. Hao, Univ. of Western Australia (Australia)

SESSION 11 DAMAGE DETECTION AND PREDICTION

- 65321E **Quasi-active, minimal-sensing load and damage identification, and quantification techniques for filament-wound rocket motor casings** [6532-50]
N. Stites, C. Escobar, J. White, D. E. Adams, Purdue Univ. (USA); M. Triplett, U.S. Army RDECOM (USA)
- 65321F **Detection of minuscule changes in structures from spectral data** [6532-51]
K. V. Singh, Miami Univ. (USA); G. K. Srinivas, Louisiana State Univ. (USA); A. Shukla, Miami Univ. (USA); S.-S. Pang, Louisiana State Univ. (USA)
- 65321G **Monitoring and characterizing corrosion in aluminum using Lamb waves and attached sensors** [6532-52]
T. E. Michaels, J. E. Michaels, Georgia Institute of Technology (USA)
- 65321H **Continuous sensors for mode selective actuation and reception of waves for structural health monitoring of woven composite laminates** [6532-53]
G. R. Kirikera, Northwestern Univ. (USA); G. Petculescu, Univ. of Louisiana at Lafayette (USA); S. Krishnaswamy, J. D. Achenbach, Northwestern Univ. (USA)
- 65321I **Impedance-based structural health monitoring of wind turbine blades** [6532-54]
C. Pitchford, B. L. Grisso, D. J. Inman, Virginia Polytechnic Institute and State Univ. (USA)
- 65321J **Assessment of vibration-based damage indexes in structural health monitoring** [6532-55]
X. Sun, Harbin Institute of Technology (China); J. Ou, Harbin Institute of Technology (China) and Dalian Univ. of Technology (China)

SESSION 12 BIOLOGICAL AND MEDICAL APPLICATIONS I

- 65321K **Optical and mechanical characterization of microfabricated optical bend loss sensor for distributive pressure measurement** [6532-56]
W.-C. Wang, Univ. of Washington (USA) and Southern Taiwan Univ. of Technology (Taiwan); C.-Y. Huang, Univ. of Washington (USA); T.-K. Chiang, Southern Taiwan Univ. of Technology (Taiwan); P. G. Reinhall, Univ. of Washington (USA)
- 65321L **Mechanical characterization of bone samples by ultrasound holography at 100 MHz** [6532-57]
H. Hartmann, U. Cobet, Martin-Luther Univ. of Halle-Wittenberg (Germany); W. Grill, Univ. of Leipzig (Germany)

SESSION 13 BIOLOGICAL AND MEDICAL APPLICATIONS II

- 65321N **Ultrasonic imaging in extinction and velocity contrast by time selective first arrival line tomography in transmission** [6532-59]
A. Schwagmann, D. Ivanov, E. Twerdowski, Univ. of Leipzig (Germany); M. Pluta, Wrocław Univ. of Technology (Poland); W. Grill, Univ. of Leipzig (Germany)
- 65321P **Design of a multi-layered optical bend loss sensor for pressure and shear sensing** [6532-61]
C.-S. Liu, G. W. Chou, National Defense Univ. (Taiwan); X. Liang, P. G. Reinhall, Univ. of Washington (USA); W. Wang, Univ. of Washington (USA) and Southern Taiwan Univ. of Technology (Taiwan)
- 65321Q **Design and implementation of a Bluetooth-based infant monitoring/saver (BIMS) system** [6532-62]
A. E. Sonmez, M. T. Nalcaci, M. A. Pazarbasi, O. Toker, K. Fidanboylyu, Fatih Univ. (Turkey)
- 65321R **Design and performance of a fiber Bragg grating displacement sensor for movement measurement of tendon and ligament** [6532-63]
L. Ren, Dalian Univ. of Technology (China) and Univ. of Houston (USA); G. Song, Univ. of Houston (USA); M. Conditt, Advanced Technology in Orthopedics LP (USA); P. C. Noble, The Institute of Orthopedic Research & Education (USA); H. Li, Dalian Univ. of Technology (China)

SESSION 14 GUIDED WAVES AND VIBRATION BASED TECHNIQUES FOR SHM

- 65321S **Detection of structural damage in carbon fibre and metal structures using Lamb waves** [6532-64]
A. MacLean, G. Thursby, H. Hogg, Univ. of Strathclyde (United Kingdom); D. Betz, Daimler-Chrysler AG (Germany); B. Culshaw, Univ. of Strathclyde (United Kingdom)
- 65321T **Strategies for overcoming the effect of temperature on guided wave structural health monitoring** [6532-65]
A. J. Croxford, P. D. Wilcox, G. Konstantinidis, B. W. Drinkwater, Univ. of Bristol (United Kingdom)

- 65321U **Autonomous health monitoring of composite structures using a statistical damage index approach** [6532-66]
S. Banerjee, Saint Louis Univ. (USA); F. Ricci, Univ. of Naples Federico II (Italy); A. Mal, Univ. of California, Los Angeles (USA)
- 65321V **Monitoring cracks and prestress-loss in PSC girder bridges using vibration-based damage detection techniques** [6532-67]
J.-H. Park, J.-T. Kim, Y.-S. Ryu, J.-M. Lee, Pukyong National Univ. (South Korea)
- 65321W **Hybrid health monitoring of PSC girder bridges using vibration and impedance based methods** [6532-68]
D.-S. Hong, J.-T. Kim, W.-B. Na, H.-S. Do, Pukyong National Univ. (South Korea)

POSTER SESSION

- 65321X **Element level structural damage detection with limited observations and with unknown inputs** [6532-36]
Y. Lei, J. Y. Lei, Y. Song, Xiamen Univ. (China)
- 65321Y **Remote assessment of FRP bridge deck system using wireless sensors** [6532-69]
G. Chen, G. Morcou, Y. K. Cho, Univ. of Nebraska, Lincoln (USA); J.-H. Youn, Univ. of Nebraska, Omaha (USA); U. Jung, Univ. of Nebraska, Lincoln (USA)
- 65321Z **Real-time long term measurement using integrated framework for ubiquitous smart monitoring** [6532-70]
G. Heo, Konyang Univ. (South Korea); G. Lee, W. Lee, J. Jeon, Chungnam National Univ. (South Korea); P.-J. Kim, Konyang Univ. (South Korea)
- 653220 **Evaluation of dermal segment on viscoelasticity measurement of skin by rheometer** [6532-71]
T. Nemoto, National Institute for Longevity Sciences, NCGG (Japan); Z. Isogai, National Hospital for Geriatric Medicine, NCGG (Japan); K. Koide, Y. Itoh, National Institute for Longevity Sciences, NCGG (Japan); F. Nogata, Gifu Univ. (Japan); A. Shimamoto, D.-Y. Ju, Saitama Institute of Technology (Japan); H. Matsuura, National Institute for Longevity Sciences, NCGG (Japan)
- 653221 **Study on damage identification of high-rise buildings** [6532-72]
Y. Song, Y. Lei, J.-X. Wang, Xiamen Univ. (China)

Symposium Plenary Presentation:

Revolutionary transitions of GE technology in NDE prognostics and health monitoring
Ed Hindle, Thadd Patton, GE Aviation (USA); Tom Batzinger, GE Global Research Ctr. (USA)

Author Index

Symposium Committee

Symposium Chairs

Yoseph Bar-Cohen, Jet Propulsion Laboratory (USA)
Alison B. Flatau, University of Maryland, College Park (USA)
Norbert G. Meyendorf, University of Dayton (USA) and Fraunhofer Institute
of Non-Destructive Testing (Germany)
George Y. Baaklini, NASA Glenn Research Center (USA)

Executive Committee

Mehdi Ahmadian, Virginia Polytechnic Institute and State University (USA)
George Y. Baaklini, NASA Glenn Research Center (USA)
Yoseph Bar-Cohen, Jet Propulsion Laboratory (USA)
Marcelo J. Dapino, The Ohio State University (USA)
L. Porter Davis, Honeywell, Inc. (USA)
Michael A. Demetriou, Worcester Polytechnic Institute (USA)
Aaron A. Diaz, Pacific Northwest National Laboratory (USA)
Alison B. Flatau, University of Maryland, College Park (USA)
Victor Giurgiutiu, University of South Carolina (USA)
B. K. Henderson, Air Force Research Laboratory (USA)
Kumar Jata, Air Force Research Laboratory (USA)
Gabor M., Kovacs, EMPA (Switzerland)
Tribikram Kundu, The University of Arizona (USA)
Donald J. Leo, DARPA (USA) and Virginia Polytechnic Institute and State
University (USA)
Douglas K. Lindner, Virginia Polytechnic Institute and State University
(USA)
Ajit K. Mal, University of California, Los Angeles (USA)
Yuji Matsuzaki, Nagoya University (Japan)
M. Brett McMickell, Honeywell, Inc. (USA)
Norbert G. Meyendorf, University of Dayton (USA)
Zoubeida Ounaies, Texas A&M University (USA)
Kara J. Peters, North Carolina State University (USA)
Peter J. Shull, The Pennsylvania State University (USA)
Masayoshi Tomizuka, University of California, Berkeley (USA)
Eric Udd, Columbia Gorge Research (USA)
Vijay K. Varadan, University of Arkansas (USA)
Dietmar W. Vogel, Fraunhofer-Institut für Zuverlässigkeit und
Mikrointegration (Germany)
H. Felix Wu, National Institute of Standards and Technology (USA)
Chung-Bang Yun, Korea Advanced Institute of Science and Technology
(South Korea)

Conference Committee

Conference Chair

Tribikram Kundu, The University of Arizona (USA)

Conference Cochairs

Ajit K. Mal, University of California, Los Angeles (USA)

Kumar V. Jata, Air Force Research Laboratory (USA)

Program Committee

Douglas E. Adams, Purdue University (USA)
Yoseph Bar-Cohen, Jet Propulsion Laboratory (USA)
Jürgen Bereiter-Hahn, Johann Wolfgang Goethe-Universität (Germany)
Fu-Kuo Chang, Stanford University (USA)
Olivier Giraudo, ONERA (France)
Victor Giurgiutiu, University of South Carolina (USA)
Wolfgang Grill, Universität Leipzig (Germany)
Shivan Haran, Arkansas State University (USA)
Sridhar Krishnaswamy, Northwestern University (USA)
Francesco Lanza di Scalea, University of California, San Diego (USA)
Shih-Chi Liu, National Science Foundation (USA)
Jerome P. Lynch, University of Michigan (USA)
Won-Bae Na, Pukyong National University (South Korea)
P. Frank Pai, University of Missouri, Columbia (USA)
Paul D. Panetta, Luna Innovations, Inc. (USA)
Dominique Placko, Ecole Normale Supérieure de Cachan (France)
Amit Shukla, Miami University (USA)
Hoon Sohn, Carnegie Mellon University (USA)
Michael D. Todd, University of California, San Diego (USA)
Wei-Chih Wang, University of Washington (USA) and Southern Taiwan
University of Technology (Taiwan)
Hwai-Chung Wu, Wayne State University (USA)
George Zentai, Varian Medical Systems, Inc. (USA)

Session Chairs

- 1 SHM for Aerospace Applications
Tribikram Kundu, The University of Arizona (USA)
Wolfgang Grill, Universität Leipzig (Germany)
- 2 Guided Waves for SHM I
Francesco Lanza di Scalea, University of California, San Diego (USA)
Hoon Sohn, Carnegie Mellon University (USA)

- 3 Guided Waves for SHM II
Hoon Sohn, Carnegie Mellon University (USA)
Francesco Lanza di Scalea, University of California, San Diego (USA)
- 4 Guided Waves for SHM of Pipes and Rods
Victor Giurgiutiu, University of South Carolina (USA)
Paul D. Panetta, Luna Innovations, Inc. (USA)
- 5 Guided Waves for SHM III
Francesco Lanza di Scalea, University of California, San Diego (USA)
Won-Bae Na, Pukyong National University (South Korea)
- 6 Damage Detection
Wolfgang Grill, Universität Leipzig (Germany)
Kumar V. Jata, Air Force Research Laboratory (USA)
- 7 Nonlinear Methods in SHM
Michael D. Todd, University of California, San Diego (USA)
Douglas E. Adams, Purdue University (USA)
- 8 Novel Instrumentation and Sensing I
Sridhar Krishnaswamy, Northwestern University (USA)
Won-Bae Na, Pukyong National University (South Korea)
- 9 Novel Instrumentation and Sensing II
Kumar V. Jata, Air Force Research Laboratory (USA)
Hwai-Chung Wu, Wayne State University (USA)
- 10 Civil Infrastructure Applications
Shivan Haran, Arkansas State University (USA)
- 11 Damage Detection and Prediction
Jerome P. Lynch, University of Michigan (USA)
Goutham R. Kirikera, Northwestern University (USA)
- 12 Biological and Medical Applications I
George Zentai, Varian Medical Systems, Inc. (USA)
Masoud Ghandehari, Polytechnic University (USA)
- 13 Biological and Medical Applications II
Wei-Chih Wang, University of Washington (USA) and Southern Taiwan
University of Technology (Taiwan)
Olivier Giraud, ONERA (France)
- 14 Guided Waves and Vibration Based Techniques for SHM
Sauvik Banerjee, Saint Louis University (USA)
Hoon Sohn, Carnegie Mellon University (USA)

Introduction

In the year 2001 the SPIE conference on Health Monitoring of Structural and Biological Systems (SPIE Vol. 4335) brought engineers, materials scientists, medical doctors, and biologists together to exchange their ideas on this important issue. After having a positive experience at that conference, yearly conferences were organized on the same topic (SPIE Vol. 4702 (2002), SPIE Vol. 5047 (2003), SPIE Vol. 5394 (2004), SPIE Vol. 5768 (2005), and SPIE Vol. 6177 (2006)) and the next one has been planned for the year 2008. These proceedings, SPIE Vol. 6532, contain papers presented at the 2007 conference.

The emphasis of this conference is to recognize that nondestructive evaluation is an integral part of health monitoring of both structural and biological systems. It is my hope that biological and physical science communities are learning from each other by coming to this conference and exchanging ideas. Some of the recent advances in the science and technology of health monitoring techniques that go beyond the traditional nondestructive imaging of internal defects are presented in these proceedings. New diagnosis, prognosis, and rehabilitation techniques applied to engineering structures made of metal, concrete, and composites, as well as biological systems, such as animal and human body parts are presented. The papers published here cover a wide range of technologies. It is hoped that this conference will stimulate further interactions between physical and life science communities resulting in new developments of more innovative techniques for health monitoring applications.

I am thankful to the conference cochairs, program committee members, authors, session chairs, and the SPIE staff for putting together this excellent conference.

Tribikram Kundu

