

PROCEEDINGS OF SPIE

Nondestructive Characterization and Monitoring of Advanced Materials, Aerospace, and Civil Infrastructure 2016

Tzuyang Yu
Andrew L. Gyekenyesi
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Editors

21–24 March 2016
Las Vegas, Nevada, United States

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Published by
SPIE

Volume 9804

Proceedings of SPIE 0277-786X, V. 9804

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

Nondestructive Characterization and Monitoring of Advanced Materials, Aerospace, and Civil Infrastructure 2016, edited by Tzuyang Yu, Andrew L. Gyekenyesi, Peter J. Shull, H. Felix Wu, Proc. of SPIE Vol. 9804, 980401 · © 2016 SPIE · CCC code: 0277-786X/16/\$18 · doi: 10.1117/12.2229278

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Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *Nondestructive Characterization and Monitoring of Advanced Materials, Aerospace, and Civil Infrastructure 2016*, edited by Tzu-Yang Yu, Andrew L. Gyekenyesi, Peter J. Shull, H. Felix Wu, Proceedings of SPIE Vol. 9804 (SPIE, Bellingham, WA, 2016) Six-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510600454

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

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Printed in the United States of America.

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Introduction

Aging and deterioration of infrastructure systems (e.g., energy, roads, rail, transit, aviation, dams, bridges, ports, drinking water) are a global challenge facing all countries in the world. In the U.S., the American Society of Civil Engineers (ASCE) estimated an investment of \$3.6 trillion is needed by 2020 to meet the needs of the nation's business, communities, and people (ASCE 2013 Report Card for America's Infrastructure). Recent incidents such as the drinking water problem in Flint, Michigan and increasing derailments around the nation are examples of this challenge. The pressing issue to the nation is to maintain a resilient and sustainable infrastructure system by developing efficient and effective inspection and repair techniques for various infrastructure systems. It certainly calls for innovative and advanced NDE (nondestructive evaluation) and SHM (structural health monitoring) solutions from the R&D community.

Highlighted areas in this year's conference include:

- NDE: Microwave and radar, ultrasonic, laser and optical, and thermal
- Applications: Wind turbines, aerospace structures, offshore and railroad structures, and composites
- Signal processing and data interpretation: Optimization, system identification, and soft computing, time reversal, nonlinear, and inverse problems
- Smart sensors: Low power, self-powered, remotely-powered
- Innovative sensing: Civilian sensing, image and video sensing

In this year's conference, we were pleased to have two invited talks from funding agencies to share with us the current and future funding trends in their organizations. These talks were given by Mr. Gary Carr from the U.S. Department of Transportation (DOT) Federal Railroad Administration (FRA) and Dr. H. Felix Wu from the U.S. Department of Energy (DOE) Vehicle Technologies Office (VTO). We were also honored to have two invited keynote speeches given by renowned researchers from Germany (Dr. Reinhard Ebert, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung) and Taiwan (Dr. Chih- Huang Chiang, Chaoyang University of Technology) to talk about the inspection and monitoring of wind turbines under operational and extreme conditions.

Several areas for future research include:

- NDE/SHM for energy facilities such as wind turbines and nuclear power plants
- Advanced signals processing techniques for improved resolution and damage detectability
- Low power or self-powered sensing networks using energy harvesting from the environment
- Deep subsurface sensing and imaging of reinforced structures using ultrasonic NDE and microwave NDE

On behalf of my colleagues (Andrew Gyekenyesi, Peter J. Shull, and H. Felix Wu), we thank all conference presenters for joining us in this international, annual event for the first time in Las Vegas, Nevada. As always, we welcome prospective researchers to come to the conference and share their exciting research with us!

Tzuyang Yu