11th International Workshop on Structural Health Monitoring

IWSHM 2017

"Real-Time Material State Awareness and Data-Driven Safety Assurance"

September 12 – 14, 2017
Stanford University

www.iwshm.org

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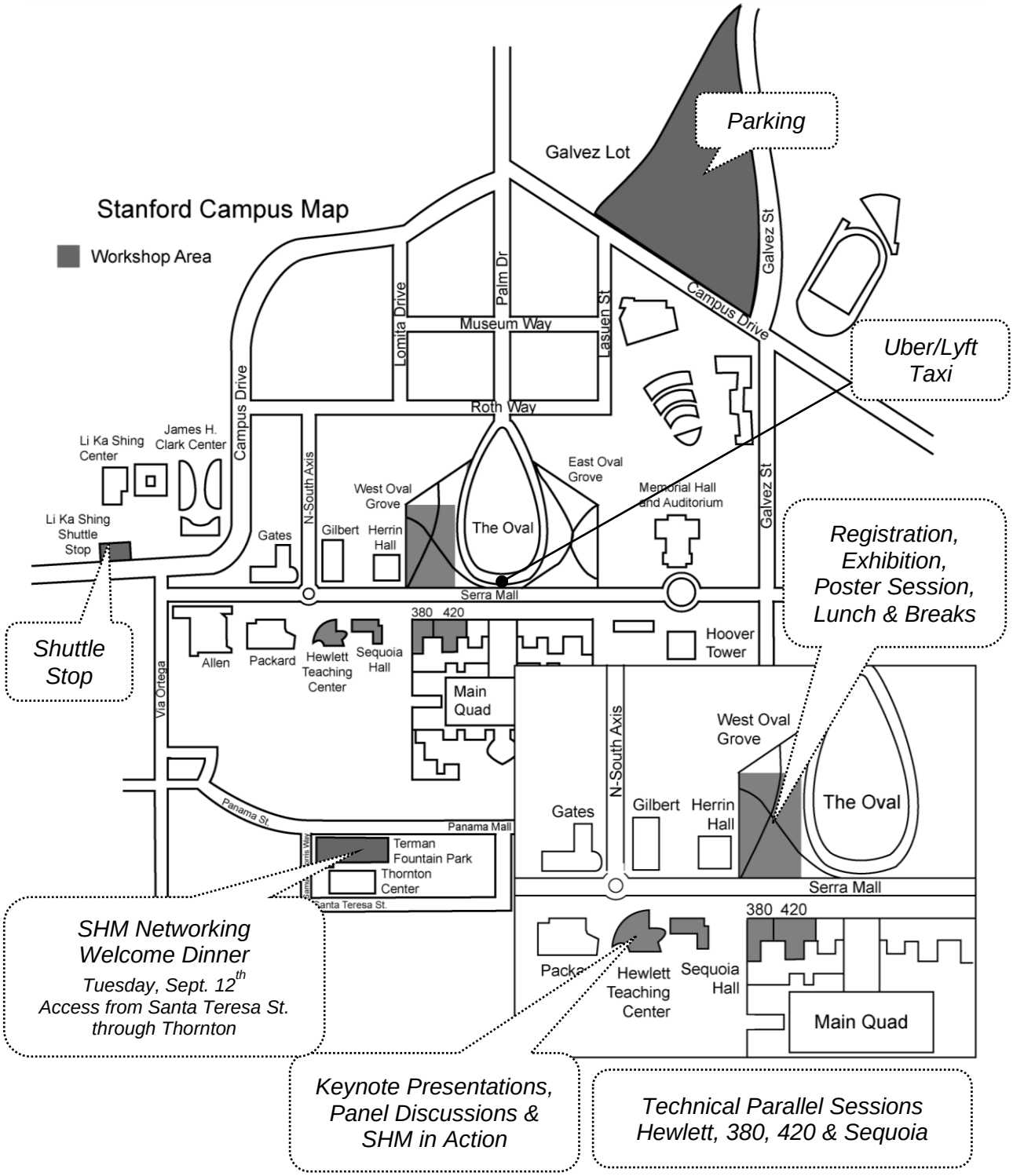

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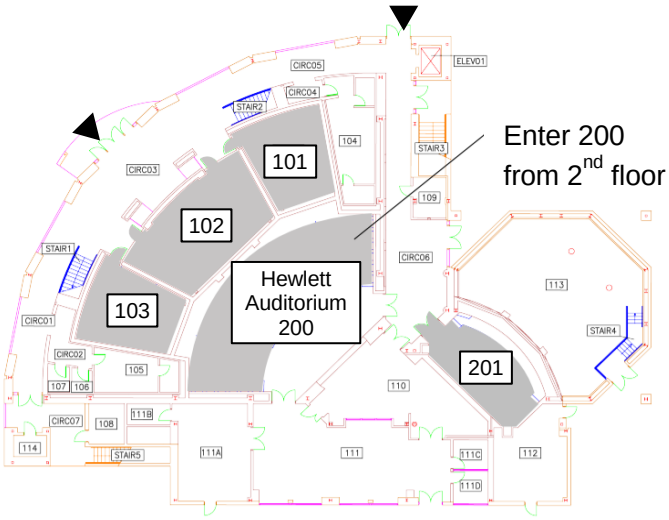

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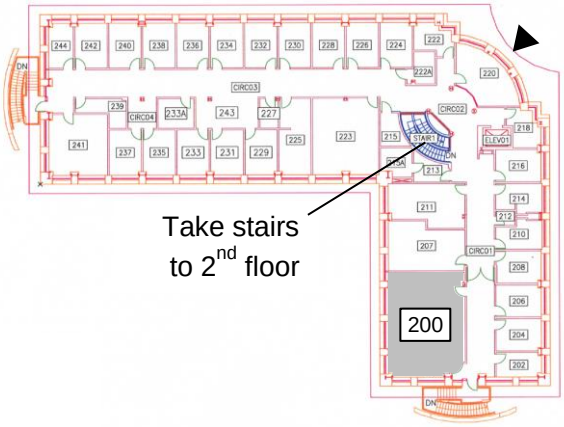

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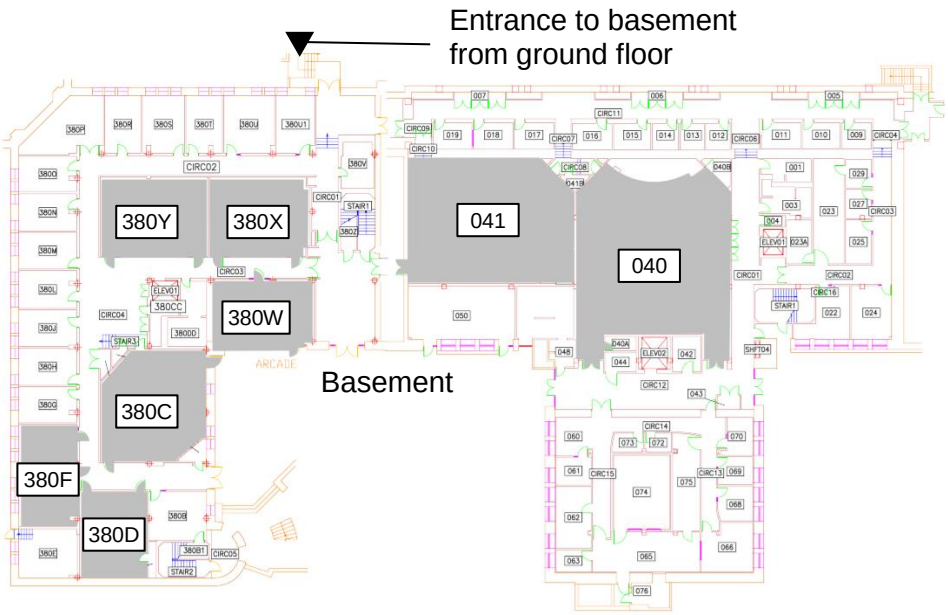

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Program At-A-Glance

The 11th International Workshop on Structural Health Monitoring - Stanford University - 2017

TECHNICAL PROGRAM

Overview

Monday, September 11		
15:00 ~ 17:00	**Early Registration**	Location: Crowne Plaza Hotel Cabana, Palo Alto
17:00 ~ 19:00	**Reception**	Location: Crowne Plaza Hotel Cabana, Palo Alto

Tuesday, September 12												
	420-040	420-041	Hewlett 101	Hewlett 102	Hewlett 103	380-380C	380-380D	380-380F	380-380W	380-380X		
07:00 ~ 08:00	**Registration**		Light Continental Breakfast						Location: The Oval			
08:00~ 08:10		**Opening Remarks**	Speaker: Prof. Charbel Farhat (Chair of Department of Aeronautics and Astronautics)				Chair: F.-K. Chang Co-chair: F. Kopsaftopoulos		Location: Hewlett Auditorium (200)			
08:10 ~ 09:40	**Keynote Presentations Dennis Roach**	08:10 ~ 08:40	Speaker: Frederica Darema, SES Director, Air Force Office of Scientific Research						Location: Hewlett Auditorium (200)			
		08:40 ~ 09:10	Speaker: John Maggiore, Managing Director, Maintenance and Leasing Solutions, Boeing Digital Aviation									
		09:10 ~ 09:40	Speaker: Ricardo Pinheiro Rulli, Smart Structures & Structural Health Monitoring, Embraer									
09:40 ~ 10:00	**Coffee Break / Exhibition**								Location: The Oval			
10:00 ~ 11:40	General Session Aerospace Structures I **Jeong-Beom Ihn & Mark Davis**	General Session Signal Processing I **Fuh-Gwo Yuan & William Meeker**	General Session SHM-based Structural Design **Kai-Uwe Schroder & Theodoros Loutas**	SPECIAL SESSION Structural Health Monitoring of High-speed and Intercity Railways I **Yi-Qing Ni & Chung-Yue Wang**	General Session Sensors and Sensor Networks I **David Ewins & Matthieu Gresil**	SPECIAL SESSION Guided Waves in Structures for SHM I **Wieslaw Ostachowicz & Roberto Semidey**	SPECIAL SESSION Distributed and Quasi-distributed Fiber-optic and Electrical Sensors, and Associated Data Analysis and Management I **Daniele Zonta**	SPECIAL SESSION Recent Advances in Ultrasonic and Acoustic Emission Techniques for SHM/NDE I **Salvatore Salamone & Aditi Chattopadhyay**	SPECIAL SESSION SHM within Harsh Extreme Environments I **Debbie G. Senesky & Haiying Huang**	SPECIAL SESSION Multifunctional Materials and Structures I **Kenneth J. Loh & Donghyeon Ryu**		
11:40 ~ 13:30	**Lunch at the Oval / Exhibition**								Location: The Oval			
11:40 ~ 13:30	**Poster Sessions: Q & A**								Location: The Oval			
13:30 ~ 15:10	General Session Aerospace Structures II **Martin Bach & Iddo Kresel**	General Session Signal Processing II **Ying Zhang & Chan Ghee Koh**	General Session Civil Structures I **Claus Peter Fritzen & Katsufumi Hashimoto**	SPECIAL SESSION Structural Health Monitoring of High-speed and Intercity Railways II **Yi-Qing Ni & Chung-Yue Wang**	General Session Sensors and Sensor Networks II **Hui Li & Frederic Cegla**	SPECIAL SESSION Guided Waves in Structures for SHM II **Wieslaw Ostachowicz & Haile Mulugeta**	SPECIAL SESSION Distributed and Quasi-distributed Fiber-optic and Electrical Sensors, and Associated Data Analysis and Management II **Daniele Zonta& Emmanuel Ramasso**	SPECIAL SESSION Recent Advances in Ultrasonic and Acoustic Emission Techniques for SHM/NDE II **Salvatore Salamone & Assunta Sorrentino**	SPECIAL SESSION SHM within Harsh Extreme Environments II **Debbie G. Senesky & Haiying Huang**	SPECIAL SESSION Multifunctional Materials and Structures II **Kenneth J. Loh & Donghyeon Ryu**		
15:10 ~ 15:30	**Coffee Break / Exhibition**								Location: The Oval			
15:30 ~ 17:00	**Panel Discussion — SHM for Next-Gen Aerospace Systems: Autonomous Systems vs Human Intervention - Establishing Trust** Erik Blasch (Air Force Office of Scientific Research), Matthias Buderath (Airbus), Mark Derriso (Air Force Research Laboratory), Iddo Kressel (Israel Aerospace Industries), Liming Salvino (Office of Naval Research)						Moderator: Daniel Inman		Location: Hewlett Auditorium (200)			
19:00 ~ 22:00	**SHM Networking Welcome Night**								Location: Terman Fountain Park			

Wednesday, September 13

	420-040	420-041	Hewlett 101	Hewlett 102	Hewlett 103	380-380C	380-380D	380-380F	380-380W	380-380X	380-380Y	Sequoia 200
08:00 ~ 09:30	**Keynote Presentations Jaret Riddick**	08:00 ~ 08:30	Speaker: Sreenivas Alampalli, Director of the Structures Evaluation Services Bureau, New York State Department of Transportation (NYSDOT)						Location: Hewlett Auditorium (200)			
		08:30 ~ 09:00	Speaker: Frederic Cegla, Senior Lecturer, Imperial College London; Jon Allin, Chief Technology Officer, Permasense Ltd.									
		09:00 ~ 09:30	Speaker: Jason Marsh, Director of Technology, NextFlex									
09:30 ~ 09:50	**Coffee Break / Exhibition**								Location: The Oval			
09:50 ~ 11:30	General Session Aerospace Structures III **Ceci Wilson & Hiroshi Mamizu**	General Session Environmental and Operational Effects **Tadeusz Uhl & Moshe Tur**	General Session Civil Structures II **Hoon Sohn & Erdal Safak**	SPECIAL SESSION Structural Health Monitoring of High-speed and Intercity Railways III **Yi-Qing Ni & Chung-Yue Wang**	SPECIAL SESSION Vision-based Studies for Structural Health Monitoring I **Mohammad Jahanshahi & Charles Farra**	SPECIAL SESSION Guided Waves in Structures for SHM III **Wieslaw Ostachowicz & Nazih Mechbal**	SPECIAL SESSION Probabilistic SHM I **Daniele Zonta & Branko Glisic**	SPECIAL SESSION Recent Advances in Ultrasonic and Acoustic Emission Techniques for SHM/NDE III **Salvatore Salamone & Vincent Le Cam**	SPECIAL SESSION Tomographic Methods for Spatial Sensing **Kenneth J. Loh & Tyler N. Tallman**	SPECIAL SESSION Multifunctional Materials and Structures III **Donghyeon Ryu & Laura Mainini**	General Session Diagnostics I **Piervincenzo Rizzo & Ioannis Georgiou**	SPECIAL SESSION Verification, Certification and Implementation of SHM Technologies for Aircraft Applications I **Matthias Buderath & Amrita Kumar**
11:30 ~ 13:00	**Lunch at the Oval / Exhibition**								Location: The Oval			
11:30 ~ 13:00	**IJSHM Board Meeting**								Location: 420-050			
12:00 ~ 13:00	**Panel Discussion — PHM Technologies and Lessons Learned, a Potpourri of Experience and Applications**						Moderator: Andrew Hess		Location: 420-040			
13:00 ~ 14:40	SPECIAL SESSION Assessment of the Value of SHM Information I **Sebastian Thöns & Maria Pina Limongelli**	SPECIAL SESSION Diagnostics and Prognostics of Composite Structures Towards a Condition-based Maintenance Framework **Dimitrios Zarouchas & Theodoros Loutas**	General Session Civil Structures III **Yang Wang & Kay Smarsly**	SPECIAL SESSION Structural Health Monitoring of High-speed and Intercity Railways IV **Yi-Qing Ni & Chung-Yue Wang**	SPECIAL SESSION Vision-based Studies for Structural Health Monitoring II **Mohammad Jahanshahi & Dryver Huston**	SPECIAL SESSION Guided Waves in Structures for SHM IV **Wieslaw Ostachowicz & Sam Huang**	SPECIAL SESSION Probabilistic SHM II **Daniele Zonta & Branko Glisic**	SPECIAL SESSION Recent Advances in Ultrasonic and Acoustic Emission Techniques for SHM/NDE IV **Salvatore Salamone & Christian Boller**	SPECIAL SESSION SHM Applications to Medical Devices and Biological Systems **Nathan Salowitz & Liming Salvino**	SPECIAL SESSION Multifunctional Materials and Structures IV **Kenneth J. Loh & Donghyeon Ryu**	General Session Diagnostics II **Cliff Lissenden & Antonios Kontsos**	SPECIAL SESSION Verification, Certification and Implementation of SHM Technologies for Aircraft Applications II **Matthias Buderath & Dy Le**
14:40 ~ 15:00	**Coffee Break / Exhibition**								Location: The Oval			
15:00 ~ 17:40	**SHM in Action**						Chair: Christian Boller Co-chair: Branko Glisic		Location: Hewlett Auditorium (200)			
19:00 ~ 22:00	**Award Banquet Dinner**								Location: Crowne Plaza Hotel, Palo Alto			

Thursday, September 14

	420-040	420-041	Hewlett 101	Hewlett 102	Hewlett 103	380-380C	380-380D	380-380F	380-380W	380-380X	380-380Y	Sequoia 200
08:30 ~ 10:00	**Keynote Presentations Holger Speckmann**	08:30 ~ 09:00	Speaker: Eric Lindgren, The Nondestructive Evaluation Technology Lead, Air Force Research Laboratory						Location: Hewlett Auditorium (200)			
		09:00 ~ 09:30	Speaker: Paul Swindell, Research Engineer, Federal Aviation Administration									
		09:30 ~ 10:00	Speaker: James Cycon, Director, Aircraft Health Management Systems, GM Impact Technologies, Sikorsky Aircraft Corporation									
10:00 ~ 10:20	**Coffee Break / Exhibition**								Location: The Oval			
10:20 ~ 12:20	SPECIAL SESSION Assessment of the Value of SHM Information II **Michael D. Todd & Sebastian Thöns**	SPECIAL SESSION Signal Processing for Health Monitoring of Structural and Biological Systems I **Ying Zhang & Jinying Zhu**	SPECIAL SESSION Acoustic Emission and Hybrid SHM **Victor Giurgiutiu & Marcias Martinez**	SPECIAL SESSION Seismic Structural Health Monitoring for Civil Structures I **Maria Pina Limongelli & Mehmet Celebi**	SPECIAL SESSION Vision-based Studies for Structural Health Monitoring III **Mohammad Jahanshahi & Yongchao Yang**	General Session System Identification and Vibration I **Matthew Carter & Chin-Hsiung Loh**	SPECIAL SESSION Distributed and Quasi-distributed Fiber-optic and Electrical Sensors, and Associated Data Analysis and Management III **Branko Glisic & Daniele Zonta**	General Session Modelling, Simulation, and Digital Twins **Li Cheng & John Sakellariou**	SPECIAL SESSION SHM Technology in Wind Turbines I **Wieslaw Ostachowicz & David Lanttanzi**	General Session Statistical Methods and Machine Learning **Matthew Smith & Shenfang Yuan**	General Session Diagnostics III **Laurent Mevel & Simon Laflamme**	SPECIAL SESSION Dynamic Data Driven Applications Systems (DDDAS) **Erik Blasch & Christine Schubert Kabban**
12:20 ~ 13:50	**Lunch Box Mini Forum: V&V/Standardization for Civil Infrastructure**						Moderators: Hui Li & Helmut Wenzel		Location: 420-040			
12:20 ~ 13:50	**Faculty / Student Panel**						Moderator: Charles Farrar		Location: Hewlett Auditorium (200)			
12:20 ~ 13:50	**Lunch at the Oval / Exhibition**								Location: The Oval			
13:50 ~ 15:30	SPECIAL SESSION Assessment of the Value of SHM Information III **Maria Pina Limongelli & Sebastian Thöns**	SPECIAL SESSION Signal Processing for Health Monitoring of Structural and Biological Systems II **Ying Zhang & Jinying Zhu**	General Session Prognostics and Health Management **Herbert Friedmann & Dirk Soffker**	SPECIAL SESSION Seismic Structural Health Monitoring for Civil Structures II **Anne Kiremidjian & Mehmet Celebi**	SPECIAL SESSION Vision-based Studies for Structural Health Monitoring IV **Mohammad Jahanshahi & Ziemowit Dworakowski**	General Session System Identification and Vibration II **Joshua Cummins & Xiaoyan Han**	SPECIAL SESSION Probabilistic SHM III **Daniele Zonta & Branko Glisic**	SPECIAL SESSION Recent Advances in Ultrasonic and Acoustic Emission Techniques for SHM/NDE V **Peter Qing & Piervincenzo Rizzo**	SPECIAL SESSION SHM Technology in Wind Turbines II **Wieslaw Ostachowicz & Elizabeth Cross**	General Session Diagnostics V **Fernando Rodrigues-Lence**	General Session Diagnostics IV **Surajit Roy & Lei Qiu**	
15:30 ~ 15:50	**Coffee Break / Exhibition**								Location: The Oval			
15:50 ~ 17:20	**Panel Discussion — SHM for Next-Gen Smart City IoT** Joshua Cummins (3M), Kara Peters (National Science Foundation), Matthew Smith (US Army Corps of Engineers), Jeffry Sundermeyer (Caterpillar, Inc, United States), Sebastian Thöns (Technical University of Denmark, Denmark)						Moderator: Anne Kiremidjian		Location: Hewlett Auditorium (200)			
17:20 ~ 17:50	**Workshop Adjourn**								Location: Hewlett Auditorium (200)			

Keynote Presentations

Hewlett Auditorium 200, Tuesday – Thursday, Sept. 12th – 14th

"AFOSR Basic Research Spotlight"

Tuesday, Sept. 12th, (8:10 – 8:40 AM)

Frederica Darema
SES Director of the Air Force Office of Scientific Research

The Air Force Office of Scientific Research (AFOSR) is the organization responsible for discovering, shaping, and championing basic science, and furthering the frontiers of scientific knowledge and technology that profoundly impacts the future Air Force (AF). In a broad sense, AFOSR, in its motto "excellence in science and transformative capabilities for the AF", accomplishes this mission by identifying the best fundamental research that and has relevance to the DoD and the AF, through funding and appropriate oversee of the research work conducted in universities, industry and government laboratories in the US and around the world, actively maintaining strong, productive alliances with such institutions to bring newly created scientific understanding and technology options from the scientific community and generate tremendous payoffs for the nation's defense. For over sixty years, the accomplishments of AFOSR, ranging across a wide spectrum of sciences and technologies, have led to the creation of revolutionary new capabilities for the Air Force and significant discoveries for the benefit of mankind. This presentation will overview programmatic activities supporting basic research enabling science and technology advances, as well as STEM education and workforce creation.

"Health Management: A Long View"

Tuesday, Sept. 12th, (8:40 – 9:10 AM)

John Maggiore
Managing Director, Maintenance and Leasing Solutions
Boeing Digital Aviation

John Maggiore leads the Maintenance and Leasing Solutions organization within Boeing Digital Aviation. Boeing Maintenance and Leasing Solutions provide a broad portfolio of information and analytics-powered capabilities to the aviation industry. These solutions are used in both daily operations and long-term planning by hundreds of airlines, lessors and MROs around the world to help customers save money, improve efficiency and minimize disruptions. His keynote address will examine the journey of aircraft health management as a discipline, and its impacts and promise.

"Advancements on the Adoption of SHM Damage Detection Technologies into Embraer Aircraft Maintenance Procedures"

Tuesday, Sept. 12th, (9:10 – 9:40 AM)

Ricardo Pinheiro Rulli
Smart Structures & Structural Health Monitoring
Embraer - São José dos Campos

Structural Health Monitoring has the potential to revolutionize aircraft maintenance. Less complex and less time-consuming procedures – when compared to current non-destructive inspection (NDI) technologies – allowed by SHM can reduce the amount of time and burden of the inspection tasks and, consequently, reduce costs. Over the years Embraer has investigated different SHM technologies, and two of them were selected for a more in-depth investigation. After demonstrating strong results on ground tests and in an Embraer-190 flight test aircraft, Comparative Vacuum Monitoring

(CVM) and Lamb Waves (LW) technologies were included in an effort to move SHM, in particular the concept of Scheduled Structural Health Monitoring (S-SHM), into routine use for aircraft maintenance procedures. Embraer teamed with the Airworthiness Assurance NDI Validation Center (AANC) at Sandia Labs and Azul Airlines in a joint effort with the Brazilian Civil Aviation Agency (ANAC) for the qualification of SHM technologies and to validate the performance of such systems in real-life operational environment. The work aimed to develop and carry out a qualification process for SHM damage detection systems, which includes laboratory tests for the assessment of detection capabilities in terms of Probability of Detection (POD) and tests with systems installed on a number of aircraft from Azul Airlines.

"Structural Health Monitoring for Bridge Safety and Management"

Wednesday, Sept. 13th, (8:00 – 8:30 AM)

Sreenivas Alampalli
Director of the Structures Evaluation Services Bureau
New York State Department of Transportation (NYSDOT)

Bridge infrastructure condition has been a hot topic of discussion due to increasing average age of bridges, many bridges nearing their design life, and lack of needed investments. This coupled with growing demands and changes in customer expectations, the role of the owner is a challenging endeavor. Structural health monitoring and nondestructive testing are being increasingly advocated to complement or replace the visual inspection of bridges and to assist in bridge management. This presentation will discuss structural health monitoring and its components, its current use in bridge management applications, and future trends.

"Ultrasonics, Corrosion and SHM – The Story of Permasense Ltd."

Wednesday, Sept. 13th, (8:30 – 9:00 AM)

Frederic Cegla
Senior Lecturer (Associate Professor)
UK Research Centre in NDE, Imperial College London

Jon Allin
Chief Technology Officer
Permasense Ltd.

The oil and gas sector produces fuels that meet more than 50% of the world's energy demand. It handles unrefined fluids that come straight from a reservoir deep in the earth's crust. The crude oil often is an unpredictable cocktail that constantly corrodes and erodes the plants that have been built to refine it.

While corrosion costs the world about 3% of GDP/annum, the oil and gas sector proportionally spends much more to guarantee integrity of its assets. Unexpected shut downs cost millions of dollars per day in lost production alone, however catastrophic failures can be even more costly. Historically, to mitigate the risk of failures, refineries carry out wall thickness surveys at regular intervals by performing manual spot check ultrasonic thickness measurements. These infrequent measurements had poor repeatability.

Our research at Imperial College London resulted in the development of the first wireless, permanently installable ultrasonic thickness gauge, delivering precise on demand measurements. The spin-off company Permasense Ltd. was formed to develop and commercialize the technology with the aim to make a complete SHM system available to industry. To date the company has supplied more than 15000 sensors to the O&G industry and more than 15 million wall thickness measurements have been made. In 2016 Permasense Ltd. was acquired by Emerson, a multi-national corporation. This talk will describe how the system works and challenges we encountered when bringing the technology from the lab to the field. Finally, we will reflect on general lessons that can be learned from the process

"Materials Star in FHE Solutions for Structural Health Monitoring"

Wednesday, Sept. 13th, (9:00 – 9:30 AM)

Jason Marsh
Director of Technology
NextFlex

Flexible Hybrid Electronics manufacturing techniques have advanced to allow for system level integration of cost effective, light-weight and scalable sensor systems that have the ability to combine multiple sensor data streams into a single MCU. NextFlex has, through efforts in its own labs as well as a series of funded projects, advanced these techniques to produce devices for market readiness, including: strain; temperature; moisture; vibration; chemical, and other sensing platforms. The speaker will identify a series of application areas still to be enabled by new manufacturing methods and what is needed to bring these products to market. He will highlight needs for data collection on manufacturing materials to be made available in a database for modelling and simulation of FHE systems, and new manufacturing developments for distributed sensor systems that provide form factor and cost advantages over previous approaches. The speaker will outline findings from several projects conducted at NextFlex related to mechanical failure modes and environmental degradation that impact interconnects and system functionality, and will provide a forward-looking view of the work NextFlex and the FHE community must do to move technology forward in devices for structural health monitoring.

"SHM Challenges for Fixed-wing Military Aviation: Thoughts on Future AFRL R&D Projects"

Thursday, Sept. 14th, (8:30 – 9:00 AM)

Eric Lindgren
The Nondestructive Evaluation Technology Lead
Air Force Research Laboratory

The US Air Force (USAF) and US Department of Defense has a long history of research and development in the exploration of on-board sensors being used for detection of damage in aircraft structures. Initial activities can be traced to the early 1980's which led to an extensive on-aircraft assessment of acoustic emission based (i.e. "passive) sensor system. In the late 1990's an effort was launched to revitalize the capability which cumulated in the "Hot Spots" program which explored the use of an ultrasonic guided wave (i.e. "active") sensor system. Each of these programs encountered challenges that have hindered the use of these technologies on fixed-wing military aircraft. This paper briefly reviews these previous efforts, present current USAF Military Standards that define Structural Health Monitoring (SHM) for fixed wing aircraft, and provide a discussion of current and future concepts for research and development to resolve these challenges and enable eventual adaptation of SHM for fixed-wing applications. This will include a summary of current initiatives within the Materials and Manufacturing Directorate of AFRL and notional thoughts on potential projects for future developments required for this capability to be applied to fixed wing military aircraft.

"FAA SHM Research Program and the Challenges in Civil Aviation"

Thursday, Sept. 14th, (9:00 – 9:30 AM)

Paul Swindell
Research Engineer
Federal Aviation Administration

The FAA's Structural Health Monitoring (SHM) research program began in 2011 and its primary focus was to determine the potential impact of introducing SHM on civil aircraft on FAA regulatory policy and guidance. The FAA funded investigators at the Sandia National Labs Airworthiness Assurance Nondestructive Inspection Validation Center (AANC) to assist the FAA in developing a research program based on the AANC's past work experience in NDI validation for the FAA. The program included a survey of the aviation industry concerning SHM

capability, a gap analysis of SHM research needs and to develop an SHM application that would clearly show the steps to possible approval. As part of the research project, a team consisting of Sandia National Labs AANC, the Boeing Corporation, Delta Air Lines, Structural Monitoring Systems, Anodyne Electronics Manufacturing Corporation were formed and selected the Comparative Vacuum Monitoring (CVM) system as the SHM test program on the B737 Center Wing Box Fitting. The team installed CVM sensors on several Delta Air Lines 737 aircraft, collected lab and flight test data sufficient to convince Boeing to approve this application and become the first successfully approved use of SHM in the civil aviation community. This presentation will discuss the challenges faced by this team and the FAA during its research program and as well as continuing hurdles still being faced for future SHM use on the civil aviation community.

"Integrated Hybrid Structural Management System (IHSMS) Program"

Thursday, Sept. 14th, (9:30 – 10:00 AM)

James Cycon
Director, Aircraft Health Management Systems
GM Impact Technologies
Sikorsky Aircraft Corporation

The Future Naval Capabilities Integrated Hybrid Structural Management System (FNC IHSMS) program developed intelligent rotor and airframe Structural Health Management (SHM) capabilities to enhance on-condition maintenance on the CH-53K Helicopter. The aircraft's existing Integrated Vehicle Health Management System (IVHMS) provides drivetrain system diagnostics and health management capabilities; FNC IHSMS integrates rotor and airframe SHM with the existing CH-53K on-board health management system and ground-based maintenance support system to reduce both maintenance and operational cost. This keynote talk provides an overview of the FNC IHSMS program, including technical efforts and the execution strategy adopted by Sikorsky and US Navy to successfully develop a TRL 6 integrated rotor and airframe SHM system for future maturation and transition to the CH-53K Helicopter.

The IHSMS team is comprised of, Office of Naval Research (ONR), NAVAIR, the CH-53K Program Office (PMA-261), Sikorsky Aircraft, large and small commercial businesses, and one university. The program began in 2012 with a rigorous systems engineering evaluation of projected CH-53K maintenance drivers to identify candidate technologies to reduce operational cost associated with rotor and airframe components and subsystems. Technologies selected for incorporation into the FNC IHSMS program included loads monitoring, impact/damage detection and environmental monitoring. Selected technologies were incorporated into full scale CH-53K components and tested to validate their ability to detect and quantify degraded conditions. Software module were also developed and integrated into both the on-board and off board components of IVHMS to demonstrate FNC IHSMS integration into the existing CH-53K health management system.

The talk concludes with a summary of key findings, as well as the path forward for technology maturation on a flight test aircraft that serves as the next step along the path to transition to the CH-53K Helicopter.

Special Events & Panel Discussions

Company & Institution Exhibition

West Oval Grove (Tuesday – Thursday, Sept. 12th – 14th, 7:30 AM – 4:00 PM)

The Company & Institution Exhibition highlights the state-of-the art Structural Health Monitoring technologies provided by leading companies and institutions working in the field. For more details, please go to page 46.

Poster Session – Q & A

West Oval Grove (Tuesday, Sept. 12th, 11:40 AM – 1:30 PM)

The Special Poster Session provides the opportunity to selected IWSHM authors to present their cutting-edge state-of-the-art work. During the Special Poster Session no other technical parallel sessions take place so that all Workshop participants can attend and interact with the authors.

Panel Discussion – SHM for Next-Gen Aerospace Systems: Autonomous Systems vs Human Intervention – Establishing Trust

Hewlett Auditorium 200 (Tuesday, Sept. 12th, 3:30 – 5:00 PM)

Moderator: Daniel Inman (University of Michigan, United States)
Panelists: Erik Blasch (Air Force Office of Scientific Research, United States)
Matthias Buderath (Airbus, Germany)
Mark Derriso (Air Force Research Laboratory, United States)
Iddo Kressel (Israel Aerospace Industries, Israel)
Liming Salvino (Office of Naval Research, United States)

How can SHM technologies support the next-gen autonomous and intelligent aerospace systems and establish trust without the need for human intervention? What should be the roadmap to address new emerging technical and societal challenges? A distinguished panel consisting of prominent researchers in the field will share their views and exchange ideas with the audience to identify the major challenges and define the roadmap towards next-gen autonomous aerospace systems.

SHM Networking Welcome Night

Terman Fountain Park (Tuesday, Sept. 12th, 7:00 – 10:00 PM)

The SHM Networking Welcome Night is the first social activity of the Workshop that traditionally takes place in the first evening. The Workshop participants have the chance to network and meet their peers while enjoying a glass of wine and tasting exquisite oriental flavors from Chef Chu's. Live music and several networking activities also take place throughout the evening.

Panel Discussion – PHM Technologies and Lessons Learned, a Potpourri of Experience and Applications

Building 420 - Room 040 (Wednesday, Sept. 13th, 12:00 – 1:00 PM)

Moderator: Andrew Hess (PHM Society, Hess PHM Group, United States)

This Special invited panel session involves panelists associated with the Prognostics and Health Management (PHM) Society discussing the recent technologies and lessons learned related to PHM experience, activities and applications.

SHM in Action

Hewlett Auditorium 200 (Wednesday, Sept. 13th, 3:00 – 5:40 PM)

Session Chairs: Christian Boller (Saarland University, Germany)
Branko Glisic (Princeton University, United States)

One of our highlighted events showcasing how Structural Health Monitoring works in practical applications. The session features demonstrations on a variety of SHM applications from many leading SHM companies and educational institutions. Participating organizations are listed in alphabetical order; a finalized schedule will be announced at the workshop. For more details, please go to page 41.

Award Banquet Dinner

Crowne Plaza Hotel, Palo Alto (Wednesday, Sept. 13th, 7:00 – 10:00 PM)

The official IWSHM Award Banquet Dinner takes place in the evening of the second day of the Workshop. The participants can enjoy a memorable dinner prepared by the Chef of the Crowne Plaza Hotel. The peak of the Banquet Dinner is the Award Ceremony organized by the IWSHM Organizing Committee.

Faculty/Student Panel

Hewlett Auditorium 200 (Thursday, Sept. 14th, 12:20 – 1:50 PM)

Moderator: Charles Farrar (Los Alamos National Laboratory, United States)

This special session, which began at the 2013 IWSHM, is designed to be an open forum where students and early-career professionals from academia, government laboratories and industry can ask questions and get advice from more senior researchers, practitioners and managers in the field of SHM. There are no formal presentations planned for this session. The discussions are intended to be driven by questions that the early career attendees ask. The participants are encouraged to ask questions on topics related to their research, education, applications of SHM and career planning. Additionally, the participants should feel free to bring up issues regarding other challenges faced by students and early-career professional. The organizer will strive to maintain a very informal and non-judgmental environment in an effort to make it easy for attendees to bring up topics of concern. A box lunch will be provided and the participants are encouraged to eat their lunch during the session.

*The panel is open for all participants of IWSHM 2017; students, early-career researchers and practitioners are particularly encouraged to attend and to actively discuss.

Lunch Box Mini Forum – V&V/Standardization for Civil Infrastructure

Building 420 - Room 040 (Thursday, Sept. 14th, 12:20 – 1:50 PM)

Moderators: Hui Li (Harbin Institute of Technology, China)
Helmut Wenzel (Wenzel Consulting Engineers GmbH, Germany)

The SHM community acknowledges the importance of codes and standards in accelerating the adoption of civil infrastructure SHM technologies. This Mini-Forum will focus on the review of existing standardization efforts and the discussion of current research trends towards SHM field deployment aiming to create a roadmap towards a globally harmonized approach to SHM code and standard development.

Panel Discussion – SHM for Next-Gen Smart City IoT

Hewlett Auditorium 200 (Thursday, Sept. 14th, 3:50 – 5:20 PM)

Moderator: Anne Kiremidjian (Stanford University, United States)
Panelists: Joshua Cummins (3M, United States)
Kara Peters (National Science Foundation, United States)
Matthew Smith (US Army Corps of Engineers, United States)
Jeffry Sundermeyer (Caterpillar, Inc, United States)
Sebastian Thöns (Technical University of Denmark, Denmark)

Where and how SHM technology development shall be focused to accommodate the Next-Gen Smart Cities requirements based on Internet of Things (IoT)? A distinguished panel consisting of prominent researchers in the field will share their views and exchange ideas with the audience in an effort to shape the SHM development trend towards the future of the Smart City vision.

Technical Program (Tuesday, September 12th)

Keynote Presentations

Chair: D. Roach (Sandia lab) **Location: Hewlett 200**

TIME	TUESDAY, SEPTEMBER 12
8:10 ~ 8:40	**AFOSR Basic Research Spotlight** Frederica Darema [Air Force Office of Scientific Research]
8:40 ~ 9:10	**Health Management: A Long View** John Maggiore [Boeing Digital Aviation]
9:10 ~ 9:40	**Advancements on the Adoption of SHM Damage Detection Technologies into Embraer Aircraft Maintenance Procedures** Ricardo Pinheiro Rulli [Embraer]

Aerospace Structures I

Chair: J.B. Ihn (Boeing) **Co-chair:** M. Davis (Sikorsky Aircraft) **Location: 420-040**

TIME	TUESDAY, SEPTEMBER 12
10:00 ~ 10:20	**The Potential for Health Monitoring in Expandable Space Modules: the Bigelow Expandable Activity Module on the ISS** N. Wells; E. Madaras [NASA, United States]
10:20 ~ 10:40	**Guided Elastic Waves in CFRP Plates with Random Material Properties** E. Zimmermann[1]; R. Lammering[1]; A. Eremin[2] [1) Helmut-Schmidt-University, Germany; 2) Kuban State University, Russia]
10:40 ~ 11:00	**Detecting Cracks in Helicopter Frame Station Structure Using Unified Change Detection** W. Wang [Defence Science and Technology, Australia]
11:00 ~ 11:20	**Optical Fiber Based Structural Integrity Monitoring of UAV Structure During Full Scale Static and Fatigue Tests** U. Ben-Simon[1]; S. Shoham[1]; R. Davidi[2]; N. Goldstein[1]; I. Kressel[1]; T. Yehoshua[2]; M. Tur[2] [1) Israel Aerospace Industries, Israel; 2) Tel-Aviv University, Israel]
11:20 ~ 11:40	**Transducer Placement Option for Ultrasonic Lamb Wave Structural Health Monitoring (SHM) on Damage Tolerant Aircraft Substructure** V. Ewald; R. Groves; R. Benedictus [Delft University of Technology, Netherlands]

Signal Processing I

Chair: F.-G. Yuan (North Carolina State University) **Co-chair:** W. Meeker (Iowa State University) **Location: 420-041**

TIME	TUESDAY, SEPTEMBER 12
10:00 ~ 10:20	**Novel Approaches for Loose Bolt Detection with and without Sensors Using Heterodyning Effect** A. Baghalian[1]; S. Tashakori[1]; V. Y. Senyurek[1]; M. Unal[2]; I. N. Tansel[1] [1) Florida International University, United States; 2) Marmara University, Turkey]
10:20 ~ 10:40	**Nuclear Power Plant PCCV Structure Monitoring Based on BOTDA and Its Data Processing Using Kalman Filter** K. Liao[1]; J. Li[2]; X. Kong[1]; X. Zhao[2] [1) Suzhou Nuclear Power Research Institute Co.,Ltd., China; 2) Dalian University of Technology,
10:40 ~ 11:00	**Eddy Current Imaging for Detecting Defects in Conductive Structures Based on Compressive Sensing Method** B. Ye; W. Deng; J. Bao; J. Wu; X. Wang; G. Huang [Kunming University of Science and Technology, China]
11:00 ~ 11:20	**A New Strategy for Damage Identification in SHM Systems by Exploring Kappa Coefficient** M. A. de Oliveira[1]; N. V. S. Araujo[2]; D. J. Inman[3]; J. Vieira Filho[4] [1) Mato Grosso Institute of Technology, Brazil; 2) Federal University of Mato Grosso, Brazil; 3) University of Michigan, USA; 4) Universidade Estadual Paulista (UNESP), Brazil]
11:20 ~ 11:40	**A Method Based on Pseudo Excitation Method to Analysis Random Dynamic Stress of Railway Vehicle System** H. Guo[1]; X. Liu[1]; W. He[1]; W. Tong[1]; Y. Zhang[2] [1) Dalian Jiao Tong University, China; 2) Dalian University of Technology, China]

SHM-based Structural Design

Chair: K.-U. Schroder (RWTH Aachen University) **Co-chair:** T. Loutas (University of Patras) **Location: Hewlett 101**

TIME	TUESDAY, SEPTEMBER 12
10:00 ~ 10:20	**Engineering Design with Digital Thread** V. Singh; K. Willcox [Massachusetts Institute of Technology, United States]
10:20 ~ 10:40	**Strain Sensors Optimal Placement for Vibration-based Structural Health Monitoring** T. Loutas; A. Bourikas [University of Patras, Greece]
10:40 ~ 11:00	**Digital Structural Health Monitoring for SHM Design** S. Mishra[1]; H. Chung[1]; H. Surendranath[2]; F.-K. Chang[3] [1) Acellent Technologies Inc., United States; 2) Dassault Systemes, United States; 3) Stanford University, United States]
11:00 ~ 11:20	**Test Event Weighting Coefficients for a Machine from Customer-Sampled D-Optimally Placed Wireless Fatigue Nodes** J. Sundermeyer [Caterpillar Inc., USA]
11:20 ~ 11:40	**BIM-based Design of Structural Health Monitoring Systems** M. Theiler; K. Dragos; K. Smarsly [Bauhaus University Weimar, Germany]

SPECIAL SESSION: Structural Health Monitoring of High-speed and Intercity Railways I

Chair: Y.-Q. Ni (The Hong Kong Polytechnic University) **Co-Chair:** C.-Y. Wang (National Central University) **Location: Hewlett 102**

TIME	TUESDAY, SEPTEMBER 12
10:00 ~ 10:20	**High-speed Non-contact Passive-only Ultrasonic Inspection of Rails from Deconvolutions of Wheel-generated Noise** X. Zhu[1]; S. Sternini[1]; M. Capriotti[1]; A. Liang[1]; S. Mariani[2]; F. Lanza di Scalea[1]; R. Wilson[3] [1) University of California, San Diego, USA; 2) N/A, Italy; 3) Federal Railroad Administration, USA]
10:20 ~ 10:40	**Research and Application of Random Vibration Fatigue Assessment System for Welded Structures in Railway Vehicle** J. Fang; W. Zhao; S. Xie; J. Wang; Y. Li; X. Li [College of traffic and transportation engineering, China]
10:40 ~ 11:00	**Structural Health Monitoring of High-speed Railways Using Ultrasonic Guided Waves** Y. Shen[1]; J. Wang[2]; Y.-Q. Ni[2] [1) Shanghai Jiao Tong University, China; 2) the Hong Kong Polytechnic University, Hong Kong]
11:00 ~ 11:20	**Design and Application of Bridge Deck Alignment Monitoring and Early-warning System for Beipan River Bridge of Shanghai-Kunming Passenger Dedicated Railway Line** G. Yang; L. Chen; X. Wang; J. Dong [China Railway Eryuan Engineering Group Co., Ltd., China]
11:20 ~ 11:40	**Operational Early Warning Analysis of High-Speed Railway Bridge Structure Based on Sliding Window Technique and Data Driven Stochastic Subspace Identification Algorithm** J. Dong; Y. Zeng; L. Chen; G. Yang [China Railway Eryuan Engineering Group Co., Ltd., China]

Sensors and Sensor Networks I

Chair: D. Ewins (Imperial College London) **Co-chair:** M. Gresil (University of Manchester) **Location: Hewlett 103**

TIME	TUESDAY, SEPTEMBER 12
10:00 ~ 10:20	**Wireless Thin Film Strain Sensing Circuit for Implantable Applications** A. Burton; J. Lynch [University of Michigan, United States]
10:20 ~ 10:40	**Optimisation of Optical Fibres for Structural Health Monitoring through Micro-braiding** O. Rufai; M. Gautam; P. Potluri; M. Gresil [University of Manchester, United Kingdom]
10:40 ~ 11:00	**Development of A Multifunctional Stretchable Sensor Network for Smart Structures** X. Chen; T. Topac; W. Smith; P. Ladpli; H. Cao; F.-K. Chang [Stanford University, United States]
11:00 ~ 11:20	**Nanocomposites Spray Quantum Resisitve Sensors (sQRS) for the Structural Health Monitoring of Composite Wind Blade** A. Lemartinel[1]; M. Castro[2]; J. C. De Lucas[1]; J.-F. Feller[2] [1) IRT Jules Verne, France; 2) University Bretagne Sud, France]
11:20 ~ 11:40	**Wireless Torque Sensing System for Rotating Machinery** V. Olariu[1]; T. S. Kalkur[2]; S. Olariu[1] [1) Albido Corp., USA; 2) University of Colorado, Colorado Springs, USA]

SPECIAL SESSION:
Guided Waves in Structures for SHM I

Chair: W. Ostachowicz (Polish Academy of Sciences) **Co-Chair:** R. Semidey (Navair Structures) **Location: 380-380C**

TIME	TUESDAY, SEPTEMBER 12
10:00 ~ 10:20	**Ground Penetrating Radar for Material Characterization in Structural Health Monitoring Applications** I. Morris; H. Abdel-Jaber; B. Glisic [Princeton University, United States]
10:20 ~ 10:40	**Interrogation of Linear/nonlinear Features of Guided Waves for Characterizing Hypervelocity Impact-induced Pitting Damage in Shielding Structures** M. Liu[1]; C. Lissenden[2]; Q. Wang[3]; Q. Zhang[4]; R. Long[4]; Z. Su[5]; F. Cui[1] [1) A*STAR, Singapore; 2) Penn State Univ., USA; 3) Nanjing Univ. of Posts and Telecommunications, China; 4) Beijing Inst. of Tech., China; 5) Hong Kong Polytechnic Univ., Hong Kong]
10:40 ~ 11:00	**Online Monitoring of Corrosion Damage Using Ultrasonic Guided Wave Tomography** J. Rao; M. Ratassepp; Z. Fan [Nanyang Technological University, Singapore]
11:00 ~ 11:20	**Compressive Sensing and Local Wavenumber Estimations for Fast Damage Imaging with Guided Waves Inspections** Y. Keshmiri Esfandabadi; A. Marzani; L. De Marchi [University of Bologna, Italy]
11:20 ~ 11:40	**Identification of Impact Damages in Aircraft Composites by Nonlinear Guided Wave Technique** W. Li[1]; Y. Cho[2]; X. Qing[1] [1) Xiamen University, China; 2) Pusan National University, South Korea]

SPECIAL SESSION:
Distributed and Quasi-distributed Fiber-optic and Electrical Sensors, and Associated Data Analysis and Management I

Chair: D. Zonta (University of Strathclyde) **Location: 380-380D**

TIME	TUESDAY, SEPTEMBER 12
10:00 ~ 10:20	**Dynamic Reconstruction of In-plane Strain Maps Using a Two-dimensional Sensing Skin** A. Downey; J. Yan; S. Laflamme; A. Chen [Iowa State University, USA]
10:20 ~ 10:40	**Damage Detection in a Vibrating Structure Using Distributed and Dynamic Fiber-optic Techniques** R. Davidi[1]; A. Motil[1]; N. Gorbatov[1]; U. Ben-Simon[2]; I. Kressel[2]; Y. Botsev[3]; M. Hahami[3]; M. Tur[1] [1) Tel-Aviv University, Israel; 2) Israel Aerospace Industries, Israel; 3) DSIT Solutions Ltd, Israel]
10:40 ~ 11:00	**Damage Detection in Composite Pipes During Mechanical Three Point Bending** N. Chandarana; C. Soutis; M. Gresil [University of Manchester, United Kingdom]
11:00 ~ 11:20	**Strain Filed Identification of an Aluminum Plate by Using Distributed Fiber-optic Sensors** H. Ogino[1]; H. Murayama[1]; F. Fujimori[1]; K. Kageyama[1]; D. Wada[2]; H. Igawa[2] [1) The University of Tokyo, Japan; 2) Japan Aerospace Exploration Agency, Japan]
11:20 ~ 11:40	**Development of the Fiber Optic Distributed Strain Sensing System and Its On-board Monitoring of Aircraft During Flight Tests** D. Wada[1]; H. Igawa[1]; M. Tamayama[1]; T. Kasai[1]; H. Arizono[1]; H. Murayama[2]; K. Shiotsubo[2] [1) Japan Aerospace Exploration Agency, Japan; 2) The University of Tokyo, Japan]

SPECIAL SESSION:
Recent Advances in Ultrasonics and Acoustic Emission Techniques for SHM/NDE I

Chair: S. Salamone (University of Texas at Austin) **Co-Chair:** A. Chattopadhyay (Arizona State University) **Location: 380-380F**

TIME	TUESDAY, SEPTEMBER 12
10:00 ~ 10:20	**A Deep Learning Approach for Single-sensor Acoustic Emission Source Localization in Plate-like Structures** A. Ebrahimkhanlou; S. Salamone [University of Texas at Austin, United States]
10:20 ~ 10:40	**A Robust-to-parameterization Clustering Fusion Approach for Monitoring Damage Onsets and Growth Using Acoustic Emission** E. Ramasso; V. Placet; X. Gabrion; L. Boubakar [FEMTO-ST, France]
10:40 ~ 11:00	**A Mechanics-informed Method for Real-time Acoustic Emission Source Classification During Fatigue Loading of Composite Structures** D. Zarouchas [Delft University of Technology, Netherlands]
11:00 ~ 11:20	**A Structural Health Monitoring Technique for the Reconstruction of Impact Forces in Aerospace Components** M. E. De Simone; F. Ciampa; M. Meo [University of Bath, UK]
11:20 ~ 11:40	**CFRP-Concrete Debonding Detection and Monitoring Using Low Cost Pizeoceramic Sensors** S. Liu[1]; J. Zhu[2]; H. Jing[1] [1) China University of Mining and Technology, China; 2) The University of Nebraska-Lincoln, United States]

SPECIAL SESSION:
SHM within Harsh Extreme Environments I

Chair: D. G. Senesky (Stanford University) **Co-Chair:** H. Huang (University of Texas) **Location: 380-380W**

TIME	TUESDAY, SEPTEMBER 12
10:00 ~ 10:20	**Experimental and Simulation Studies of Underground Wireless Sensor Networks** T.-H. Lin[1]; Y. Wu[2]; K. Soga[1]; L. Luo[1]; M. Riemer[1]; H. Huang[4]; X. Gao[3] [1) University of California, Berkeley, US; 2) Wisen Innovation Ltd, CHN; 3) Nanjing Agricultural University, CHN; 4) Tongji University, CHN]
10:20 ~ 10:40	**Temperature Resistant Fiber Bragg Gratings for Online Monitoring of Future Sodium-cooled Fast Reactors: Paving the Way to SHM Implantation into the Nuclear Industry** G. Laffont; R. Cotillard; R. Desmarchelier; S. Rougeault; N. Roussel [CEA, France]
10:40 ~ 11:00	**SHM in CMS Underground Detector at CERN Using FBG Sensors** S. Buontempo[1]; G. Breglio[2]; M. Consales[3]; A. Cusano[3]; F. Fienga[2]; A. Gaddi[4]; C. Schaefer[4]; N. Beni[4]; Z. Szillasi[5] [1) INFN Napoli - CERN Geneva, Italy; 2) Universitiy "Federico II" of Naples, Italy; 3) University of Sannio, Benevento, Italy; 4) CERN, Switzerland; 5) Institute of Nuclear Research of the Hungarian Academy of Sciences (ATOMKI), Hungary]
11:00 ~ 11:20	**Influence of Gamma Radiation on Piezoelectric Active Elements of Space Systems** M. Anderson[1]; A. Zagrai[1]; J. Daniel[2]; D. Westpfahl[1]; D. Henneke[1] [1) New Mexico Institute of Mining and Technology, USA; 2) White Sands Missile Range, USA]
11:20 ~ 11:40	**Robust Variable Input Observer for Structural Health Monitoring of Systems Experiencing Harsh Extreme Environments** J. Hong[1]; L. Cao[1]; S. Laflamme[1]; J. Dodson[2] [1) Iowa State University, USA; 2) AFRL, USA]

SPECIAL SESSION:
Multifunctional Materials and Structures I

Chair: K. J. Loh (University of California-San Diego) **Co-Chair:** D. Ryu (New Mexico Institute of Mining & Technology) **Location: 380-380X**

TIME	TUESDAY, SEPTEMBER 12
10:00 ~ 10:20	**In Situ Printing of Conductive Poly Lactic Acid (PLA) Strain Sensors Embedded into Additively Manufactured Parts** B. Rumley-Ouellette[1]; J. Wahry[2]; A. Baker[3]; J. Bernardin[2]; A. Marchi[2]; M. Todd[4] [1) UCSD &Los Alamos National Laboratory, US; 2) Los Alamos National Laboratory, US; 3) Los Alamos National Laboratory & University of Delaware, US; 4) UCSD, US]
10:20 ~ 10:40	**Displacement-Amplified Piezoelectric Heel Charger to Generate Power On-the-go** H. Liu; Y. Wang [Stony Brook University, United States]
10:40 ~ 11:00	**Mechanics and Design of Self-healing Materials to Complement SHM** N. Salowitz; A. Correa; T. Santebennur; A. Moghadam;P. Rohatgi [University of Wisconsin - Milwaukee, United States]
11:00 ~ 11:20	**Damage Diagnosis in Composite Materials Under Applied Load with Guided Waves-Based SHM** C. Rosania; F.-K. Chang [Stanford University, United States]
11:20 ~ 11:40	**Self-Sensing Health of Carbon Composite Pultrusion Strength Members** R. Sellers[1]; E. Patten[2] [1) Google, Inc., USA; 2) X, Inc., USA]

Aerospace Structures II

Chair: M. Bach (Airbus Defence and Space) **Co-Chair:** I. Kressel (Israel Aerospace Industries) **Location: 420-040**

TIME	TUESDAY, SEPTEMBER 12
13:30 ~ 13:50	**A Robust and Effective Approach Towards Accelerated Dent-mapping Using a Purpose-built 3D Optical Inspection Tool** H. Chung; P. Böttcher; E. Klaas; A. Chhabra [8tree, United States]
13:50 ~ 14:10	**Characterization of Lamb Waves Propagation Behavior in Friction Stir Welds Joints in Dissimilar Materials** F. Mohammad Ali[1]; J. Tarraf[1]; M. Samir[1]; H. Mohammad[1]; W. Jongjian[2]; A. Georges[3]; H. Ramsey[1] [1) The American University of Beirut, Lebanon; 2) University of Sydney, Australia; 3) University of Michigan Dearborn, USA]
14:10 ~ 14:30	**Evaluation of NDT by Robotic Line Scan Thermography on Composite Aircraft Parts** M. Lison[1]; P. Hendrick[2]; P. Servais[3]; Y. Dufour[4] [1) Vrije Universiteit Brussel, BEL; 2) Université Libre de Bruxelles, BEL; 3) NDTPRO sprl, BEL; 4) SONACA, BEL]
14:30 ~ 14:50	**A Damage Imaging Method Based on MUSIC Algorithm of Linear Sensor Array for Aircraft Structure** Q. Bao; S. Yuan; L. Qiu [Nanjing University of Aeronautics and Astronautics, China]
14:50 ~ 15:10	**Structural Integrity Assessment of Corroded Landing Gear Drag Beam** D. Lee; S. Yang [Republic of Korea Air Force, South Korea]

Signal Processing II

Chair: Y. Zhang (Georgia Institute of Technology) **Co-Chair:** C. G. Koh (National University of Singapore) **Location: 420-041**

TIME	TUESDAY, SEPTEMBER 12
13:30 ~ 13:50	**Glass Fibre Reinforced Composite Samples Inspected Using THz Spectroscopy** M. Mieloszyk; K. Majewska; W. Ostachowicz [Polish Academy of Sciences, Poland]
13:50 ~ 14:10	**Robust Hammering Echo Analysis for Concrete Assessment with Transfer Learning** J. Ye; T. Kobayashi; H. Tsuda; M. Murakawa [The National Institute of Advanced Industrial Science and Technology (AIST), Japan]
14:10 ~ 14:30	**Deformation Data Recovery Based on Compressed Sensing in Bridge Structural Health Monitoring** H. Cao[1]; Y. Tian[1]; J. Lei[2]; X. Tan[1]; D. Gao[3]; F. Kopsaftopoulos[3]; F.-K. Chang[3] [1) Chongqing University, China; 2) China Automotive Engineering Research Institute Co., China; 3) Stanford University, United States]
14:30 ~ 14:50	**Identifying Unstable Damage Growth in CFRP Composites under Tension** D. Tran; M. Sundaresan [North Carolina A&T State University, United States]
14:50 ~ 15:10	**Time Reversal Invariance for Nonlinear Crack Characterization** P. Blanloeuil[1]; L. R. F. Rose[1]; C. H. Wang[2] [1) RMIT University, Australia; 2) University of New South Wales, Australia]

Civil Structures I

Chair: C. P. Fritzen (Uniersity of Siegen) **Co-Chair:** K. Hashimoto (Kyoto University) **Location: Hewlett 101**

TIME	TUESDAY, SEPTEMBER 12
13:30 ~ 13:50	**A Big Data Management and Analytics Framework for Bridge Monitoring** S. Jeong[1]; R. Hou[2]; J. Lynch[2]; H. Sohn[3]; K. Law[1] [1) Stanford University, US; 2) University of Michigan, US; 3) KAIST, South Korea]
13:50 ~ 14:10	**Towards an Automated Damage Detection System for Miter Gates on Navigation Locks** B. Eick[1]; B. Spencer[1]; M. Smith[2]; Q. Alexander[2]; S. Foltz[2] [1) University of Illinois, Urbana-Champaign, US; 2) US Army Corps of
14:10 ~ 14:30	**SHM Application to USACE Large Civil Infrastructure: Development of Trunnion Friction Detection Methodology for Radial (Tainter) Gates** M. Smith; Q. Alexander [US Army Corps of Engineers, United States]
14:30 ~ 14:50	**Development of SMART Gate Decision Support Tools for Large Inland Navigation USACE Infrastructure: The Dalles Tainter Gate** Q. Alexander; M. Smith; B. Eick [US Army Corps of Engineers, United States]
14:50 ~ 15:10	**Mapping, Assessing, and Monitoring Urban Underground Infrastructure** D. Huston; T. Xia; D. Burns; D. Orfeo; Y. Zhang; C. Ou [University of Vermont, United States]

SPECIAL SESSION:
Structural Health Monitoring of High-speed and Intercity Railways II

Chair: Y.-Q. Ni (The Hong Kong Polytechnic University) **Co-Chair:** C.-Y. Wang (National Central University) **Location: Hewlett 102**

TIME	TUESDAY, SEPTEMBER 12
13:30 ~ 13:50	**Predictive Maintenance of Ground Power Supply System for Tramways - Anomaly Detection and Localization** O. Hmad[1]; T. M. H. LA[2] [1) Alstom, France; 2) Université de Technologie de Troyes, France]
13:50 ~ 14:10	**Monitoring and Analysis of Train-Track-Bridge Interaction Behavior: A Case Study of Train Puyouma Passing Through Tai'an Viaduct in Taiwan** H.-L. Wang[1]; C.-S. Chen[1]; H.-C. Tsai[2]; H. Wang[2]; R.-Z. Wang[3]; C.-Y. Wang[1] [1) National Central University, Taiwan; 2) China Engineering Consultants, INC., Taiwan; 3) National Center for Research on Earthquake Engineering, Taiwan]
14:10 ~ 14:30	**Online Monitoring of Rail Damage Based on Wigner-Ville High Order Spectrum** W. Liang[1]; J. Xiao[2]; D. Qin[2]; Huo He[1] [1) Southwest Jiaotong University Railway Development Co. Ltd., China; 2) Southwest Jiaotong University, China]
14:30 ~ 14:50	**Fiber Bragg Grating Sensing System for Detection of Laser-Induced Ultrasonics in Application to Railway** Y. Zhao[1]; Y. Zhu[2]; J. Wang[3]; S. Zhu[3]; J. Ma[1] [1) Laser Institute of Shandong Academy of Science, China; 2) Northwestern University, United States; 3) The Hong Kong Polytechnic University, Hong Kong]

Sensors and Sensor Networks II

Chair: H. Li (Harbin Institute of Technology) **Co-Chair:** F. Cegla (Imperial College London) **Location: Hewlett 103**

TIME	TUESDAY, SEPTEMBER 12
13:30 ~ 13:50	**Distributed Smart Sensing on the Fly: Dynamic Task Allocation in Wireless Sensor Networks** J. Long; O. Buyukozturk [Massachusetts Institute of Technology, United States]
13:50 ~ 14:10	**Embedded Piezoelectric Transducers in Carbon Fibre Composites for Nonlinear Ultrasonic Applications** C. Andreades; F. Ciampa [University of Bath, United Kingdom]
14:10 ~ 14:30	**Expandable Sensor Networks for Structural Health Monitoring** J. Bergman[1]; F. Li[1]; A. Kumar[1]; J. Min[2] [1) Acellent Technologies Inc., United States; 2) NASA Glenn Research Center, United States]
14:30 ~ 14:50	**Multifunctional Skin Based on Spiral Passive Electromagnetic Sensor for Efficient Structural Health Monitoring of Composite Structures** O. Iervolino; M. Meo [University of Bath, United Kingdom]
14:50 ~ 15:10	**Impact and Damage Localization with Integrated Active and Passive Sensing Using L-shaped Sensor Arrays** H. K. Jung; G. Park; H. Moon [Chonnam National University, South Korea]

SPECIAL SESSION: Guided Waves in Structures for SHM II

Chair: W. Ostachowicz (Polish Academy of Sciences) **Co-Chair:** H. Mulugeta (ARL) **Location: 380-380C**

TIME	TUESDAY, SEPTEMBER 12
13:30 ~ 13:50	**Guided Wave Mode Selection for Microstructure-Sensitive Mutual Wave Interactions** M. Hasanian; G. Choi; C. Lissenden [Penn State, USA]
13:50 ~ 14:10	**A Reference-Free Guided Wave Based Damage Localization Approach for Highly Dispersive Structures** G. Li[1]; A. Rajadas[1]; A. Chattopadhyay[1]; D. W. Huff[2] [1) Arizona State University, USA; 2) The Boeing Company, USA]
14:10 ~ 14:30	**Rail Crack Monitoring Using Fiber Optic Based Ultrasonic Guided Wave Detection Technology** J. Wang; M. Yuan; Y.-Q. Ni [The Hong Kong Polytechnic University, Hong Kong]
14:30 ~ 14:50	**Guided Wave Generation and Propagation in Piezoelectric Composite Plates for Establishing Structural Self-awareness** Y. Shen; J. Wang [Shanghai Jiao Tong University, China]
14:50 ~ 15:10	**For the Practical Use of a Lamb Wave Based SHM System** H. Soejima[1]; K. Takahashi[1]; M. Hiraki[1]; Y. Okabe[2]; N. Takeda[2]; N. Sawai[3] [1) Fuji Heavy Inustries ltd., Japan; 2) The University of Tokyo, Japan; 3) RIMCOF, Japan]

SPECIAL SESSION: Distributed and Quasi-distributed Fiber-optic and Electrical Sensors, and Associated Data Analysis and Management II

Chair: D. Zonta (University of Strathclyde) **Co-Chair:** E. Ramasso (FEMTO-ST) **Location: 380-380D**

TIME	TUESDAY, SEPTEMBER 12
13:30 ~ 13:50	**Monitoring Early-age Strain and Temperature Distributions in Full-scale Steelconcrete Composite Beams with Distributed Fiber Optic Sensors** Y. Bao; M. Hoehler; L. Choe; M. Klegseth; G. Chen [Missouri University of Scence and Technology, United States]
13:50 ~ 14:10	**Impact Damage Detection and Localization of Adhesively Bonded Fiber Reinforced Structures Using Silver Nanoparticle Based Printed Circuits** T. Augustin; J. Karsten; B. Fiedler [Hamburg University of Technology, Germany]
14:10 ~ 14:30	**Field Study on Wireless Sensor Networks For Structural Health Monitoring Using Beamforming Communication Systems** M. Feilen[1]; C. T. Geiss[1]; N. Niklasch[1]; M. Krauss[2] [1) IABG mbH, Germany; 2) Zentrum für Telematik e.V., Germany]
14:30 ~ 14:50	**Optical Fiber for 3D Imaging of Deformations in Concrete Containers Stacked** G. Hermand; S. Bethmont; M. Landolt; S. Lesoille [ANDRA, France]
14:50 ~ 15:10	**Local and Global Approaches for Damage Detection in Composite Structures by Fiber Optic Sensors** A. Güemes[1]; A. Fernandez-Lopez[1]; P. F. Diaz-Maroto[1]; A. Lozano[1]; J. Sierra[2] [1) UPM, Spain; 2) Univ Pontificia Bolivariana, Colombia]

SPECIAL SESSION:
Recent Advances in Ultrasonics and Acoustic Emission Techniques for SHM/NDE II

Chair: S. Salamone (University of Texas at Austin) **Co-Chair:** A. Sorrentino (CIRA scpa) **Location: 380-380F**

TIME	TUESDAY, SEPTEMBER 12
13:30 ~ 13:50	**Degradation Entropy: an Acoustic Emission Based Approach to Structural Health Assessment** A. Kahirdeh; H. Yun; M. Modarres [University of Maryland, United States]
13:50 ~ 14:10	**Damage Classification in Aeronautic Structures Using Guided Waves** M. Moix Bonet[1]; B. Eckstein[2]; M. Bach[2]; P. Wierach[1]; M. Wiedemann[1] [1) German Aerospace Center, Germany; 2) Airbus Group Innovations, Germany]
14:10 ~ 14:30	**Compressive Sensing for Direct Time of Flight Estimation in Ultrasound-based NDT** R. Fuentes[1]; K. Worden[1]; I. Antoniadou[1]; C. Mineo[2]; G. Pierce[2]; E. J. Cross[1] [1) University of Sheffield, UK; 2) University of Strathclyde,
14:30 ~ 14:50	**Identifying the Effect of CFRP Application Type on Behavior of CFRP-strengthened Beams by Acoustic Emission** N. Alver[1]; S. Tayfur[1]; H. M. Tanarslan[2] [1) Ege University, Turkey; 2) Dokuz Eylul University, Turkey]
14:50 ~ 15:10	**Impact Induced Delamination Detection by Application of Full Wavefield Analysis** W. Ostachowicz; M. Radzienski; P. Kudela [Polish Academy of Sciences, Poland]

SPECIAL SESSION:
SHM within Harsh Extreme Environments II

Chair: D. G. Senesky (Stanford University) **Co-Chair:** H. Huang (University of Texas) **Location: 380-380W**

TIME	TUESDAY, SEPTEMBER 12
13:30 ~ 13:50	**Simultaneous Strain and Temperature Sensing Using a Microstrip Patch Antenna** F. Mbanya Tchafa; H. Huang [University of Texas at Arlington, USA]
13:50 ~ 14:10	**Gasifier Health Monitoring Using Smart Refractory Bricks** Q. Huang; D. Bhattacharyya; R. Pillai; K. Sabolsky; E. M. Sabolsky [West Virginia University, USA]
14:10 ~ 14:30	**Challenges and Solutions in SHM for Nuclear Power Environments** G. Dib; M. Prowant; M. Good; P. Ramuhalli [Pacific Northwest National Laboratory, United States]
14:30 ~ 14:50	**Design of the Structural Health Monitoring System for the Third Bridge over the Panama Canal at the Atlantic Side** G. Cespedes [University at Buffalo, United States]
14:50 ~ 15:10	**A Multifunctional Piezo and Temperature Sensor for Process and Structural Health Monitoring of CFRP Structures Made by Resin Transfer Molding** M. Scheerer[1]; Z. Simon[1]; M. Marischler[1]; B. Rittenschober[2] [1) Aerospace & Advanced Composites GmbH, Austria; 2) ALPEX Technologies GmbH, Austria]

SPECIAL SESSION:
Multifunctional Materials and Structures II

Chair: K. J. Loh (University of California-San Diego) **Co-Chair:** D. Ryu (New Mexico Institute of Mining & Technology) **Location: 380-380X**

TIME	TUESDAY, SEPTEMBER 12
13:30 ~ 13:50	**Incorporation of Nanoparticles and Quantum Dots for Enhanced Additive Manufacturing and 3D Printing Applications of Novel 'Smart' Materials** C. Brubaker; T. Frecker; I. Njoroge; K. Jennings; S. Rosenthal; D. Adams [Vanderbilt University, USA]
13:50 ~ 14:10	**Nano-engineered Functional Composites with Self-sensing Capability for Ultrasonics-based Structural Health Monitoring** Y. Li; Y. Liao; Z. Su [Hong Kong Polytechnic University, Hong Kong]
14:10 ~ 14:30	**Structural Health Monitoring of Multifunctional Fibre Metal Laminates under Mode I loading** B. Bosbach; C. Ohle; B. Fiedler [Hamburg University of Technology, Germany]
14:30 ~ 14:50	**Numerical Model for Characterization of Multifunctional Energy Storage Composite Cells, Modules, and Systems** Y. Wang; P. Ladpli; F. Kopsaftopoulos; F.-K. Chang [Stanford University, United States]
14:50 ~ 15:10	**Multifunctional Mechanoluminescent Composites for Autonomous Impact Detection of Aerospace Structures** Q. Towler; D. Ryu [New Mexico Tech, United States]

Technical Program (Wednesday, September 13th)

Keynote Presentations

Chair: J. Riddick (Army Research Laboratory) **Location: Hewlett 200**

TIME	WEDNESDAY, SEPTEMBER 13
8:00 ~ 8:30	**Structural Health Monitoring for Bridge Safety and Management** Sreenivas Alampalli [New York State Department of Transportation]
8:30 ~ 9:00	**Ultrasonics, Corrosion and SHM - the Story of Permasense Ltd** Frederic Cegla [Imperial College London] & Jon Allin [Permasense Ltd]
9:00 ~ 9:30	**Materials Star in FHE Solutions for Structural Health Monitoring** Jason Marsh [NextFlex]

Aerospace Structures III

Chair: C. Wilson (Structural Integrity Associates) **Co-Chair:** H. Mamizu (Kawasaki Heavy Industries) **Location: 420-040**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**Health Monitoring of Full-Scale Aerospace Systems Using Networked Acoustic Emission Sensors** M. Haile[1]; N. Bordick[2]; J. Riddick[1] [1) US Army Research Laboratory, US; 2) U.S. Army Aviation Development Directorate, US]
10:10 ~ 10:30	**Structural Health Monitoring of Turbomachinery Using TOA Signal and Expert Software** M. Witos; M. Zieja; K. Dragan [Air Force Institute of Technology, Poland]
10:30 ~ 10:50	**Optical Fiber Sensor Based Aircraft Structure Health Monitoring System** H. Mamizu[1]; A. Kuraishi[1]; Y. Ikeda[1]; T. Wakayama[1]; N. Takeda[2]; S. Minakuchi[2]; K. Enomoto[3] [1) Kawasaki Heavy Industries, Japan; 2) University of Tokyo, Japan; 3) R&D Inst. of Metals and Composites for Future Ind., Japan]
10:50 ~ 11:10	**A Fully Integrared Health Monitoring Smart Sensor** G. Dramitinos[1]; D. Fragkopoulos[1]; C. Papadas[1]; P. Vagiannis[1]; K. Makris[1]; D. Brambran[2]; J. Feau[3] [1) Integrated Systems Development SA, Greece; 2) Airbus Group, France; 3) Airbus Operations SAS, France]
11:10 ~ 11:30	**Structural Health Monitoring of a Military Aircraft Using an Analog and Fiber Optic Sensor-based Data Acquisition System for Structural Life Management** J.-S. Ha ; C.-Y. Park; S.-Y. Kim [Agency for Defense Development, South Korea]

Environmental and Operational Effects

Chair: T. Uhl (University of Science and Technology AGH) **Co-chair:** M. Tur (Tel-Aviv University) **Location: 420-041**

TIME	WEDNESDAY, SEPTEMBER 13
Cancelled	**Principal Component Analysis and Artificial Neural Network Framework for Damage Detection Strategy under Varying Operational Loading Conditions** S. Abdul Rahim; G. Manson; K. Worden [University of Sheffield, United Kingdom]
10:10 ~ 10:30	**A Novel Heat Sink for Thermo-electric Power Harvesting of Structural Health Monitoring Systems** S. Boccardi; O. Iervolino; G. Loisi; F. Ciampa; M. Meo [University of Bath, United Kingdom]
10:30 ~ 10:50	**Thermal Effect Identification and Bridge Damage Disclosure by Using Blind Source Separation Method** Y. Zhu[1]; A. Jesus[1]; I. Laory[1]; Y. Ren[2] [1) University of Warwick, United Kingdom; 2) Southeast University, China]
10:50 ~ 11:10	**An Enhanced Guided Wave-Gaussian Mixture Model for Aircraft Structural Damage Monitoring under Varying Environmental and Operational Conditions** L. Qiu; S. Yuan; F. Fang [Nanjing University of Aeronautics and Astronautics, China]

Civil Structures II

Chair: H. Sohn (KAIST) **Co-chair:** E. Safak (Bogazici University) **Location: Hewlett 101**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**Dynamics Testing for Alkali-Silica Reaction Diagnosis in Concrete** S. Miele; S. Mahadevan; K. Neal [Vanderbilt University, United States]
10:10 ~ 10:30	**A Multiscale Multispectral Approach to Digital Image Correlation for SHM Applications** M. Mathew; A. Ellenberg; S. Escola; I. Bartoli; A. Kontsos [Drexel University, United States]
10:30 ~ 10:50	**Damage Evaluation on Steel Plate Reinforced RC Slabs with One-Side Access AE Tomography via Anchor Bolts** K. Hashimoto[1]; T. Shiotani[1]; T. Nishida[1]; H. Asaue[1]; S. Kayano[2] [1) Kyoto University, Japan; 2) Hanshin Expressway Company Limited,
10:50 ~ 11:10	**Stiffness Identification of High-rise Buildings via Subspace and Inverse-mode Methods** I. Takewaki; Y. Fujimori; K. Fujita [Kyoto University, Japan]
11:10 ~ 11:30	**Sequential Importance Sampling Algorithm in Damage Detection of a Cable Stayed Bridge** M. Azarbayejani; A. El-Osery [New Mexico Institute of Mining and Technology (NMTech), United States]

SPECIAL SESSION:
Structural Health Monitoring of High-speed and Intercity Railways III

Chair: Y.-Q. Ni (The Hong Kong Polytechnic University) ***Co-Chair:*** C.-Y. Wang (National Central University) **Location: Hewlett 102**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**A Time Series Decomposition Method for Heteroskedastic Data in Structural Health Monitoring** H. Shi; K. Worden; E. Cross [University of Sheffield, United Kingdom]
10:10 ~ 10:30	**Rail Contact Stress Real-time Monitoring Using Ultrasound Reflectometry** L. Zhou[1]; H. Brunskill[2]; R. Lewis[2] [1) The Hong Kong Polytechnic University, Hong Kong; 2) University of Sheffield, United Kingdom]
10:30 ~ 10:50	**Field Test and Dynamic Characteristics Analysis of High-Speed Maglev Guideway Girder** J. Huang; X. Deng; H. Li; L. Zhang; Z. Wu; D. Wang [Tongji University, China]
10:50 ~ 11:10	**Damage assessment of high-speed EMU train bolsters via PZT sensor network-based SHM technology** L. Ma[1]; M. Du[1]; Z. Wang[1]; H. Chung[2]; F. Li[2]; C. Cheung[2] [1) CRRC Qingdao Sifang Corp., Ltd., China; 2) Acellent Technologies Inc., US]
11:10 ~ 11:30	**Signal processing and analysis techniques used in monitoring the integrity of rail vehicle components** D. Ming[1]; P. Lin[1]; L. Ma[1]; H. Chung[2]; C. Cheung[2]; F. Li[2] [1) CRRC Qingdao Sifang Corp., Ltd., China; 2) Acellent Technologies Inc., US]

SPECIAL SESSION:
Vision-based Studies for Structural Health Monitoring I

Chair: M. Jahanshahi (Purdue University) **Co-chair:** C. Farrar (Los Alamos National Lab) **Location: Hewlett 103**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**Structural Health Monitoring from the Window Seat of a Passenger Airplane** A. Davis[1]; J. G. Chen[2]; O. Buyukozturk[2]; F. Durand[2]; D. James[1] [1) Stanford University, US; 2) Massachusetts Institute of Technology, US]
10:10 ~ 10:30	**Smaller than the Eye Can See: Selected Applications of Video-based Measurement** J. G. Chen; M. Uzun; T. Ngamsangrat; O. Buyukozturk [Massachusetts Institute of Technology, United States]
10:30 ~ 10:50	**Vision Based Displacement Sensor with Heat Haze Filtering Capability** L. Luo; M. Feng [Columbia University, United States]
10:50 ~ 11:10	**Augmented Reality Tools for Enhanced Structural Inspection** F. Moreu[1]; B. Bleck[1]; S. Vemuganti[1]; D. Rogers[2]; D. Mascarenas[2] [1) University of New Mexico, United States; 2) Los Alamos National Laboratory, United States]
11:10 ~ 11:30	**Identification of Key Geometrical Features for Automatic Structural Damage Detection from Point Clouds** R. Wood; M. E. Mohammadi [University of Nebraska-Lincoln, United States]

SPECIAL SESSION:
Guided Waves in Structures for SHM III

Chair: W. Ostachowicz (Polish Academy of Sciences) **Co-Chair:** N. Mechbal (ENSAM Paris) **Location: 380-380C**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**Damage Detection in a Composite T-joint Using Guided Lamb Waves** M. Philibert[1]; Y. Wang[1]; K. Yao[2]; C. Soutis[1]; M. Gresil[1] [1) University of Manchester, UK; 2) A*STAR (Agency for Science, Technology and Research), Singapore]
10:10 ~ 10:30	**Application of Model Assisted Probability of Detection (MAPOD) to a Guided Wave SHM System** G. Jarmer; S. Kessler [Metis Design Corporation, USA]
10:30 ~ 10:50	**Study of Guided Wave Propagation in Water Immersed Samples with Protective Coating** P. Malinowski[1]; J. Moll[2]; T. Wandowski[1]; M. Golub[3]; W. Ostachowicz[1] [1) Institute of Fluid Flow Machinery, PAN, Poland; 2) Goethe University Frankfurt, Germany; 3) Kuban State University Krasnodar, Russia]
10:50 ~ 11:10	**Spectral Finite Element Method for Studying the Wave Response on Using SH Modes in Adhesively Bonded Metallic Joints** S. Paunikar; S. Gopalakrishnan [Indian Institute of Science, India]
11:10 ~ 11:30	**A Fundamental Study on Characterization of Guided Wave Scattering from Crack under Different Loading Conditions** N.-B. Ravi; D. Roy Mahapatra [Indian Institute of Science, India]

SPECIAL SESSION:
Probabilistic SHM I

Chair: D. Zonta (University of Strathclyde) **Co-Chair:** B. Glisic (Princeton University) **Location: 380-380D**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**Resilience to Extreme Events: A Bayesian Nonparametric Approach** M. Memarzadeh[1]; M. Pozzi[2] [1) University of California Berkeley, US; 2) Carnegie Mellon University, US]
10:10 ~ 10:30	**Verification of Fatigue Path Probability Integration (FPPI) for Fatigue Management with Multiple Maintenance Options** T. Chen; M. Shiao [Army Research Laboratory, United States]
10:30 ~ 10:50	**Random Vibration Based Damage Localization and Estimation via the Functional Model Based Method (FMBM) - an Overview** S. Fassois; C. Sakaris; J. Sakellariou [University of Patras, Greece]
10:50 ~ 11:10	**On the Choice of Optimisation Scheme for Gaussian Process Hyperparameters in SHM problems** T. J. Rogers[1]; G. Manson[2]; K. Worden[1]; E.-J. Cross[2] [1) Sheffield University, UK; 2) University of Sheffield, UK]
11:10 ~ 11:30	**Non-linear Damage Classification Based on Machine Learning and Damage Indices** D. A. Tibaduiza Burgos[1]; M. A. Torres Arredondo[2]; J. Vitola Oyaga[3]; M. Anaya Vejar[4]; F. Pozo[5] [1) Univ. Nacional de Colombia, Colombia; 2) Man Diesel and Turbo, Germany; 3) Univ. Santo Tomás, Colombia; 4) Fundación Univ. Los Libertadores, Colombia; 5) Univ. Politecnica de Catalunya, Spain]

SPECIAL SESSION:
Recent Advances in Ultrasonics and Acoustic Emission Techniques for SHM/NDE III

Chair: S. Salamone (University of Texas at Austin) **Co-Chair:** L.- C. Vincent (IFSTTAR) **Location: 380-380F**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**Characterization of Distributed Cracks in Concrete Using Randomly Scattered Ultrasonic Wavefield Extraction** H. Song; J. Popovics [University of Illinois at Urbana-Champaign, United States]
10:10 ~ 10:30	**Enhancing the Robustness of Nonlinear Ultrasonic Testing by Implementing 1D Phononic Crystals** A. Mostavi; M. Kabir; D. Ozevin [University of Illinois at Chicago, United States]
10:30 ~ 10:50	**Model-driven, Wavefield Baseline Subtraction for Damage Visualization using Dictionary Learning** K. S. Alguri[1]; C. C. Chia[2]; J. Harley[1] [1) University of Utah, United States; 2) Universiti Putra Malaysia (UPM), Malaysia]
10:50 ~ 11:10	**Nonlinear Ultrasonic Reciprocal Method for Damage Localization** S. Boccardi; D. Calla'; F. Ciampa; M. Meo [University of Bath, UK]
11:10 ~ 11:30	**In-situ NDE of Composite Repair Patch and Thick Panel with Substructures Using Mobile Pusle-echo Ultrasonic Propagation Imager** S.-C. Hong[1]; J.-R. Lee[1]; J.-B. Ihn[2] [1) Korea Advanced Institute of Science and Technology, South Korea; 2) The Boeing Company, US]

SPECIAL SESSION:
Tomographic Methods for Spatial Sensing

Chair: K. J. Loh (University of California-San Diego) **Co-chair:** T. N. Tallman (Purdue University) **Location: 380-380W**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**Inverse Calculation of Displacements in CNF/PU from EIT-Imaged Conductivity Changes** T. Tallman [Purdue University, USA]
10:10 ~ 10:30	**Noncontact Epoxy Curing Monitoring and Subsurface Damage Detection** S. Gupta; G. Fan; K. Loh [UC San Diego, USA]
10:30 ~ 10:50	**First Field Results of Guided Wave Tomography for Continuous Monitoring of Corrosion and Erosion Damage in Pipelines** F. Simonetti[1]; G. Instanes[2] [1) University of Cincinnati, United States; 2) ClampOn, Norway]
10:50 ~ 11:10	**Perliminary Findings on The Size Dependence of Sensing Skin Damage Detection Resolution** R. Rashetnia[1]; A. Seppänen[2]; M. Pour-Ghaz[1] [1) North Carolina State University, USA; 2) University of Eastern Finland, Finland]
11:10 ~ 11:30	**Observing the Fracture Behavior of a Center Crack via Electrical Impedance Tomography Using Inkjet-printed Carbon Nanotube Thin Films** Y. Zhao; S. Gschossmann; M. Schagerl [Johannes Kepler University Linz, Austria]

SPECIAL SESSION:
Multifunctional Materials and Structures III

Chair: D. Ryu (New Mexico Institute of Mining & Technology) **Co-Chair:** L. Mainini (UTRC) **Location: 380-380X**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**Strain Sensor Made by Thick-film Resistors on Substrates of Glass Ceramic** X. Guan; M. Wen; H. Li; J. Ou [Harbin Institute of Technology, China]
10:10 ~ 10:30	**Effect of Polymer-Based Self-Healing Agent on the Gas Permeability of Cement Mortar after Compressive Loading** T. Du; K.-Y. Yan; S.-Y. Zhao; H. Li [Harbin Institute of Technology, China]
10:30 ~ 10:50	**UAV Structure Integrated Energy Storage and Management System** P. Górny; T. Uhl [AGH University of Science and Technology, Poland]
10:50 ~ 11:10	**On the Dynamic Acquisition of Electrical Signals for Structural Health Monitoring of Carbon Nanotube Doped Composites** C. Sbarufatti[1]; X. F. Sánchez-Romate[2]; D. Scaccabarozzi[1]; S. Cinquemani[1]; F. Libonati[1]; A. Güemes[3]; A. Ureña[2] [1) Politecnico di Milano, Italy; 2) University Rey Juan Carlos, Spain; 3) Technical University of Madrid (ETSIAE), Spain]
11:10 ~ 11:30	**Sensitivity Improvement of MWCNTs/Epoxy Composite Strain Sensor** M. Y. Hwang; M.-C. Kang; L. H. Kang Chonbuk National University, South Korea]

Diagnostics I

Chair: P. Rizzo (University of Pittsburgh) **Co-chair:** I. Georgiou (National Technical University of Athens) **Location: 380-380Y**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**Model-assisted Assessment of Damage Detection and Localization Using Guided Wave-based Imaging Techniques** J. Moriot[1]; N. Quaegebeur[1]; A. Le Duff[2]; P. Masson[1] [1) Université de Sherbrooke, Canada; 2) Laboratoire d'Acoustique de l'Université du Maine, France]
10:10 ~ 10:30	**Impact Localization Using Sparse PWAS Networks and Wavelet Transform** A. Migot; V. Giurgiutiu [Unversity of South Carolina, United States]
10:30 ~ 10:50	**Signal-based versus Nonlinear Model-based Damage Sensitive Features for Delamination Quantification in CFRP Composites** M. Ghrib; M. Rébillat; N. Mechbal; L. Berthe; M. Guskov [Arts et Métiers ParisTech, France]
10:50 ~ 11:10	**Battery State of Charge Estimation Using Guided Waves - Numerical Validation and Statistical Analysis** P. Ladpli; F. Kopsaftopoulos; F.-K Chang [Stanford University, United States]
11:10 ~ 11:30	**Model-based Evaluation of Electro-mechanical Impedance Measurements for Detection and Size Identification of Face Layer Debondings in Sandwich Panels** C. Kralovec; M. Schagerl; T. Erlinger [Johannes Kepler University Linz, Austria]

SPECIAL SESSION:
Verification, Certification and Implementation of SHM Technologies for Aircraft Applications I

Chair: M. Buderath (Airbus Defence and Space) **Co-chair:** A. Kumar (Acellent Technologies) **Location: Sequoia 200**

TIME	WEDNESDAY, SEPTEMBER 13
09:50 ~ 10:10	**Reference Damages for Verification of Probability of Detection with Guided Waves** M. Bach[1]; A. Pouilly[2]; B. Eckstein[1]; M. Moix Bonet[3] [1) Airbus Defence and Space GmbH, Germany; 2) Testia GmbH, Germany; 3) DLR, Germany]
10:10 ~ 10:30	**Long Term Sensor Malfunction Detection and Data Regeneration Using Autoregressive Time Series Models** J. Reilly; B. Glisic [Princeton University, United States]
10:30 ~ 10:50	**Damage Quantification of Active-sensing Acousto-ultrasound-based SHM Based on a Multi-path Unit-cell Approach** S. Kumar Yadav[1]; F. Kopsaftopoulos[2]; F.-K Chang[3] [1) Acellent Technologies Inc, United States; 2) Stanford University, United States]
10:50 ~ 11:10	**Challenges in Meeting the Framework for SHM System Certification and Compliance** R. Ikegami[1]; A. Kumar[1]; H. Chung[1]; V. Janapati[1]; T. Singhal[1]; I. Li[1]; F.-K. Chang[2] [1) Acellent Technologies Inc., United States; 2) Stanford University, United States]
11:10 ~ 11:30	**Simulation, Realization and Validation of Guided Wave SHM System Solutions for Aircraft Metallic Structural Repairs** A. Taltavull[1]; L. Qiu[2]; R. Sridaran Venkat[1]; C. Dürager[3]; C. Boller[1]; Y. Ren[2]; S. Yuan[2] [1) Saarland University, Germany; 2) Nanjing University of Aeronautics & Astronautics (NUAA), China; 3) SR Technics, Switzerland]

SPECIAL SESSION:
Assessment of the Value of SHM Information I

Chair: S. Thöns (Technical University of Denmark) **Co-chair:** M. P. Limongelli (Politecnico di Milano) **Location: 420-040**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**On-board Decision Making Platform for Structural Health Monitoring** C. Barthes[1]; M. Rebillat[2]; K. Mosalam[1]; N. Mechbal[2] [1) UC Berkeley, USA; 2) ENSAM-CNRS-CNAM, France]
13:20 ~ 13:40	**First Steps Toward Integration of Structural Health Monitoring and Non-destructive Evaluation Data for Decision Making** S. Ye[1]; X. Lai[1]; I. Bartoli[1]; F. Moon[2]; A. E. Aktan[1]; H. Azari[3] [1) Drexel University, United States; 2) Rutgers University, United States; 3) Federal Highway Administration, United States]
13:40 ~ 14:00	**Technology Advancements Lead to New Approaches in SHM with Battery-Free Wireless Embedded RFID Strain Sensors** S. Dalgleish [Phase IV Engineering, USA]
14:00 ~ 14:20	**Reliability Monitoring for an Individual Product Based on Degradation Information Fusion** Z. Wang; A. Zhang; X. Wen; J. Li; Y. Zhang [Beihang University, China]
Cancelled	**An Introduction to the Heterogeneous SHM for a Super-large-scale Multiple-tower Suspension Bridge** H. Ding; Q. Shen; S. Du [Nanjing University, China]

SPECIAL SESSION:
Diagnostics and Prognostics of Composite Structures Towards a Condition-based Maintenance Framework

Chair: D. Zarouchas (Delft University of Technology) **Co-chair:** T. Loutas (University of Patras) **Location: 420-041**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**Ensuring the Reliability of Damage Detection in Composites by Fusion of Differently Classified Acoustic Emission Measurements** S. Rothe[1]; S. F. Wirtz[1]; G. Kampmann[2]; O. Nelles[2]; D. Söffker[1] [1) University of Duisburg-Essen, Germany; 2) University of Siegen, Germany]
13:20 ~ 13:40	**Online Remaining Useful Life Prognosis for Composite Materials Based on Acoustic Emission and Strain Data** N. Eleftheroglou1; D. Zarouchas1; T. Loutas2; R. Alderiesten1; R. Benedictus1 [1) TU Delft, Netherlands; 2) University of Patras, Greece]
13:40 ~ 14:00	**Coupling In Situ Microstructure Observation with Machine Learning Algorithms for Damage Diagnostics and Prognostics** B. Wisner; A. Kontsos [Drexel University, USA]
14:00 ~ 14:20	**Embedded Sensing of Damage in Composite Materials** A. Hall[1]; M. Haile[1]; M. Coatney[1]; J. H. Yoo[2]; N. Bradley[3] [1) U.S. Army Research Laboratory, United States; 2) Naval Surface Warfare Center, United States; 3) Vehicle Technology Directorate, United States]
14:20 ~ 14:40	**Development of Strain Measurement based On-line Impact Monitoring System for Composite Structures** Augustin M.J.; A. Datta; Sakthi Sathya P.; N. Gupta; Viswamurthy S.R.; K. Gaddikeri; R. Sundaram [National Aerospace Laboratories, India]

Civil Structures III

Chair: Y. Wang (Georgia Tech) **Co-chair:** K. Smarsly (Bauhaus University Weimar) **Location: Hewlett 101**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**Monitoring of Bridges by Optical Strands** F.-B. Cartiaux1; G. Andrikopoulos2; P. M. Pelletier1 [1) OSMOS Group SA, France; 2) OSMOS HELLAS SA, Greece]
13:20 ~ 13:40	**Guidelines for Monitoring of Structures in the Offshore Wind Industry** H. Wenzel [Wenzel Consulting Engineers GmbH, Austria]
13:40 ~ 14:00	**Forced Vibration Monitoring of Railway Bridges by Use of Multiple Long Stroke Shakers** M. Reiterer[1]; S. Lachinger[2]; J. Fink[3]; S.-Z. Bruschetini-Ambro[4] [1) REVOTEC zt gmbh, Austria; 2) Austrian Institute of Technology, Austria; 3) Vienna University of Technology, Austria; 4) Austrian Federal Railways, Austria]
14:00 ~ 14:20	**An On-site Evaluation Method for Corrosion Degradation of In-service Cable Wires by Image Histogram Matching** Y. Xu; S. Li; H. Li; C. Gu; X. Li; X. Chen; W. Qiao [Harbin Institiute of Technology, China]
14:20 ~ 14:40	**Experimental Study on the In-situ Stress Measurement of Reinforced Concrete Structure by the Ring-Hole Method with FBG Sensor** N. Deng[1]; J. Liu[2]; Y. Luo[3]; B. Wu[1] [1) Guangxi University, China; 2) Guangxi University of Science and Technology, China; 3) Guangxi Transportation Research Institute Co., Ltd, China]

SPECIAL SESSION:
Structural Health Monitoring of High-speed and Intercity Railways IV

Chair: Y.-Q. Ni (The Hong Kong Polytechnic University) **Co-Chair:** C.-Y. Wang (National Central University) **Location: Hewlett 102**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**A Probabilistic Approach for Fault Detection of Railway Suspensions** H. Jung; T. Münker; G. Kampmann; O. Nelles; C.-P. Fritzen [University of Siegen, Germany]
13:20 ~ 13:40	**Detection of Performance Deterioration of High-speed Train Wheels Based on Bayesian Dynamic Model** Y. W. Wang; Y. Q. Ni; X. Wang [The Hong Kong Polytechnic University, Hong Kong]
13:40 ~ 14:00	**A Correlation Study of Vibration and Noise Signals by Analyzing its Responses for Monitoring of High-speed Trains** S. K. Lai; Y. Q. Ni; L. H. Zhang [The Hong Kong Polytechnic University, Hong Kong, China]
14:00 ~ 14:20	**Damage Detection of Train-Track System with Extreme Function Theory** H. Tang[1]; Z. Huang[1]; C. Wan[2] [1) Tongji University, China; 2) Southeast University, China]
14:20 ~ 14:40	**Damage Diagnostic Techniques and Experimental Research of High-speed EMU Aluminum Carbody Bolster based on Lamb Waves** Z. Ju; Z. Wang; L. Ma [CRRC Qingdao Sifang Corp., Ltd., China]

SPECIAL SESSION:
Vision-based Studies for Structural Health Monitoring II

Chair: M. Jahanshahi (Purdue University) **Co-Chair:** D. Huston (University of Vermont) **Location: Hewlett 103**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**Camera-based Triggering of Bridge Structural Health Monitoring Systems Using a Cyber-Physical System Framework** R. Hou[1]; S. Jeong[2]; K. Law[2]; J. Lynch[1] [1) University of Michigan, Ann Arbor, USA; 2) Stanford University, USA]
13:20 ~ 13:40	**Corrosion Detection Using Deep Convolutional Neural Networks** D. Atha; M. Jahanshahi [Purdue University, United States]
13:40 ~ 14:00	**Long-term Structural Displacement Monitoring Using Image Sequences and Spatio-Temporal Context Learning** C.-Z. Dong; O. Celik; N. Catbas [University of Central Florida, United States]
14:00 ~ 14:20	**Computer Vision Based Inspection Approach to Predict Damage State and Load Level for RC Members** R. Davoudi; G. Miller; N. Kutz [University of Washington, United States]
14:20 ~ 14:40	**Level-of-detail Assessment of Structural Surface Damage Using Spatially Sequential Stereo Images and Deep Learning Methods** Z. Q. Chen; S. Tang [University of Missouri-Kansas City, United States]

SPECIAL SESSION:
Guided Waves in Structures for SHM IV

Chair: W. Ostachowicz (Polish Academy of Sciences) **Co-Chair:** S. Huang (ARL/NASA Ames) **Location: 380-380C**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**Simultaneous Localization and Classification of Acoustic Emission Sources in Plates Using a Guided Wave-Based Sparse Reconstruction Approach** B. Dubuc; A. Ebrahimkhanlou; S. Salamone [University of Texas at Austin, United States]
13:20 ~ 13:40	**On Performance Limits in Estimating Thickness of a Plate-Like Structure from a Full-Field Single-Tone Response Lamb Wave Measurement** N. Stull; M. Mascarenas; E. Flynn [Los Alamos National Laboratory, United States]
13:40 ~ 14:00	**Guided Wave Tomography for Corrosion Monitoring in Planar Structures** T. Druet[1]; J.-L. Tastet[1]; B. Chapuis[1]; E. Moulin[2] [1) CEA LIST, France; 2) University of Valenciennes, France]
14:00 ~ 14:20	**Low Temperatures Influence on the Lamb Waves in Aluminum Structures** T. A. Salaoru; I. Andrei [INCAS, Romania]
14:20 ~ 14:40	**Numerical and Experimental Study of First Symmetric and Antisymmetric Lamb Wave Modes Generated and Received by Dual-PZTs in a Composite Plate** E. Lizé[1]; C. Hudin[1]; M. Rébillat[2]; N. Mechbal[2]; C. Bolzmacher[1] [1) CEA, France; 2) PIMM, France]

SPECIAL SESSION:
Probabilistic SHM II

Chair: D. Zonta (University of Strathclyde) **Co-Chair:** B. Glisic (Princeton University) **Location: 380-380D**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**Big Data Analytics in Structural Diagnosis and Prognosis** G. Cai; S. Mahadevan [Vanderbilt University, United States]
13:20 ~ 13:40	**Bond Graph based Bayesian Network (BGBN) for Damage Diagnosis in Structural Health Monitoring** S. Khazaeli[1]; L. Manolache[1]; S. M. Soleimani[2] [1) Concordia University, Canada; 2) Australian College of Kuwait, Kuwait]
13:40 ~ 14:00	**Damage Classification Based on Machine Learning Applications for an Unmanned Aerial Vehicle** M. Anaya[1]; H. Cerón[2]; J. Vitola[3]; D. A. Tibaduiza Burgos[4]; F. Pozo[5] [1) Fundación Univ. los Libertadores, Colombia; 2) Univ. de Sao Paulo, Brazil; 3) Univ. Santo Tomas, Colombia; 4) Univ. Nacional de Colombia, Colombia; 5) Univ. Politecnica de Catalunya, Spain]
14:00 ~ 14:20	**Delamination Detection in Laminated Composite with Uncertainty due to Material Degradation in Damaged Region** R. K. Munian; D. Roy Mahapatra; S. Gopalakrishnan [Indian Institute of Science, India]
14:20 ~ 14:40	**Expected utility theory for monitoring-based decision support system** D. Tonelli[1]; A. Verzobio[2]; C. Cappello[1]; D. Bolognani[1]; D. Zonta[2]; O. Bursi[1]; C. Costa[3] [1) University of Trento, Italy; 2) University of Strathclyde, United Kingdom; 3) Autostrada del Brennero SpA, Italy]

SPECIAL SESSION:
Recent Advances in Ultrasonics and Acoustic Emission Techniques for SHM/NDE IV

Chair: S. Salamone (University of Texas at Austin) **Co-Chair:** C. Boller (Saarland University) **Location: 380-380F**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**Full-field Ultrasonic Data Analysis Based on Statistical Covariance Method** S. Y. Chong ; M. Todd [University of California, San Diego, US]
13:20 ~ 13:40	**Clustering-based Crack Growth Characterisation Using Synchronised Vibration and Acoustic Emission Measurements** R. Fuentes; N. Ray; T. Rogers; K. Worden; E. J. Cross [University of Sheffield, United Kingdom]
13:40 ~ 14:00	**The Influence of Periodic Arrangement of Structural Geometry to Ultrasonic Waves** M. Kabir; O. Can; D. Ozevin [University of Illinois at Chicago, United States]
14:00 ~ 14:20	**Wavelet-based Wavenumber Filtering for Damage Detection and Thickness Estimation with Laser-scanning** D. H. Kim[1]; T. Kang[2]; S. W. Han[2]; M. D. Todd[3]; G. Park[1] [1) Chonnam National University, South Korea; 2) Korea Atomic Energy Research Institute, United States; 3) University of California, San Diego, United States]
14:20 ~ 14:40	**Structural Displacement, Velocity, and Acceleration Measurement System Based on Accelerometer and GPS-RTK for Large-scale Civil Structures** K. Kim; J. Choi; G. Koo; J. Chung; H. Sohn [Korea Advanced Institute of Science & Technology, South Korea]

SPECIAL SESSION:
SHM Applications to Medical Devices and Biological Systems

Chair: N. Salowitz (University of Wisconsin - Milwaukee) **Co-Chair:** L. Salvino (Office of Naval Research) **Location: 380-380W**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**Noncontact and Noninvasive Strain Monitoring of Osseointegrated Prostheses** S. Gupta; K. Loh [UC San Diego, USA]
13:20 ~ 13:40	**Numerical simulation of vibrational methods for the healing assessment of an internally fixated femur** W. Chiu[1]; W. H. Ong[1]; M. Russ[2]; T. Tran[1]; M. Fitzgerald[3] [1) Monash University, Australia; 2) The Alfred Hospital, Australia; 3) The National Trauma Research Institute, Australia]
13:40 ~ 14:00	**Electromechanical Impedance Method to Assess the Stability of Dental Implants** P. Rizzo[1]; E. La Malfa Ribolla[2] [1) Univeristy of Pittsburgh, United States; 2) University of Palermo, Italy]
14:00 ~ 14:20	**"Smart" Applications for Monitoring Percutaneous, Osseointegrated Implants** J. Reed1; D. Barnett1; M. Todd2 [1) Elintrix Inc., United States; 2) University of California San Diego, United States]
14:20 ~ 14:40	**Guided Wave Analysis of Osseointegration at Bone-Prosthesis Interfaces** W. Wang; J. P. Lynch [University of Michigan, United States]

SPECIAL SESSION:
Multifunctional Materials and Structures IV

Chair: K. J. Loh (University of California-San Diego) **Co-Chair:** D. Ryu (New Mexico Institute of Mining & Technology) **Location: 380-380X**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**Structural Hybrid Layer for Critical Strain Detection in Composite Parts: a Multifunctional Approach** F. Rizzo; O. Iervolino; F. Pinto; M. Meo [University of Bath, United Kingdom]
13:20 ~ 13:40	**Structural Health Monitoring of Elastomeric and Structural Composites Using Mechanoluminescent Phosphors** V. B. Sundaresan; S. Krishnan [The Ohio State University, United States]
13:40 ~ 14:00	**Advances of Bio-inspired in-situ Triboluminescent Optical Fiber Sensor for Damage and Load Monitoring in Multifunctional Composite** A. Shohag[1]; T. Ndebele[1]; D. Olawale[2]; O. Okoli[1] [1) High-Performance Materials Institute, USA; 2) University of Indianapolis, USA]
14:00 ~ 14:20	**Printed Electronics for Structural Health Monitoring: Automating the Identification of Cohesive Damage Parameters** F. Heinrich; R. Lammering [Helmut Schmidt University, Germany]
14:20 ~ 14:40	**CNT Enabled Fabric Sensors for Highly Sensitive and Large-area Monitoring of Polymeric Composites** Y. Wang[1]; Y. Zhai[1]; G. Wang[2]; S. Luo[1] [1) Beihang University, China; 2) China University of Geosciences, China]

Diagnostics II

Chair: C. Lissenden (Penn State) **Co-Chair:** A. Kontsos (Drexel University) **Location: 380-380Y**

TIME	WEDNESDAY, SEPTEMBER 13
13:00 ~ 13:20	**Determining the Deformed Shape of Beams Using the Conjugate Beam Method and Strain Measurements** C. Kavanaugh; B. Glisic [Princeton University, United States]
Cancelled	**Application of Interface Waves for Damage Detection in Laminated Composite Bends** M. Jahanbin1; S. Santhanam2; J.-B. Ihn3; N. Desai4 [1) Boeing, United States; 2) Villanova, United States; 3) Boeing Research & Technology, United States; 4) Boeing Commercial Airplanes, United States]
13:40 ~ 14:00	**Baseline-Subtraction-Free (BSF) Damage-scattered Wave Extraction for Stiffened Isotropic Plates** J. He[1]; P. Leser[2]; W. Leser[2] [1) National Institute of Aerospace, USA; 2) NASA Langley Research Center, USA]
14:00 ~ 14:20	**Defect imaging on CFRP and honeycomb composite structures by guided waves generated and detected by a sparse PZT array** A. Kulakovskyi[1]; B. Chapuis[2]; O. Mesnil[2]; N.-R. Bedreddine[3]; O. D'Almeida[4]; A. Lhémery[2] [1) CEA, LIST / Safran Tech, France; 2) CEA, LIST, France; 3) Safran Nacelles, France; 4) Safran Tech, France]
14:20 ~ 14:40	**Study of Adhesive Bonds by Mechanical Tests, Ultrasounds, and Electromechanical Impedance Method** P. Malinowski[1]; K. Tserpes[2]; R. Ecault[3]; W. Ostachowicz[1] [1)Polish Academy of Sciences, Poland; 2) University of Patras, Greece; 3) Airbus Group Innovations, France]

SPECIAL SESSION: Verification, Certification and Implementation of SHM Technologies for Aircraft Applications II **Chair:** M. Buderath (Airbus Defence and Space) **Co-chair:** D. Le (Texas Tech University) **Location: Sequoia 200**	
TIME	***WEDNESDAY, SEPTEMBER 13***
13:00 ~ 13:20	**Sensitivity Analysis and Uncertainty Evaluation in the Design of Structural Health Monitoring Systems** C. Schubert Kabban[1]; B. Lin[2]; Y. Bhuiyan[2]; C. Edelmann[1]; V. Giurgiutiu[2] [1) Air Force Institute of Technology, USA; 2) University of South Carolina, USA]
13:20 ~ 13:40	**Measuring Data Driven Fleet Management Benefits through Post Implementation Assessment** M. Carter [US Army AMCOM, United States]
13:40 ~ 14:00	**Convergence of Multiple Statistical Methods for Calculating the Probability of Detection from SHM Sensor Networks** D. Roach[1]; T. Rice[1]; P. Swindell[2] [1) Sandia National Labs, United States; 2) Federal Aviation Administration, US]
14:00 ~ 14:20	**Reliability Analysis of an Ultrasonic Guided Wave Based Structural Health Monitoring System for a Carbon Fibre Reinforced Thermoplastic Torsion-Box** P. Ochôa; R. M. Groves; R. Benedictus [Delft University of Technology, Netherlands]
Cancelled	**Defect Detection Using Electro-Mechanical Impedance Sensing and Optical Fiber Bragg Gratings - a Comparison** C. Lopatin [Technion, Israel Institute of Technology, Israel]

Technical Program (Thursday, September 14th)

Keynote Presentations

Chair: H. Speckmann (Testia) **Location: Hewlett 200**

TIME	THURSDAY, SEPTEMBER 14
8:30 ~ 9:00	**SHM Challenges for Fixed-wing Military Aviation: Thoughts on Future AFRL R&D Projects** Eric Lindgren [Air Force Research Laboratory]
9:00 ~ 9:30	**FAA SHM Research Program and the Challenges in Civil Aviation** Paul Swindell [Federal Aviation Administration]
9:30 ~ 10:00	**Integrated Hybrid Structural Management System (IHSMS) Program** James Cycon [Sikorsky Aircraft Corporation]

SPECIAL SESSION: Assessment of the Value of SHM Information II

Chair: M. D. Todd (University of California San Diego) **Co-chair:** S. Thöns (Technical University of Denmark) **Location: 420-040**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Optimal Sensor Placement and Scheduling with the Value of Information** C. Malings; M. Pozzi [Carnegie Mellon University, United States]
10:40 ~ 11:00	**Airbus Roadmap and Typical Solutions** M.-A. De Smet [AIRBUS, France]
11:00 ~ 11:20	**Parametric Analysis of Value of Information for Monitoring Infrastructure Components** S. Li; M. Pozzi [Carnegie Mellon University, United States]
11:20 ~ 11:40	**Damage Detection and Deteriorating Structural Systems** L. Long[1]; S. Thöns[2]; M. Döhler[3] [1) Federal Institute for Materials Research and Testing (BAM), GER; 2) Technical University of Denmark, DEN; 3) Inria/IFSTTAR, FRA]
11:40 ~ 12:00	**Bridge Impact Detection and Classification Using Artificial Neural Networks** J. Sitton; Y. Zeinali; B. Story [Southern Methodist University, United States]
12:00 ~ 12:20	**Novel Detection and Quantification of Sensitivity of Impact-Induced Structural Dynamics: Potential Enhanced Damage Detection by Wave Chaos Information** I. Georgiou [National Technical University of Athens, Greece]

SPECIAL SESSION: Signal Processing for Health Monitoring of Structural and Biological Systems I

Chair: Y. Zhang (Georgia Institute of Technology) **Co-chair:** J. Zhu (University of Nebraska at Lincoln) **Location: 420-041**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Experimental Validation of an Improved Dynamic Displacement Estimation Method using Accelerometer and Gyroscope** Y. Liao[1]; A. Kiremidjian[1]; R. Rajagopal[1]; C.-H. Loh[2] [1) Stanford University, USA; 2) National Taiwan University, Taiwan]
10:40 ~ 11:00	**Clutter Effect on the Noncontact Seismocardiogram Signals Measured Using Microwave Radars** M. H. Shandhi; Z. Xia; O. T. Inan; Y. Zhang [Georgia Institute of Technology, United States]
11:00 ~ 11:20	**Data Fusion Application in Predicting Human Comfort** F. Alsaleem; M. Rafaie; A. Holthaus [University of Nebraska - Lincoln, United States]
11:20 ~ 11:40	**Characterizing the Effect of Applied Stress in Concrete by Magnitude-Squared Coherence of Ultrasonic Full-waveforms** A. Hafiz; T. Schumacher [Portland State University, United States]
11:40 ~ 12:00	**Investigation on Mapping Relationship Between Deflection and Cable Tension by Artificial Neural Networks** Y. Tian; H. Li [Harbin Institute of Technology, China]
12:00 ~ 12:20	**Intelligent Aperture Identification Combining Compressed Data Acquisition with Sparse Filtering-based Deep Learning Towards Natural Gas Pipeline Leak** J. Sun; Y. Qiao; J. Wen [Yanshan University, China]

SPECIAL SESSION:
Acoustic Emission and Hybrid SHM

Chair: V. Giurgiutiu (University of South Carolina) **Co-chair:** M. Martinez (Clarkson University) **Location: Hewlett 101**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Experimental and Computational Analysis of Acoustic Emission Waveforms for SHM applications** Y. Bhuiyan; V. Giurgiutiu [University of South Carolina, United States]
10:40 ~ 11:00	**Increased Lamb Wave Detection Sensitivity of Surface Bonded Fiber Bragg Gratings through Bonding Optimization** J. Wee; D. Hackney; P. Bradford; K. Peters [NCSU, United States]
11:00 ~ 11:20	**Integration of Acoustic Emission with Digital Image Correlation** A. Kontsos [Drexel University, United States]
11:20 ~ 11:40	**Source Identification and Classification of Acoustic Emission Signals by a SHAZAM-inspired Pattern Recognition Algorithm** N. Facciottoa[1]; M. Martinez[2]; E. Troiani[1] [1) University of Bologna, Italy; 2) Clarkson University, United States]
11:40 ~ 12:00	**Fiber-Optic Acoustic Emission Sensor Based on a Chirped FBG Pair for Crack Detection in Aluminum Plate** M. Han; G. Liu; L. Hu; Y. Zhu [University of Nebraska-Lincoln, United States]
12:00 ~ 12:20	**Application of Shape-based Similarity Measures to Classification of Acoustic Emission Waveforms** S. F. Wirtz; D. Söffker [University of Duisburg-Essen, Germany]

SPECIAL SESSION:
Seismic Structural Health Monitoring for Civil Structures I

Chair: M. P. Limongelli (Politecnico di Milano) **Co-chair:** M. Celebi (Earthquake Science Center) **Location: Hewlett 102**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Monitoring Hand-Washing Practices Using Structural Floor Vibrations** J. Fagert; M. Mirshekari; S. Pan; P. Zhang; H. Y. Noh [Carnegie Mellon University, United States]
10:40 ~ 11:00	**Damage Localization of a Real Structure Using the Statistical Subspace Damage Localization Method** S. Allahdadian[1]; M. Döhler[2]; C. Ventura[1]; L. Mevel[2] [1) University of British Columbia, Canada; 2) INRIA, France]
11:00 ~ 11:20	**Structural Health Monitoring of Existing Bridges in Earthquake Prone Areas: Laboratory Validation** C. Rainieri[1]; D. Gargaro[1]; G. Fabbrocino[1]; L. Di Sarno[2]; G. Maddaloni[2]; A. Prota[3]; G. Manfredi[3] [1) University of Molise, Italy; 2) University of Sannio, Italy; 3) University of Naples Federico II, Italy]
11:20 ~ 11:40	**Acceleration response data processing for Structural Health Monitoring of a High-rise Building** H. Gomez; D. Bech; B. Tremayne [Holmes Structures, United States]
11:40 ~ 12:00	**Performance of a Passively-controlled Steel Building Before and After the 2011 Great East Japan Earthquake** Y. Tong[1]; L. Xie[1]; S. Xue[2]; H. Tang[1] [1) Tongji University, China; 2) Tohoku Institute of Technology, Japan]
12:00 ~ 12:20	**Identification of Energy Loss Due to Soil-structure Interaction from the Recorded Vibrations of Buildings** E. Safak; E. Cakti [Bogazici University, Turkey]

SPECIAL SESSION:
Vision-based Studies for Structural Health Monitoring III

Chair: M. Jahanshahi (Purdue University) **Co-Chair:** Y. Yang (Los Alamos National Laboratory) **Location: Hewlett 103**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Full-field Imaging and Modeling of Structural Dynamics with Digital Video Cameras** Y. Yang[1]; C. Dorn[2]; C. Farrar[1]; D. Mascarenas[1] [1) Los Alamos National Laboratory, United States; 2) California Institute of Technology, United States]
10:40 ~ 11:00	**Automated Region-of-Interest Localization and Classification for Visual Assessment** C. M. Yeum; J. Choi; S. Dyke [Purdue University, United States]
11:00 ~ 11:20	**Vision-based Crack Detection on Metallic Surfaces Using Deep Convolutional Neural Network with Patch Clustering** F.-C. Chen; M. Jahanshahi [Purdue University, United States]
11:20 ~ 11:40	**Real-time Damage Detection of Engine Blade Using Computer Vision and Machine Learning** Y. H. Kim ; J.-R. Lee [Korea Advanced Institute of Science and Technology (KAIST), South Korea]
11:40 ~ 12:00	**Accurate Structural Dynamic Response Monitoring of Multiple Structures Using One CCD Camera and a Novel Targets Configuration** Y. Zeinali; Y. Li; D. Rajan; B. Story [Southern Methodist University, United States]
12:00 ~ 12:20	**Computer Vision System for Real-Time Monitoring of Civil Infrastructures** Y. Yang; X. Yu [Case Western Reserve University, United States]

System Identification and Vibrations I

Chair: M. Carter (US Army) **Co-chair:** C.-H. Loh (National Taiwan University) **Location: 380-380C**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Rapid Damage Assessment in Tall Buildings after Seismic Events** K. Tsuchimoto; B. F. Spencer, Jr. [University of Illinois, United States]
10:40 ~ 11:00	**A Modal-analysis-based NODIS Method for Beam-like Structure and Its Performance under Changing Boundary Conditions** T. Huang; K.-U. Schröder [RWTH Aachen University, Germany]
11:00 ~ 11:20	**Sparsity-based Reconstruction Method for Simultaneous External Force Monitoring and Structural Damage Identification** D. Ginsberg; C.-P. Fritzen [University of Siegen, Germany]
11:20 ~ 11:40	**Experimental Tests of Substructure Approaches for Health Monitoring System** L. Xie[1]; L. Luo[2]; A. Mita[1]; M. Q. Feng[2] [1) Keio University, Japan; 2) Columbia University, United States]
11:40 ~ 12:00	**Model-free Structural Hysteretic Force and Mass Identification Using Limited Acceleration Measurement** B. Xu[1]; B. Deng[2]; J. Li[1] [1) Huaqiao University, China; 2) Hunan University, China]
12:00 ~ 12:20	**Development of A Novel Osseointegrated Endoprosthesis, combining Orthopaedic and Engineering Design Principles, and Structural Health Monitoring Concepts** M. Russ[1]; W. Chiu[2]; W. Ong[2]; T. Tran[2]; M. Russ[3]; M. Fitzgerald[4] [1) The Alfred Surgeon, Australia; 2) Monash University, Australia; 3) The Alfred Hospital, Australia; 4) National Trauma Research Institute, Australia]
Cancelled	**Comparison of Three Time-domain Methods for Damage Tracking of Nonlinear Hysteretic Vibration Isolation System with Unknown Inputs** T. Mu[1]; L. Zhou[2] [1) Commercial Aircraft Corporation of China Ltd., China; 2) Nanjing University of Aeronautics and Astronautics, China]

SPECIAL SESSION: Distributed and Quasi-distributed Fiber-optic and Electrical Sensors, and Associated Data Analysis and Management III

Chair: B. Glisic (Princeton University) **Co-Chair:** D. Zonta (University of Strathclyde) **Location: 380-380D**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Strain Transfer for Optimal Performance of Sensing Sheet** M. Gerber[1]; B. Glisic[2] [1) Georgia Tech, United States; 2) Princeton University, United States]
10:40 ~ 11:00	**Validating 3D Photonic Crystals for Structural Health Monitoring** V. Piccolo[1]; A. Chiappini[2]; A. Vaccari[3]; A. Calà Lesina[4]; M. Ferrari[2]; L. Deseri[5]; D. Zonta[1] [1) University of Trento, Italy; 2) CSMFO Group IFN-CNR Trento, Italy; 3) Fondazione Bruno Kessler Trento, Italy; 4) University of Ottawa, Italy; 5) Brunel University London, UK]
Cancelled	**Monitoring Method and System for Uneven Sedimentation of Storage Tank Foundation Based on FBG** K. Ding; G. Chen; F. Tang; L. Zhang [China Special Equipment Inspection and Research Institute (CSEI), China]
11:20 ~ 11:40	**Virtual Environments for Structural Health Monitoring** R. Napolitano; A. Blyth; B. Glisic [Princeton University, United States]
11:40 ~ 12:00	**Railway Wheel Defect Identification Using the Signals Reconstructed from Impact Load Data** A. Alemi[1]; Y. Pang[1]; F. Corman[2]; G. Lodewijks[3] [1) TU Delft, Netherlands; 2) ETH Zurich, Switzerland; 3) The University of NSW,
12:00 ~ 12:20	**Associated Data Analysis and Application Based on the Stress Measurements** W. Lu; J. Teng; R. Wen; Q. Peng [Harbin Institute of Technology Shenzhen Graduate School, China]

Modelling, Simulation, and Digital Twin

Chair: L. Cheng (Hong Kong Polytechnic University) **Co-Chair:** J. Sakellariou (University of Patras) **Location: 380-380F**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**A New Ultrasonic Immersion Technique to Retrieve Anisotropic Stiffness Matrix for Dispersion Curves Algorithms** D. Barazanchy; W. Roth; V. Giurgiutiu [University of South Carolina, United States]
10:40 ~ 11:00	**Measurement and Modelling of Thermal and Mechanical Anisotropy of Parts Additively Manufactured using Fused Deposition Modeling (FDM)** A. Baker[1]; J. McCoy[2]; B. Majumdar[2]; B. Rumley-Ouellette[1]; J. Wahry; A. Marchi[1]; D. Spernjak[1]; J. Bernardin[1] [1) Los Alamos National Laboratory, US; 2) New Mexico Institute of Mining and Technology, US]
11:00 ~ 11:20	**Mathematical Modelling and Numerical Simulation of the Online Structural Health Monitoring System** B. S. Ebna Hai; M. Bause [Helmut Schmidt University - University of the Federal Armed Forces Hamburg, Germany]
11:20 ~ 11:40	**Characterizations of Fundamental SH Wave Generation Using a Fully Coupled Dynamic Model** P. Li; S. Shan; L. Cheng [The Hong Kong Polytechnic University, Hong Kong]
11:40 ~ 12:00	**Mitigation of Adhesive Nonlinearity in Nonlinear Lamb Wave based SHM Systems** S. Shan; F. Wen; L. Cheng [The Hong Kong Polytechnic University, Hong Kong]
12:00 ~ 12:20	**Analysis and Optimization of Vehicle-borne Gateway Based on Finite Element Technology** Y. Li; F. Li; H. Li [Shanghai Jiao Tong University, China]

SPECIAL SESSION:
SHM Technology in Wind Turbines I

Chair: W. Ostachowicz (Polish Academy of Sciences) **Co-Chair:** D. Lanttanzi (George Mason University) **Location: 380-380W**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Extraction of Environmental and Operational Conditions of Wind Turbines using Tower Response Data for Structural Health Monitoring** O. Bahrami[1]; S. Tsiapoki[2]; M. B. Kane[3]; J. P. Lynch[1]; R. Rolfes[2] [1) University of Michigan, US 2) Leibniz Universität Hannover, Germany; 3) Northeastern University, USA]
10:40 ~ 11:00	**Improvement of Damage Detection Performance of a SHM-framework by Using AdaBoost: Validation on an Operating Wind Turbine** S. Tsiapoki[1]; J. Lynch[2]; M. Häckell[3]; R. Rolfes[1] [1) Leibniz Universität Hanover, Germany; 2) University of Michigan, USA; 3) Wölfel Ingenieure, Germany]
11:00 ~ 11:20	**Wind Turbine Blade Damage Detection via Phase-Based Motion Estimation** A. Sarrafi; Z. Mao [University of Massachusetts Lowell, United States]
11:20 ~ 11:40	**The MISTRALWIND Project - Towards a Remaining Useful Lifetime Analysis and Holistic Asset Management Approach for More Sustainability of Wind Turbine Structures** C. T. Geiss[1]; S. Kinscherf[4]; M. Decker[4]; S. Romahn[4]; M. Botz[2]; M. Raith[2]; B. Wondra[2]; C. Grosse[2]; K. Osterminski[2]; A. Emiroglu[2]; K.-U. Bletzinger[2]; D. Obradovic[3]; U. Wever[3]; [1) IABG mbH / Tech. Univ. Munich, GER; 2) Technical Univ. Munich, GER; 3) Siemens AG, GER; 4) IABG mbH, GER]
11:40 ~ 12:00	**Detecting Damage in Grouted-Joints of Wind Turbine Support Structures - Application to a Large-Scale Experiment** M. Häckell; H. Friedmann; M. Feulner [Wölfel Engineering GmbH + Co. KG, Germany]
12:00 ~ 12:20	**SHM of a Small Wind Turbine Unit by Assessment of Its Vibration Behavior** N. Constantin; S. Sorohan [University "Politehnica" of Bucharest, Romania]

Statistical Methods and Machine Learning

Chair: M. Smith (USACE) **Co-Chair:** S. Yuan (Nanjing University of Aeronautics and Astronautics) **Location: 380-380X**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Transfer Matrices-based Output-only Statistical Damage Localization and Quantification on a Frame Structure** D. H. Bhuyan[1]; S. Allahdadian[2]; M. Doehler[1]; Y. Lecieux[3]; L. Mevel[1]; F. Schoefs[3]; C. Ventura[2] [1) Inria/IFSTTAR, France; 2) University of British Columbia, Canada; 3) University of Nantes, France]
10:40 ~ 11:00	**Reliability of Resonant Frequency Test for Strength Estimation of Concrete Using Probabilistic Methods** S. Sajid; L. Chouinard [McGill University, Canada]
11:00 ~ 11:20	**A Generalized Approach to Integrate Machine Learning, Finite Element Modeling, and Monitoring Data for Bridges** A. Santos[1]; E. Figueiredo[2]; P. Campos[2]; I. Moldovan[2]; J. C.W.A. Costa[1] [1) Universidade Federal do Pará, Brazil; 2) Universidade Lusófona de Humanidades e Tecnologias, Portugal]
11:20 ~ 11:40	**Deep Neural Controller: a Neural Network for Model-free Predictive Control and Its Application to Viscosity Control in Chemical Process** J. Park; H.-W. Suh; J. Park [Korea Advanced Institute Science and Technology, South Korea]
11:40 ~ 12:00	**Stochastic Subspace-based Damage Detection with Uncertainty in the Reference Null Space** E. Viefhues[1]; M. Döhler[2]; F. Hille[1]; L. Mevel[2] [1) Federal Institute for Materials Research and Testing, Germany; 2) Inria, France]
12:00 ~ 12:20	**Imputing Missing Strain Monitoring Data in Structural Health Monitoring** Z. Chen; Y. Bao; H. Li [Harbin Institute of Technology, China]

Diagnostics III

Chair: L. Mevel (INRIA) **Co-Chair:** S. Laflamme (Iowa State University) **Location: 380-380Y**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Reliability Assessment for NanoEngineered Fatigue Crack Sensor** S. Kessler; C. Schmidt; C. Dunn [Metis Design Corporation, USA]
10:40 ~ 11:00	**Electromechanical Impedance-based Damage Identification Enhancement Using Integrated Bistable and Adaptive Piezoelectric Circuitry** J. Kim; K.-W. Wang [University of Michigan, USA]
11:00 ~ 11:20	**Remote Mechanical Vibration Sensing: A Comparison Between CW-Doppler Radar and Laser-Doppler Vibrometer Measurements** A. Shrestha[1]; R. Kumar[1]; F. Dornuf[1]; J. Moll[1]; V. Krozer[1]; M. Schmidt[2] [1) Goethe University of Frankfurt am Main, Germany; 2) Fraunhofer LBF, Germany]
11:20 ~ 11:40	**Optimum Reduction of Electrodes Needed for Delamination Identification Using Electrical Resistance Tomography** L. W. Escalona Galvis; P. Diaz-Montiel; S. Venkataraman [San Diego State University, United States]
11:40 ~ 12:00	**Enhanced Empirical Wavelet Transform with Application to Rolling Bearings Fault Diagnosis** X. Tu; Y. Hu; F. Li [Shanghai Jiao Tong University, China]
12:00 ~ 12:20	**NDT Approaches to Optimize Acoustics Based SHM Systems for Anisotropic Composite Structures** R. Sridaran Venkat; C. Boller [Saarland University, Germany]

SPECIAL SESSION:
Dynamic Data Driven Applications Systems (DDDAS)

Chair: E. Blasch (Air Force Research Lab) **Co-chair:** C. S. Kabban (Air Force Institute of Technology) **Location: Sequoia 200**

TIME	THURSDAY, SEPTEMBER 14
10:20 ~ 10:40	**Structural Assessment and Sensor Placement Strategy for Self-aware Aerospace Vehicles** L. Mainini [MIT and UTRC, United States]
10:40 ~ 11:00	**DDDAS-based Joint Nonlinear Manifold Learning for Target Localization** E. Blasch[1]; D. Shen[2]; R. Niu[3]; J. Lu[1]; Z. Wang[1]; G. Chen[1]; P. Zulch[4]; M. Distasio[4] [1) Air Force Office of Scientific Research, US; 2) Intelligent Fusion Technology, Inc., US; 3) Virginia Commonwealth University, US; 4) Air Force Research Laboratory, US]
11:00 ~ 11:20	**Multiscale DDDAS Framework for Damage Prediction in Aerospace Composite Structures with Emphasis on Unmanned Aerial Vehicles** M. S. Pigazzini[1]; A. Korobenko[2]; Y. Bazilevs[1] [1) University of California San Diego, United States; 2) University of Calgary, Canada]
11:20 ~ 11:40	**Data-driven State Awareness for Fly-by-feel Aerial Vehicles: Experimental Assessment of a Non-parametric Probabilistic Stall Detection Approach** F. Kopsaftopoulos[1]; R. Nardari[2]; Y.-H. Li[3]; F.-K Chang[1] [1) Stanford University, United States; 2) Zenith Aerospace, United States; 3) Apple Inc., United States]
11:40 ~ 12:00	**Intelligent Flight State Identification of a Self-Sensing Wing through Neural Network Modeling** X. Chen; F. Kopsaftopoulos; H. Cao; F.-K Chang [Stanford University, United States]
12:00 ~ 12:20	**WiStealth: A Fixed Point RSSI Covert Channel Using Multi-Modality Filtering Techniques** T. Chin[1]; K. Xiong[2] [1) Grimm (SMFS, Inc.), United States; 2) University of South Florida, United States]

SPECIAL SESSION:
Assessment of the Value of SHM Information III

Chair: M. P. Limongelli (Politecnico di Milano) **Co-chair:** S. Thons (Technical University of Denmark) **Location: 420-040**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Quantifying the Benefit of SHM: What if the Manager Is Not the Owner?** D. Bolognani[1]; A. Verzobio[2]; D. Tonelli[2]; C. Cappello[2]; B. Glisic[1]; D. Zonta[3] [1) Princeton University, United States; 2) University of Trento, Italy; 3) University of Strathclyde, United Kingdom]
14:10 ~ 14:30	**Progress of the COST Action TU1402 on the Quantification of the Value of Structural Health Monitoring** S. Thöns[1]; M. P. Limongelli[2]; A. Mandić Ivanković[3]; D. Val[4]; M. Chryssanthopoulos[5]; G. Lombaert[6]; M. Döhler[7]; D. Straub[8]; E. Chatzi[9]; J. Köhler[10]; H. Wenzel[11]; J. D. Sørensen[12] [1) Technical University of Denmark, Denmark; 2) Politecnico di Milano, Milano, Italy / IFSTTAR, Paris, France, Italy; 3) University of Zagreb, Croatia; 4) Heriot-Watt University, UK; 5) University of Surrey, UK; 6) KU Leuven, Belgium; 7) IFSTTAR, France; 8) Technical University of Munich, Germany; 9) ETH Zurich, Switzerland; 10) NTNU, Norway; 11) WENZEL Consulting Engineers GmbH and University of Natural Resources and Life Sciences, Austria; 12) Aalborg University, Denmark]
14:30 ~ 14:50	**Optimized Structural Health Monitoring System Design for Aviation Structures** W. T. Little ; T. Gilbert; D. Wood; M. Platt; J. Vreuls Jr. [1) AVNIK Defense Solutions, Inc., United States; 2) U.S. Army Aviation & Missile Research Development & Engineering Center, United States]
14:50 ~ 15:10	**Wireless Sensors Synchronization : an Accurate and Deterministic GPS-based Algorithm** V. Le Cam; A. Bouche; D. Pallier [IFSTTAR, France]
15:10 ~ 15:30	**A Method to Monitor the Circular Deformation of Metro Shield Tunnels in Soft Soils** J. Zhang; M. Zhao [Tongji University, China]

SPECIAL SESSION:
Signal Processing for Health Monitoring of Structural and Biological Systems II

Chair: Y. Zhang (Georgia Institute of Technology) **Co-chair:** J. Zhu (University of Nebraska at Lincoln) **Location: 420-041**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Recursive Multi-step Prediction of Bioimplants Thermal Effect** R. Chai; Y. Zhang [Georgia Institute of Technology, United States]
14:10 ~ 14:30	**Passive Defect Detection and Imaging in Structures by Cross-correlations of Infrared Thermography Measurements** M. Capriotti; S. Sternini; F. Lanza di Scalea [University of California San Diego, USA]
14:30 ~ 14:50	**Interference and Removal of Respiration Harmonics on Noncontact Seismocardiogram Signals** Z. Xia; M. H. Shandhi; O. T. Inan; Y. Zhang [Georgia Institute of Technology, United States]
14:50 ~ 15:10	**Magnetic Flux Leakage Detection Defect of Oil Storage Tank Applying Variational Mode Decomposition** W. Liu[1]; F. Lv1; M. Li[2] [1) Northeast Petroleum University, China; 2) ShangHai DianJi University, China]
15:10 ~ 15:30	**Automated Acoustic Scanning of Concrete Bridge Decks** H. Sun[1]; S. Ham[2]; J. Zhu[1] [1) University of Nebraska-Lincoln, United States; 2) University of Texas at Arlington, United States]

Prognostics and Health Management

Chair: H. Friedmann (Wolfel Engineering GmbH) **Co-chair:** D. Soffker (University of Duisburg-Essen) **Location: Hewlett 101**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Integrated Prognostic Model for RUL Estimation Using Threshold Optimization** R. Jihin; D. Söffker; N. Beganovic [University of Duisburg-Essen, Germany]
14:10 ~ 14:30	**Battery Aging and Fuel Efficiency as Optimization Objectives as Part of a Real-time Operating System of a Multi Source HEV** B. Moulik[1]; D. Soeffker[2] [1) Amity University, Noida, India; 2) University of Duisburg-Essen, Germany]
14:30 ~ 14:50	**Multi-parameter Fibre Optic Sensing System for Remote Condition and Operation Monitoring of Gearbox Bearings in Rack and Pinion Jacking Systems** E. van Genuchten1; J. M. Alvarez De Con2; S. Van Eesbeek1 [1) SKF (NL) BV, Netherlands; 2) Smart Fibres Limited, United Kingdom]
14:50 ~ 15:10	**Study on Non-linear Regression Algorithm for Prognostic and Health Management of Aero-engine** Y. Liu; M. Yuan; S. Dong; Y. Wu [Beihang University, China]
15:10 ~ 15:30	**Adaptive Prognosis of Fatigue Damage Based on the Combination of Particle Filters and Neural Networks** C. Sbarufatti; F. Cadini; M. Giglio [Politecnico di Milano, Italy]

SPECIAL SESSION:
Seismic Structural Health Monitoring for Civil Structures II

Chair: A. Kiremidjian (Stanford University) **Co-chair:** M. Celebi (Earthquake Science Center) **Location: Hewlett 102**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Characterizing Dynamics of Pile-Supported Structures Using System and Subsystems Identification Methods** H. Soltani; K. Muraleetharan; J. Havlicek [University of Oklahoma, United States]
14:10 ~ 14:30	**Seismic Induced Damage Detection through Parallel Estimation of Force and Parameter Using Improved Interacting Particle-Kalman Filter** S. Subhamoy[1]; A. Crinière[1]; L. Mevel[1]; F. Cerou[1]; J. Dumoulin[2] [1) Inria Rennes, France; 2) IFSTTAR Bouguenais, France]
14:30 ~ 14:50	**Structural Damage Assessment via Centralized Vibration-Based Data Analysis** C.-H. Loh; J.-D. Chen; J.-H. Lin; W. Hsieh [National Taiwan University, Taiwan]
14:50 ~ 15:10	**Damage Assessment on Framed Structures through Regression Models Retrieved by Nonlinear Numerical Analyses** C. Iacovino; G. Auletta; R. Ditommaso; F. C. Ponzo [University of Basilicata, Italy]
15:10 ~ 15:30	**Dynamic Inference and Assessment of Structural Damage States Based on Naive Bayesian Classifier** P. Sun; Z. Wu; S. Wang; H. Yang; X. Liu [Northwestern Polytechnical University, China]

SPECIAL SESSION:
Vision-based Studies for Structural Health Monitoring IV

Chair: M. Jahanshahi (Purdue University) **Co-Chair:** Z. Dworakowski (AGH University of Science and Technology) **Location: Hewlett 103**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Evaluation of using Structure from Motion Optical Techniques for Structural Health Monitoring of Railroad Track** A. Sabato; C. Niezrecki [University of Massachusetts Lowell, United States]
14:10 ~ 14:30	**Integrating 3D Computer Vision and Robotic Infrastructure Inspection** A. Khaloo; D. Lattanzi [George Mason University, USA]
14:30 ~ 14:50	**Combined Laser Scanning and Image Based Monitoring of Large Infrastructure Objects** W. Lienhart; S. Kalenjuk [Graz University of Technology, Austria]
14:50 ~ 15:10	**Assessment of Pressed Panel Products Using Camera Image Processing** H. Moon; H. Jung; Y. Kong; G. Park [Chonnam National University, South Korea]

System Identification and Vibrations II

Chair: J. Cummins (Corporate Research Analytical Laboratory) **Co-chair:** X. Han (Wayne State University) **Location: 380-380C**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Effectiveness of the Random Decrement Technique in Modal Identification of Structures Using Ambient Vibration Response** A. Sabamehr[1]; A. Bagchi[1]; L. Tirca[1]; S. K. Panigrahi[2]; A. Chourasia[2] [1) Concordia University, Canada; 2) Central Building Research Institute, India]
14:10 ~ 14:30	**Performance, Reliability, and Validation of Mass Spring Systems by Means of Vibration-based Excitation Sources** E. Pistone; H. Töll; G. Achs [VCE Vienna Consulting Engineers ZT GmbH, Austria]
14:30 ~ 14:50	**Structural Vibration Analysis of Networking Equipment for the Internet of Things under Base Excitation** Y. Liu; H. Li; F. Li [Shanghai Jiao Tong University, China]
14:50 ~ 15:10	**Design and Validation of a Smartphone Based Wireless Structural Vibration Monitoring System** D. Zhang; J. Tian; H. Li [Harbin Institute of Technology, China]
15:10 ~ 15:30	**Data Fusion Based EKF-UI for Real-time Simultaneous Identification of Structural Systems and Unknown External Inputs** Y. Lei; L. Liu [Xiamen University, China]

SPECIAL SESSION:
Probabilistic SHM III

Chair: D. Zonta (University of Strathclyde) **Co-Chair:** B. Glisic (Princeton University) **Location: 380-380D**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Kernel Dependence Analysis for Structural Health Monitoring With High-dimensional, Small Size Datasets** R. Mohammadi-Ghazi; O. Büyüköztürk [Massachusetts Institute of Technology, United States]
14:10 ~ 14:30	**Bayesian Calibration and Bias Correction for Forward Model-driven SHM** P. Gardner; R. Barthorpe; C. Lord [University of Sheffield, UK]
14:30 ~ 14:50	**A Novel Two-Dimensional Distributed Temperature Sensor Based On Electrical Resistance Tomography** R. Rashetnia[1]; D. Smyl[1]; M Hallaji[1]; A. Seppänen[2]; M. Pour-Ghaz[1] [1) North Carolina State University, USA; 2) University of Eastern Finland, Finland]
14:50 ~ 15:10	**A Probabilistic Approach to Improve SHM Scheme** K. M. Simon[1]; R. Shivamurthy[1]; N. B. Ravi[1]; N. Chakraborty[1]; D. Roy Mahapatra[1]; C. Boller[2] [1) Indian Institute of Science, India; 2) University of Saarland, Germany]
15:10 ~ 15:30	**Multi-task Sparse Bayesian Learning for Model Updating in Structural Health Monitoring** Y. Huang[1]; J. Beck[2]; H. Li[1] [1) Harbin Institute of Technology, China; 2) California Institute of Technology, US]

SPECIAL SESSION:
Recent Advances in Ultrasonics and Acoustic Emission Techniques for SHM/NDE V

Chair: P. Qing (Xiaman University) **Co-Chair:** P. Rizzo (University of Pittsburgh) **Location: 380-380F**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Pushing the Limits of Ultrasonic Imaging of Solids by Wave Mode Beamforming and GPU Processing** S. Sternini[1]; A. Liang[1]; F. Lanza di Scalea[1]; R. Wilson[2] [1) University of California, San Diego, USA; 2) Federal Railroad Administration, USA]
14:10 ~ 14:30	**Recent Progress on a Multi-modal SHM System for Waveguides** A. Nasrollahi[1]; W. Deng[2]; P. Rizzo[1] [1) University of Pittsburgh, United States; 2) Northwestern Polytechnical University, China]
14:30 ~ 14:50	**Two-Year Acoustic Emission Monitoring of Natural Corrosion in Prestressed Concrete Exposed to Saltwater** W. Vélez[1]; M. ElBatanouny[2]; F. Matta[3]; P. Ziehl[3] [1) B. Thayer Associates, USA; 2) Wiss, Janney, Elstner Associates, Inc., US; 3) University of South Carolina, USA]
14:50 ~ 15:10	**Ultrasonic Guided Wave Inspection and Characterization of Integrated Circuit Packages with Delamination** J. Ikram[1]; G. Li[2]; R. Neerukatti[1]; A. Chattopadhyay[2] [1) Intel Corporation, US; 2) Arizona State University, US]
15:10 ~ 15:30	**Delta-T Acoustic Source Localisation for Plate with Holes** W. H. Ng; K. Y. Chiam; C. G. Koh [National University of Singapore, Singapore]

SPECIAL SESSION:
SHM Technology in Wind Turbines II

Chair: W. Ostachowicz (Polish Academy of Sciences) **Co-Chair:** E. Cross (University of Sheffield) **Location: 380-380W**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Monitoring of Wind Turbine Structures Using Stationary Sensors and Short-term Optical Techniques** M. Botz; M. Raith; A. Emiroglu; C. U. Grosse [Technical University of Munich, Germany]
14:10 ~ 14:30	**On the Structural Health Monitoring of Operational Wind Turbine Blades** K. Chandrasekhar[1]; N. Stevanovic[2]; M. Corbetta[2]; N. Dervilis[1]; K. Worden[1] [1) University of Sheffield, United Kingdom; 2) Siemens Wind Power A/S, Denmark]
14:30 ~ 14:50	**Field Demonstration of Radar-based SHM of Wind Turbine Blades at a 2 MW Wind Turbine: Installation, Data Acquisition and Signal Analysis** J. Moll[1]; M. Mälzer[1]; J. Simon[1]; V. Krozer[1]; M. Feulner[2]; M. Scholz[2]; H. Friedmann[2]; A. Nuber[2]; R. Salman[3]; D. Pozdniakov[3]; M. Dürr[4] [1) Goethe Univ. of Frankfurt am Main, Germany; 2) Wölfel Engineering GmbH, Germany; 3) HF Systems Engineering GmbH, Germany; 4) Volta Windkraft GmbH, Germany]
14:50 ~ 15:10	**Fatigue Usage Monitoring in Wind Turbines Using Sparse Vibration Measurements** B. LeBlanc; E. Hernandez [University of Vermont, United States]
15:10 ~ 15:30	**Fleet Monitoring and Site Specific Environmental and Operational Conditions in Wind Energy** H. Friedmann1; P. Kraemer2; S. Markus1 [1) Woelfel Engineering GmbH + Co. KG, Germany; 2) Bochum University of Applied Sciences, Germany]

Diagnostics V

Chair: F. Rodrigues-Lence (Airbus-Spain) **Location: 380-380X**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Crack Initiation and Growth Acoustic Emission Analysis with Finite Element Analysis for Structural Health Monitoring of Mooring Chains** Á. Angulo; S. Soua; J. Allwright; T.-H. Gan; C. Mares [TWI Ltd, United Kingdom]
Cancelled	**Damage Identification of Plates by Using a Continuously Scanning Laser Doppler Vibrometer System** D. Chen; Y. Xu; W. Zhu [University of Maryland Baltimore County, United States]
14:30 ~ 14:50	**Development of a Remote Acquisition and Transmission System of Strain Measurements in an Unmanned Aerial Vehicle for Damage Detection** J. Alvarez-Montoya; A. Carvajal-Castrillón; L. Betancur-Agudelo; F. O. Amaya-Fernández; J. Niño-Navia; J. Sierra-Pérez [Universidad Pontificia Bolivariana, Colombia]
14:50 ~ 15:10	**In-situ Wear Monitoring: An Experimental Investigation of Acoustic Emission during Thread Forming** S. F. Wirtz[1]; A. L. Demmerling[2]; D. Söffker[1] [1) University of Duisburg-Essen, Germany; 2) Rhenus Lub GmbH & Co KG, Germany]
15:10 ~ 15:30	**Comparison Analysis of German and Chinese Code for Deformation Measurement** C. Liu[1], Y. Yuan[1], K. Wang[2], M. Zhang[1] [1) Dalian University of Technology, China; 2) China Orient Asset Management Company, China]

Diagnostics IV

Chair: S. Roy (California State University, Long Beach) **Co-chair:** L. Qiu (Nanjing University of Aeronautics and Astronautics) **Location: 380-380Y**

TIME	THURSDAY, SEPTEMBER 14
13:50 ~ 14:10	**Transfer Impedance Approach to Damage Detection and Localization Based on RAPID Imaging Algorithm** K. Dragan; M. Dziendzikowski; A. Kurnyta [Air Force Institute of Technology, Poland]
14:10 ~ 14:30	**Use of Time-frequency Damage Sensitive Features for Structural Damage Diagnosis** S.-K. Huang[1]; Y. Liao[2]; C.-M. Chang[3]; C.-H. Loh[3]; A. Kiremidjian[2]; R. Rajagopal[2] [1) National Center for Research on Earthquake Engineering, Taiwan; 2) Stanford University, USA; 3) National Taiwan University, Taiwan]
14:30 ~ 14:50	**Bio-robotic ROV Design for Pipework Opto-sensorial Safety Inspections** T. D'agostino[1]; M. Meo[2]; M. Zarrelli[3] [1) University of Bath, United Kingdom; 2) University Bath, United Kingdom; 3) CNR – Research National Council of Italy, Italy]
14:50 ~ 15:10	**Identification of the Location and Level of Loosening in a Multi-bolt Structure Using Nonlinear Ultrasound** J. P. Malfense Fierro; M. Meo [University of Bath, United Kingdom]
15:10 ~ 15:30	**Statistical Based Features Vector for Skin-Stringer DeBonding Detection** B. Galasso; M. Ciminello; F. Pisano; A. Concilio [CIRA SCPA, Italy]

Poster Session (Thursday, September 12th)

Poster Session (Display Starts: Tuesday, Sept. 12th, 9:40; Q & A Session: Tuesday, Sept.12th, 11:40 - 13:30) Location: West Oval Lawn, the Oval	
TIME	Tuesday, SEPTEMBER 12
11:40 ~ 13:30	**A Data Mining Tool for Detecting and Predicting Abnormal Behaviour of Railway Tunnels** M. Vagnoli[1]; R. Remenyte-Prescott[1]; D. Thompson[2]; J. Andrews[1]; P. Clarke[2]; N. Atkinson[2] [1) University of Nottingham, UK; 2) AECOM Infrastructure and Environment UK Ltd., UK]
11:40 ~ 13:30	**A Categorical Approach towards Metamodeling Cyber-physical Systems** D. Legatiuk; M. Theiler; K. Dragos; K. Smarsly [Bauhaus University Weimar, Germany]
11:40 ~ 13:30	**A Method of Crack Detection Based on Convolutional Neural Networks** X. Zhao; S. Li [Dalian University of Technology, China]
11:40 ~ 13:30	**A Simplified Treed Gaussian Process Approach to the Modelling of Bridge Data for Structural Health Monitoring** T. Zhang; R. Barthorpe; K. Worden [University of Sheffield, UK]
11:40 ~ 13:30	**A Steerable-Needle Inspired Mechanism for Inspecting Extremely Confined Spaces** D. Mascarenas[1]; F. Moreu[2]; P. Cantu[3]; D. Shields[1]; J. Wadden[1]; M. Al Hadedy[4]; C. Farrar[1] [1) Los Alamos National Laboratory, US; 2) University of New Mexico, US; 3) University of Utah, US; 4) University of Virginia, US]
11:40 ~ 13:30	**Acoustic Emission for Monitoring the Elastic Concrete Beam Subjected to Three-Point-Bending** Q. Han; J. Xu; G. Yang [Tianjin University, China]
11:40 ~ 13:30	**An Investigation of the Performances of Embedded Buckypapers within a 0/90 WC Glass Fibre Reinforced Composite with a Delamination Under Tensile Loading** J. Epaarachchi[1]; A. Kakei[1]; M. Islam[1]; Z. Zhang[2]; J. Leng[2] [1) University of Southern Queensland, Australia; 2) Harbin Institute of Technology, China]
11:40 ~ 13:30	**Anomaly Imaging Using Decomposed Lamb Wave Modes** A. Zoubi; V. J. Mathews [Oregon State University, US]
11:40 ~ 13:30	**Compact Laser Ultrasound Scanner for Wide-Area Persistent Monitoring** J. Senecal; A. Jarque; E. Flynn [Los Alamos National Laboratory, US]
11:40 ~ 13:30	**Conductive Poly Lactic Acid (PLA) Temperature Sensors Embedded in Additively Manufactured Parts** J. Wahry[1]; B. Ouellette[1]; M. Todd[2]; A. Marchi[1] [1) Los Alamos National Laboratory, US; 2) UCSD, US]
11:40 ~ 13:30	**Controlled Substructure Identification of Shear Structure via Virtual Control System** D. Zhang; H. Li [Harbin Institute of Technology, China]
11:40 ~ 13:30	**Crack Detection of Orthotropic Plate Box Girder Bridges Based on FBG Strain Sensors** S. Wei; Y. Zhao; H. Li [Harbin Institute of Technology, China]
11:40 ~ 13:30	**Damage Detection for Beam-Like Structures Based on Local Flexibility Method with Rotary DOF Measurement** T.-Y. Hsu[1]; W. I. Liao[2]; S. Y. Hsiao[3] [1) National Taiwan University of Science and Technology, Taiwan; 2) National Taipei University of Technology, Taiwan; 3) National Center for Research on Earthquake Engineering, Taiwan]
11:40 ~ 13:30	**Damage Detection in Complex Composite Material Structures by Using Elliptical Triangulation Method** A. Sorrentino[1]; A. De Fenza[2] [1) CIRA SCPA, Italy; 2) University of Naples Federico II, Italy]
11:40 ~ 13:30	**Damage Identification of RC Beams from Changes in Their Vibration Characteristics** F. Ahmed; R. Ahsan [Bangladesh University of Engineering and Technology (BUET), Bangladesh]
11:40 ~ 13:30	**Damage Localization Methodology Using Pattern Recognition and Machine Learning Approaches** J. Vitola[1]; F. Pozo[2]; M. Anaya[3]; D. A. Tibaduiza[4] [1) Universidad Santo Tomás, Colombia; 2) Universitat Politècnica de Catalunya, Spain; 3) Fundación Universitaria Los Libertadores, Colombia; 4) Universidad Nacional de Colombia, Colombia]
11:40 ~ 13:30	**Data Fusion of Multiple Sensing Techniques** G. Cai; S. Mahadevan [Vanderbilt University, US]
11:40 ~ 13:30	**Data-Driven Pattern Recognition Model Employing Auditory Receptors for Human-Based Structural Health Monitoring System** S. Khazaeli[1]; A. S. Ziabari[2]; P. Bandamiri[2]; E. Cook[2] [1) Concordia University, Canada; 2) McGill University, Canada]
11:40 ~ 13:30	**Delamination detection of composites based on a bi-variate Gamma function approach** S. Y. Lee[1]; G.-D. Kim[1]; F.-K Chang[2] [1) Andong National University, South Korea; 2) Stanford University, US]
Cancelled	**Developing Integrated Methods and Software Tools for Monitoring-based Asset Performance Management** Z. Y. Wu [Bentley Systems, Incorprated, US]
11:40 ~ 13:30	**Dynamical Behavior of a Metamaterial Beam** T. Yang; P. Hagedorn [Technische Universität Darmstadt, Germany]

11:40 ~ 13:30	**Experimental Analysis of Digital Data Communication in Intelligent Structures Using Lamb Waves** J. Moll[1]; M. Mälzer[1]; N. Testoni[2]; L. De Marchi[2]; A. Marzani[2] [1) Goethe University of Frankfurt am Main, Germany; 2) University of Bologna, Italy]
11:40 ~ 13:30	**Experimental Verification of Vision-based Cable Force Evaluation Using a Smartphone** K. Ri[1]; N. Wang[2]; X. Zhao[2] [1) Pyongyang University of Architecture, North Korea; 2) Dalian University of Technology, China]
11:40 ~ 13:30	**Extending the Use of Power Tools to Aerial Robots for Infrastructure Repair** B. Chesebrough[1]; D. Mascarenas[2]; D. Grow[1] [1) New Mexico Tech, US; 2) Los Alamos National Laboratory, US]
11:40 ~ 13:30	**Elasto-acoustic wave source localization in composite plate-like structure using multi-rosettes sensing** K. Majewska; M. Mieloszyk; W. Ostachowicz [Polish Academy of Sciences, Poland]
11:40 ~ 13:30	**Heterodyning Effect in Composites Bond Inspection** S. Tashakori[1]; A. Baghalian[1]; V. Senyurek[1]; M. Unal[2]; I. N. Tansel[1] [1) Florida International University, US; 2) Marmara University, Turkey]
11:40 ~ 13:30	**Impedance-based Structural Health Monitoring Using Sub-frequency for Compensating Temperature Effects** Y. Zhan; L. Xiao; W. Qu [Wuhan University, China]
11:40 ~ 13:30	**Integrated Hybrid Structural Health Monitoring System** J. Bergman1; F. Li[1]; C. Cheung[1]; A. Kumar[1]; L. Oblea[2]; W. Price[2]; S. Jankly[2]; V. Sotoudeh[2]; B. Moslehi[2]; M. Cope[3] [1) Acellent Technologies Inc., US; 2) IFOS, US; 3) NAVAIR, US]
11:40 ~ 13:30	**Key Technologies and Experimental System of High-speed Train Tracking Monitoring** J. Lin[1]; C. Yi[2]; L. Liu[1] [1) Southwest Jiaotong University, China; 2) 1. City University of Hong Kong; 2. Xihua University, China]
11:40 ~ 13:30	**Load and Deformation Identifications of a Wing Structure by Using Distributed Fiber-optic Sensors** H. Murayama[1]; R. Matsumoto[1]; K. Kageyama[1]; D. Wada[2]; H. Igawa[2] [1) The University of Tokyo, Japan; 2) Japan Aerospace Exploration Agency, Japan]
11:40 ~ 13:30	**Measurement of thickness of wall-thinned plate using acoustic-wavenumber spectroscopy and spatial local wavenumber flitering** T. Kang[1]; S.-I. Moon[1]; J. H. Lee[1]; S.-W Han[1]; J.-H. Park[1]; G. Park[2]; J. Y. Jeon[2] [1) Korea Atomic Energy Research Institute, South Korea; 2) Chonnam National University, South Korea]
Cancelled	**Method for Extracting Fault Features from Shaft Vibration Signals of Large Turbine Units Based on Gabor Transform Time-frequency Filtering** L. Zhao[1]; W. Teng[2]; C. Zhou[2]; H. An[1]; Y. Liu[2] [1) Beijing Energy Investment Corporation, China; 2) North China Electric Power University, China]
11:40 ~ 13:30	**Modeling, Simulation and Analysis of Electromechanical Impedance-Based SHM Using Finite Element** R. Alencastro Antunes[1]; N. E. Cortez Ledesma[2]; B. Morais Gianesini[2]; A. E. Turra[1]; J. Vieira Filho[1] [1) Universidade Estadual Paulista, Brazil; 2) Universidade Federal de Mato Grosso, Brazil]
11:40 ~ 13:30	**Modeling, Simulation and Analysis of Temperature Effects on Impedance-Based SHM Applications Using Finite Elements** B. Morais Gianesini[1]; N. E. Cortez Ledesma[1]; R. Alencastro Antunes[2]; J. Vieira Filho[2] [1) Universidade Federal de Mato Grosso, Brazil; 2) Universidade Estadual Paulista, Brazil]
11:40 ~ 13:30	**Monitoring and Analysis of Acoustic Characteristics of Interior Noise of a High-speed Train Running in Low Temperature Environment** Q. Sun; J. Wang; K. Qian; X. Jiang [CRRC Changchun Railway Vehicles Co., Ltd., China]
11:40 ~ 13:30	**Multichannel Device for Integrated Pitch Catch and EMI Measurements in Guided Wave Structural Health Monitoring Applications** K. Neuschwander[1]; A. Shrestha[1]; J. Moll[1]; V. Krozer[1]; M. Bucker[2] [1) Goethe University of Frankfurt am Main, Germany; 2) CCOR - Schafer MWN GmbH, Germany]
11:40 ~ 13:30	**New Methodology for Testing Flight Actuators in Aiding Loads Catering for Large Prognosis Data Needs** S. B. Gollapudi[1]; L. Kandaswamy[1]; A. Lingamurthy[1]; A. S. Sekhar[2] [1) Defence Research & Development Organisation (DRDO), India; 2) Indian Institute of Technology (IIT) Madras, India]
11:40 ~ 13:30	**Numerical Model for Predicting Carbon Fiber Composite Cable Forces in a Cable-Stayed Bridge** K. A. McDonald[1]; A. J. Goupee[2]; K. A. Berube[2]; R. A. Lopez-Anido[2] [1) Griffith University, Australia; 2) University of Maine, US]
11:40 ~ 13:30	**Performance Monitoring of an Existing Concrete Bridge Using Strain Measurement Data** A. P. Adewuyi[1]; Z. Wu[2]; S. O. Franklin[1] [1) University of Botswana, Botswana; 2) Ibaraki University, Japan]
11:40 ~ 13:30	**Research on Modal Analysis and Impact Force Inversion Based on Compressive Sampling Data** Z.-F. Fan; D. Liang; X. Li; Q. Zhu [Xiamen University, China]
11:40 ~ 13:30	**Research on Weak Signal Feature Extraction Method Based on Double Coupled Duffing Escillator Stochastic Resonance** D. Han; Y. Sun; P. Shi [Yanshan University, China]
11:40 ~ 13:30	**Selective Guided Waves Generation in a Bi-dimensional Waveguide for Damage Detection** V. Serey[1]; M. Renier[2]; M. Castaings[2]; P. Masson[1]; N. Quaegebeur[1]; P. Micheau[1] [1) Université de Sherbrooke, Canada; 2) Univ. Bordeaux, CNRS, Bordeaux INP, Arts et métiers Paris Tech, France]
11:40 ~ 13:30	**SHM Using Integrated Photonics Based Fiber Sensing Solutions** R. Evenblij [Technobis Fibre Technologies, Netherlands]

11:40 ~ 13:30	**Speed and Load Extraction from Vibration Signal Using Artificial Neural Networks and Broadband Features** Z. Dworakowski[1]; K. Dziedziech[1]; O. Graja[2]; A. Jablonski[1] [1) AGH University of Science and Technology, Poland; 2) National School of Engineers of Sfax, Tunisia]
11:40 ~ 13:30	**Stochastic Deviation Method of Calculating Nodal Positions of Existing Spatial Structures** J. Liu; Y. Luo [Tongji University, China]
11:40 ~ 13:30	**Structural Reliability Updating and Damage Assessment with Bayesian Networks** H. Yang[1]; Z. Wu[1]; H. Sun[2]; P. Sun[1] [1) Northwestern Polytechnical University, China; 2) University of Nebraska-Lincoln, US]
11:40 ~ 13:30	**Study on Feature Extraction Method of Fault Signal Based on Reinforcement Cascaded Multi-Stable Stochastic Resonance System** P. Shi; S. An; D. Han [Yanshan University, China]
11:40 ~ 13:30	**Study on the Monitoring Method of Wind-induced Response of Transmission Tower Structure Based on Dynamic Analysis** Y. Luo[1]; L. Wang[1]; N. Deng[2]; H. Wang[3] [1) Guangxi Transportation Research & Consulting Co., Ltd., China; 2) Guangxi University, China; 3) Zhejiang University, China]
11:40 ~ 13:30	**System for Logging Acoustic Emission Signals from FRP Reinforcing Rods that is Suitable for Field and Long Term Laboratory Testing** M. Shateri; D. Thomson; M. Ghaib; D. Svecova [University of Manitoba, Canada]
11:40 ~ 13:30	**The Research and Application of Structural Health Monitoring Technology on the Coke Tower** K. Ding; F. Tang; N. Zhao; L. Zhang [China Special Equipment Inspection and Research Institute (CSEI), China]
11:40 ~ 13:30	**Torsional Waves for Load Monitoring of Cylindrical Waveguides** J. Quiroga[1]; L. E. Mujica[2]; R. Villamizar[1]; M. Ruiz[2]; J. Camacho[2] [1) Universidad Industrial de Santander (UIS), Colombia; 2) Universitat Politécnica de Catalunya, Spain]
11:40 ~ 13:30	**Wheel Polygonalization Feature and Re-profiling Evaluation Method and Application Based on Vehicle Interior Noise Monitoring** Y. Gao[1]; X. Li[1]; X. Xiao[2]; S. Xie[3]; X. Li[3] [1) CRRC Changchun Railway Vehicles Co., Ltd., China; 2) Southwest Jiaotong University, China; 3) Dalian Jiaotong University, China]
11:40 ~ 13:30	**Eddy Current Imaging for Detecting Defects in Conductive Structures Based on Compressive Sensing Method** B. Ye; W. Deng; J. Bao; J. Wu; X. Wang; G. Huang [Kunming University of Science and Technology, China]

SHM in Action

Hewlett Auditorium 200 (Wednesday, Sept. 13th, 3:00 – 5:40 PM)

One of our highlighted events showcasing how Structural Health Monitoring works in practical applications. The session features demonstrations on a variety of SHM applications from many leading SHM companies and educational institutions. Participating organizations are listed in alphabetical order; a finalized schedule will be announced at the workshop.

Session Chairs: Christian Boller (Saarland University, Germany)
Branko Glisic (Princeton University, United States)

8tree

8tree's dentCHECK tool is Airbus approved and is in use by numerous airlines/MROs globally. It is slashing dent-mapping/reporting times by 90%, while delivering unprecedented levels of measurement accuracy and SRM-compliant answers. dentCHECK is revolutionizing the speed with which airlines can inspect airframe damage caused by GSE, bird strikes and hail damage. This reduces Turn-around-Time (TaT) and boosts operational efficiency, thereby directly helping the bottom line.

Acellent Technologies

Acellent Technologies, Inc., a Structural Health Monitoring systems provider, will demonstrate a combined passive-active impact detection system with trajectory estimation. This novel system integrates impact detection with active damage scanning and trajectory estimation to inform the end user when an impact has occurred, whether damage has resulted, the damage size and trajectory of the impact through the object. This system will be demonstrated on a mockup of a helicopter tailboom with results shown in real-time.

ARMOR Lab, University of California, San Diego

The ARMOR Lab at UC San Diego aims to derive innovative solutions for safeguarding our structural/human assets using multifunctional materials with performance accentuated by tomographic methods. We will showcase a system that enables noncontact and subsurface damage quantification and localization. Like computed tomography, this system generates cross-sectional images of a structure; however, it uses electric fields to interrogate the system to generate electrical permittivity images, where locations and magnitudes of permittivity changes can be directly visualized. Embedded nanocomposites sensors further enhances damage selectivity. Its applicability for monitoring corrosion, strain, and pH will be demonstrated.

Embedor Technologies

Embedor Technologies' Xnode Smart Sensor is a powerful and versatile wireless sensor platform designed specifically for SHM applications. The Xnode's capabilities have recently been expanded with the addition of a trigger accelerometer and a high-fidelity, 32-bit 3-axis accelerometer. The former allows for event-triggered data acquisition, necessary for applications such as seismic monitoring and rare event detection. The latter makes the Xnode capable of measuring the structural response from low-amplitude ambient vibrations, e.g. in very stiff structures. In this demonstration, we will showcase the combination of these capabilities for high-fidelity rare event monitoring without losing any data from the event, which is common with other wireless sensor platforms. As excitation is applied to a model structure, the Xnode will autonomously detect the vibration and seamlessly stitch the data from the two accelerometers, starting seconds before the triggering event. This demo highlights the utility of the Xnode for applications like impact detection and rapid condition assessment.

Etherdyne Technologies

We are an innovative and disruptive start up focused on advancing the capabilities of IoT sensors by providing them power wirelessly. Our demo will highlight our patent-pending 'Loop Technology' that addresses the factors restricting IoT sensor growth - battery life and devices/sensors are tethered (wired) and the cumbersome and less than ideal user experience.

Intelligent Infrastructure Systems Laboratory (IISL), Purdue University

In this video demonstration, we have implemented a practical capability to automatically perform region-of-interest (ROI) localization and classification using UAV images. A large volume of images from a full-scale highway sign truss is collected using a drone. A selected target inspection region (welded connection in our demo) on each image is automatically localized, and less useful ROIs, such as those corrupted by occlusions, are further filtered using a robust image classification technique, called convolution neural network algorithms. We will also demonstrate, with thousands of images collected from the structure, our in-house software implementing these techniques.

Los Alamos National Laboratory

One of the issues with current manual structural inspections is that there tends to be variance across inspectors with regards to the current structural integrity of infrastructure. This problem is going to be exacerbated as we move towards building structures with design lives on the order of hundreds of years. Over these time frames even language can change so it is becoming increasingly necessary to develop tools that capture high-resolution structural inspection information in an unambiguous manner. Emerging augmented reality headsets offer a promising solution to the problem of collecting high-resolution, 3D structural information in an on-the-fly manner and we will demonstrate our current work in this area.

Metis Design Corporation

Metis Design Corporation will demonstrate their latest MD7-Pro Rev4 hardware to perform acoustic emission based impact detection, thus trigging guided wave based damage detection. The MD7-Pro Rev4 system is comprised of a beamforming array of piezoelectric sensors surrounding an actuator wafer that uses ultrasonic energy to detect and localize impacts and the resulting damage. Multiple impact events will be conveyed to the structure, and the MD7-Pro Rev4 system will automatically perform the data collection and transfer to a display predicting impact location and damage, if present.

Micron Optics

Micron Optics will demonstrate the latest in optical interrogation technology, the Micron Optics Hyperion Platform, to enable the sensing of aerospace fluid level and aerofoil pressure measurements using lightweight and intrinsically small Fiber Bragg Gratings. This leading edge measurement capability is enabled by sensors from Arkwright Technologies in Australia to make what were once impossible measurements, possible.

NDT–CE Lab, University of Nebraska-Lincoln

The University of Nebraska-Lincoln (UNL) team has developed an automated acoustic scanning system for rapid evaluation of concrete bridge decks. Multi-channel MEMs microphones are used to continuously collect acoustic signals generated ball chains, and a RTK GPS system provides real-time positions of the testing system. The system is able to scan a typical bridge lane in less than 3 minutes and generate a defect map immediately after the scanning.

Optics11

Optics11 will demonstrate acoustic emission monitoring using optical fiber interferometry. The ZonaSens system is capable of measuring with femto-strain sensitivity in stretches of optical fiber, while sampling at one MegaHerz. Applications are crack detection, leak detection, rail monitoring and more. In addition, miniature all-optical acceleration sensors with nano-g sensitivity will be shown.

Optilab

Optilab, LLC will demonstrate a photonic IoT solution for structure health monitoring and machinery condition monitoring. This system consists of Optilab Oak Creek Fiber Sensor Interrogators (FSI-S-OC) and various fiber Bragg grating sensors. FSI-S-OC features our compact form factor Sedona series housing which includes a 10-point touch screen and a rechargeable battery with up to 8 hours of continuous operation. The FSI-S-OC is designed to integrate with our proprietary FAC-520 Fiber Accelerometer to create a fully functional solution to record, plot and monitor the vibrational characteristics of a system including time domain vibrational signals and the corresponding FFT spectrum. In addition, the FSI-S-OC can also integrate with FBG-based sensors to monitor structural strain, temperature and displacement etc. The FSI-S-OC features 64 GB of built in memory for storing time and frequency domain data as well as built in Wi-Fi for transferal of data to a Cloud or IoT-based server for predictive analytics or data storage.

Opto-Electro-Structural Lab, Aerospace Engineering, KAIST

Opto-Electro-Structural Lab will introduce fully non-contact mobile pulse-echo ultrasonic propagation imager (PE UPI) based on laser ultrasound as an in-situ nondestructive evaluation tool. The mobile PE UPI provides an excellent solution for visualizing through-the-thickness damage and defect in composite structure, which is commonly used in real world structures. This system consists of compact scanning laser head, two-axis translation scanner and UPI controller and is able to inspect the structure by using the compact scanning laser head which combines generation and sensing laser beams to scan the structure in high speed and high spatial resolution. Inspection result can be represented in real-time not as a two-dimensional image but as a three-dimensional video which shows the propagation of through-the-thickness ultrasound as bulk wave based on pulse-echo ultrasonic wave propagation imaging (PE UWPI) technique. The system also provides post processor for damage visualization such as multi-time frame amplitude mapping, defect pointing function, and polygon defect area calculation. In a 5 minute video live, we will show the principle and practical operation of mobile PE UPI as well as practical applications in real world structures using mobile PE UPI.

PHASE IV Engineering

Phase IV Engineering will demonstrate its battery-free wireless RFID strain sensors that can be embedded in concrete and other materials. These sensors can take precision strain readings wirelessly using RFID sensors that do not have a battery. Another version of these sensors that are “battery assisted” can data log time-stamped strain sensor readings to memory and be downloaded at a later time over an RFID interface.

SHMlab and HSLab, Princeton University

Data visualization is an important aspect of the SHM process. The ability to communicate effectively between various involved parties working on an SHM project is frequently the key to success in long-term SHM applications. Our work presents a method for integrating SHM data and meta-data into an informational modelling (IM) and virtual reality (VR) environment. By presenting SHM data and meta-data in an intuitive and interactive manner enabled through IM/VR, communication during projects, an understanding of the SHM system, and an understanding of SHM data will be fostered. As a case study, the method implementation on Streicker Bridge is presented.

Stanford University and Massachusetts Institute of Technology

Vibration analysis is a powerful tool for structural health monitoring -- where operational mode shapes, and the spectra of their vibrations, can often be used to identify structural damage and other anomalies. We present Modal Imaging, and Interactive Dynamic Video: two recent techniques for measuring, visualizing, and even plausibly simulating the vibrations of structures based on regular or high-speed video.

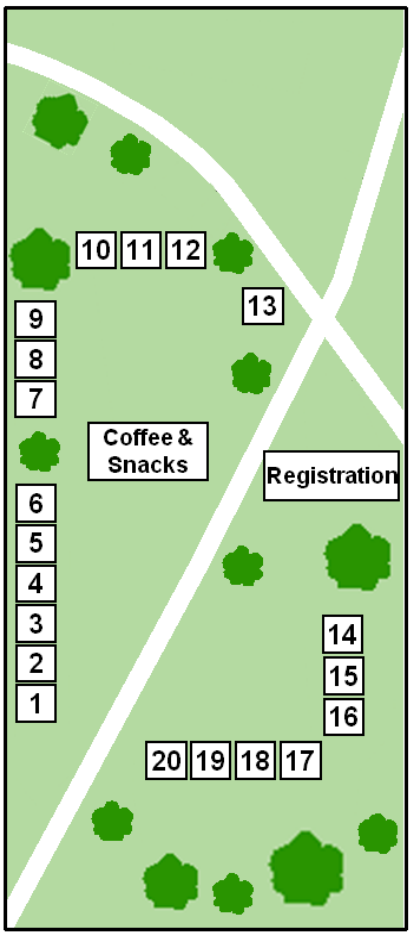
Stochastic Mechanical Systems and Automation Laboratory, University of Patras

Real time damage detection and classification via a simple Power Spectral Density (PSD) based statistical time series method is demonstrated on a laboratory-scale ship hull structure. The hull structure consists of a number of vertical and horizontal aluminum plates and beams jointed together via bolts and rivets. The detection and classification of damages, each corresponding to a loosened bolt, is achieved based on a single 10 seconds long vibration acceleration signal within the 0-850 Hz frequency range. The method automatically detects and classifies each considered damage, and is also capable of identifying the healthy state following proper structural repair (bolt re-tightening).

Company & Institution Exhibition

West Oval Grove (Tuesday – Thursday, Sept. 12th – 14th, 7:30 AM – 4:00 PM)

The Company & Institution Exhibition highlights the state-of-the art Structural Health Monitoring technologies provided by leading companies and institutions working in the field.



Booth Number	Organization Name
1 & 2	Acellent Technologies
3	Phase IV Engineering
4	Technobis
5	Transtek International Group
6	Kinemetrics
7	Micron Optics
8	Smart Fibres
9	Optics11
10	Civionics
12	Metis Design Corporation
13	Optilab
14	Redondo Optics
16	The Laboratory for Verification & Validation (LVV)
17	Etherdyne Technologies
18	Intelligent Fiber Optic Systems Corporation(IFOS)
19	Embedor Technologies
20	Structures and Composites Laboratory (SACL)

Exhibition Map – West Oval Grove, the Stanford Oval

Acellent Technologies

(Booth number 1 & 2)

Acellent® Technologies Inc., provides state-of-the-art Structural Health Monitoring systems including SMART Layers®, diagnostic hardware, and software platforms. Acellent® systems can be used for active and/or passive monitoring of composite and metal structures. Our systems can either be on-board the structure or off-board. Acellent® products are currently used in several markets including aircraft, spacecraft, automobiles, and pipelines.

Civionics

(Booth number 10)

Civionics was established in 2009 to provide wireless sensing and embedded control solutions to the structural health monitoring community and beyond. Civionics' current Percēv wireless sensing products provide our customers with the ability to make intelligent decisions in real-time by collecting and processing sensor data using scalable tools located both within our hardware and in the cloud. We strive to use our experience building intelligent wireless systems for industrial, civil, naval, aerospace, and wind energy applications to create a safer and more efficient world.

Embedor Technologies

(Booth number 19)

Embedor Technologies is developing a smart sensor platform and a software framework capable of sensing at multiple scales to facilitate reliable, real-time structural condition assessment of civil infrastructure for extreme events (earthquakes, hurricanes) and long-term deterioration (corrosion, stress fractures).

Etherdyne Technologies

(Booth number 17)

Etherdyne Technologies Inc., (ETI) provides and creates wireless-power-enabled environments (WPEs) to enhance functionalities of the sensors and their communication distance. ETI's revolutionary technology of (the 'Loop') conceive the possibility for multiple devices to simultaneously receive power, across great distances. ETI's state of the art technology, (the 'Loop') can deliver power across long distances, multiple devices, simultaneously. The Loop system is highly adaptable and suitable for various environments: commercial building, residential, and large open spaces.

Intelligent Fiber Optic Systems Corporation (IFOS)

(Booth number 18)

Intelligent Fiber Optic Systems Corporation (IFOS) develops innovative photonic sensing solutions for monitoring and control of crucial assets deployed from the subsurface to space and beyond. IFOS is the provider of choice for photonic sensing solutions in the aerospace, energy, and medical markets, and a trusted partner to government agencies in applied research at the photonics frontier.

Kinemetrics

(Booth number 6)

For over forty years, Kinemetrics has been creating products for monitoring earthquakes, volcanoes, tsunamis, and nuclear non-proliferation while helping society understand these events on a global, regional and local scale. The company has been creating products for monitoring civil structures, bridges, dams, and nuclear power plants as this monitoring provides important information about the structures' responses to natural or man-induced seismicity. We are committed to delivering innovative, standard setting technologies, products and solutions - on time, on-line, every time.

Metis Design Corporation

(Booth number 12)

Metis Design Corporation (MDC) is a technical consulting firm specializing in Structural Health Monitoring, Multifunctional Material and Lightweight Power Generation. For a decade and a half, Metis has been at the forefront of SHM technology development, inventing novel sensors, hardware and algorithms for reliable damage detection. MDC will be showcasing our work in both distributed guided wave based impact and damage detection as well as our wireless carbon nanotube (CNT) based systems.

Micron Optics

(Booth number 7)

Micron Optics, Inc. is a global leader of fiber optic sensing systems used in diverse SHM applications in the oil & gas, aerospace, civil, maritime, energy, transportation and biomedical industries. We offer a broad portfolio of sensor, instrumentation and data acquisition products.

Optics11

(Booth number 9)

Optics11 is a young company that has developed revolutionary optical fiber measurement systems for acoustic monitoring and acceleration sensing. The unique combination of fiber interferometry and micro-mechanical transducers provides exceptional characteristics: ZonaSens technology offers acoustic monitoring up to 1 MHz with high sensitivity, while DeltaSens offers miniature all-optical acceleration sensors with nano-g performance.

Optilab

(Booth number 13)

Optilab is a developer of innovative, high performance fiber optic products and photonic equipment. Optilab offers customized solutions for RFoF, testing and measurement, and fiber sensing applications. The newest Sedona platform is battery operated and completely portable with a 7" LCD touch screen and Wi-Fi capabilities. Optilab is headquartered in Phoenix, Arizona with its facilities occupy 15,000 sq. ft., a multimillion-dollar building. Research and development, assembly, qualifications, sales, marketing, and technical support are conducted at this location to support worldwide customers. Optilab also owns and manages OEQuest.com, an e-Commerce website.

Phase IV Engineering

(Booth number 3)

Phase IV Engineering is celebrating its 25th year as leaders in wireless sensing for challenging applications. Phase IV invented battery-free wireless RFID sensing and has recently enhanced the technology and applied it to embedded battery-free wireless strain sensing for structural health monitoring. These sensors provide high-accuracy strain sensing with a wireless interface, no sensor battery - all while being embedded in materials such as concrete. In addition to battery-free RFID sensors, Phase IV also provides some of the most advanced battery-powered long-range wireless sensors and wireless data loggers for challenging applications such as embedded sensors for structural health monitoring. While Phase IV specializes on custom-engineered advanced wireless sensors for specific applications, we also offer an extensive line of off-the-shelf wireless sensors.

Redondo Optics

(Booth number 14)

Redondo Optics Inc.'s product lines include passive and dynamic fiber Bragg grating sensor(s) and interrogation systems for multi-point distributed measurement of strain, temperature, pressure, vibration, acceleration, acoustics, acoustic emissions, and ultrasound; distributed fiber optic sensors for hydrocarbon fuels (liquid and gas), RH and moisture, and cryogenic gas leak detection, multi-parameter fiber optic fluorescence sensors (O_2, CO_2, H_2, T, P, pH, RH), fluorescence lifetime detection systems, and micro- and nanofluidic biochips for biological analysis.

Smart Fibres

(Booth number 8)

Smart Fibres is a leading company in the field of fiber optic sensing technologies. Since its foundation, Smart Fibres has been at the forefront of innovation in FBG sensors and interrogators. Our multi-parameter sensing systems are used globally for multiple applications in aerospace, oil & gas, wind energy, civil engineering or photonics research amongst many others. Smart Fibres products are widely recognised for their excellent quality, reliability and for delivering high performance in a cost-effective way.

Structures and Composites Laboratory (SACL)

(Booth number 20)

Structures and Composites Laboratory (SACL) is located in the Department of Aeronautics & Astronautics at Stanford University. The main focus of the group is related to the development of novel intelligent multifunctional structures, structural health monitoring diagnostics and prognostics, and micro-fabricated sensors and sensor networks.

Technobis

(Booth number 4)

Please go to *www.technobis.com* for more information.

The Laboratory for Verification & Validation (LVV)

(Booth number 16)

The Laboratory for Verification & Validation (LVV), part funded by the EPSRC and by the European Regional Development Fund (ERDF), is a unique dynamics testing facility enabling research into V&V of models across test scales and in all environments. Opening in December 2017, it will be larger and more versatile than any facility of its kind currently available for open academic and industrial use. Led by the Dynamics Research Group (DRG) at Sheffield University's Department of Mechanical Engineering, the laboratory will offer significant benefits across a range of industrial sectors including energy, aerospace, automotive, renewables and medical engineering.

The centerpiece of the facility is a series of three large environmental chambers designed for dynamic testing under realistic environmental conditions. They offer the ability to control temperature and humidity and to simulate both wind and rainfall. An integrated shake table and reconfigurable electro-dynamic shakers enables dynamic testing across a broad frequency range within the chambers. A separate wave tank facility enables generation of deep water wave conditions. A strong wall and floor will be available for the testing of large size components and structures.

Transtek International Group

(Booth number 5)

TIG is a technology spin-off company with extensive experience in modeling, simulation, sensing, imaging, field testing and assessment of structural systems for maintenance, rehabilitation, preservation and management decision-making for civil, aerospace and energy structures. TIG provides local and global monitoring of structures for rapid, cost-efficient and effective assessment with particular capabilities on non-contact (image-based) monitoring.

Awards

SHM Lifetime Achievement Award

An individual in the SHM community who has championed SHM over their career by advancing the state-of-the-art through their meritorious accomplishments in research, applications, education or sponsorship of the discipline will be selected to receive the prestigious SHM Lifetime Achievement Award by a committee of researchers, educators and practicing scientists and engineers. **This award is sponsored by 'Boeing'.**

SHM Person of the Year Award

A structural health monitoring person of the year (SHM-POY) will be selected by the editors and associate editors of Structural Health Monitoring: An International Journal. The Person of the Year should have made an outstanding contribution to the field of SHM that will benefit society. This contribution can be in the form of theory, analysis, applications, education, or other ways that support the discipline of SHM and benefit society. The award is meant to recognize accomplishments within the past year or few years. **This award is sponsored by 'SAGE'.**

SHM Hans-Juergen Schmidt Award

Individuals in the SHM community, recognized for their outstanding leadership in advancing technologies in industry and government, will be selected by an Award Committee representative of the world-wide SHM community to receive during every SHM workshop (International Workshop on Structural Health Monitoring [IWSHM], European Workshop on Structural Health Monitoring [EWSHM] and Asia-Pacific Workshop on Structural Health Monitoring [APWSHM]) the SHM Hans-Juergen Schmidt Award. **This award is sponsored by 'Aerospace Journal' and 'IWSHM committee'.**

The Achenbach Medal

The Achenbach Medal has been created to recognize an individual (within 10 years of PhD) who has made an outstanding contribution to the advancement of the field of Structural Health Monitoring. It is an international award and nominations from all over the world are encouraged. **This award is sponsored by 'Embraer'.**

Best Paper Award

The SHM Best Paper Award is presented to one or more individuals whose paper(s) are selected to have the highest quality and innovation from the Proceedings of the 2017 IWSHM. The Award Committee is formed by all the Session Chairmen for this Workshop. They may propose among the articles from the sessions of their specialty, one or two papers which may be candidates for the Award, justifying their proposal. **This award is sponsored by 'Boeing'.**

Best Poster Paper Award

The SHM Best Poster Paper Award is presented to one or more individuals whose poster paper(s) are selected to have the highest quality and innovation from 2017 IWSHM. The Award Committee is formed by all the Session Chairmen for this Workshop. They may propose among the articles from the sessions of their specialty, one or two poster papers which may be candidates for the Award, justifying their proposal. **This award is sponsored by 'Sensor Journal'.**

Student Best Paper Award

The IWSHM organizing committee is pleased to invite students to submit abstracts for the 2017 IWSHM Student Best Paper Award Competition. Papers will then be evaluated by a committee of experts from academia, industry, and the research community. **This award is sponsored by 'DEStech Publications'.**

The Most Practical SHM Solutions for Aerospace Award

Airbus is proud to sponsor a prize for the "Most Practical SHM Solutions for Aerospace" to be demonstrated in SHM in Action. The session will be judged by a panel of representatives from industry and government. The prize will be awarded at the end of the session. **This award is sponsored by 'Airbus'.**

The Most Practical SHM Solutions for Civil/Mechanical Systems Award

The Most Practical SHM Solution for Civil & Mechanical Systems will be demonstrated in the SHM in Action. The session will be judged by a panel of representatives from industry and government. The prize will be awarded at the end of the session.

Transportation

Workshop Venue

Registration location: **West Oval Lawn**, the Stanford Oval, Stanford University
(East end of the Herrin Hall (393 Serra Mall, Stanford, CA 94305))
GPS coordinates: (37.4295393, -122.1709593)
You can also access these and other map resources at: iwshm-location.iwshm.org/

Parking

Galvez Lot is the dedicated parking space for the event. Address: Galvez Lot (L-96), Stanford, CA 94305

Please pay at the pay machines using the event code '**7546'** for an all-day parking rate of $8.00 per day. If arriving after 10:45am, please use the incremental option without the event code. Cash or credit/debit cards are accepted. Metered parking is enforced Monday through Friday from 8 a.m. to 4 p.m. Parking is free throughout the University after 4p.m. and all day on weekends.

There are by-the-hour parking spots around campus and closer to the Workshop location, but at a higher rate and on a first-come-first-serve basis. Please consult the instructions on Stanford Parking and Transportation Services (PT&S) website for more details.

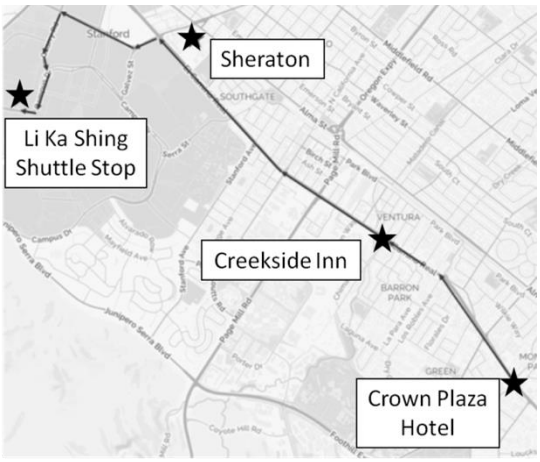
Uber and Lyft

The **Stanford Oval** is the closest drop-off point. Address: 20 Palm Dr., Stanford, CA 94305

Guests to IWSHM 2017 are encouraged to use Uber or Lyft for easy transportation. Shared ride rates per person from Crowne Hill Plaza to the Stanford campus range from $5 - $10 per person per trip.

Free Shuttle Service

A complementary shuttle service is provided between the *Crowne Plaza Hotel Palo Alto, Creekside Inn, Sheraton Hotel, and the Stanford campus*. Workshop guests will be dropped off at the **Li Ka Shing Shuttle Stop**, from which the workshop can be reached on foot. Guests staying at nearby hotels may use any stop on this line for transportation to or from the workshop. The shuttle service will also be provided to and from the **SHM Networking Welcome Night** at Terman Park on September 12th, and the **Award Banquet Dinner** at the Crowne Plaza Hotel on September 13th.



Li Ka Shing Stop: Campus @ Li Ka Shing, Stanford, CA 94305
Sheraton Hotel: 625 El Camino Real, Palo Alto, CA 94301
Creekside Inn: 3400 El Camino Real, Palo Alto, CA 94306
Crowne Plaza: 4290 El Camino Real, Palo Alto, CA 94306

Shuttle Schedule

Tuesday, September 12th

Morning (To Workshop)				
BUS	CREEKSIDE INN	CROWNE PLAZA	SHERATON	STANFORD - LI KA SHING STOP
BUS 1	6:15 AM	6:25 AM	6:45 AM	6:55 AM
BUS 2	6:45 AM	6:55 AM	7:15 AM	7:25 AM
BUS 3	7:15 AM	7:25 AM	7:45 AM	7:55 AM
BUS 4	7:45 AM	7:55 AM	8:15 AM	8:25 AM
BUS 5	8:15 AM	8:25 AM	8:45 AM	8:55 AM
BUS 6	8:45 AM	8:55 AM	9:15 AM	9:25 AM

Afternoon (From Workshop to Welcome Dinner)					
BUS	STANFORD - LI KA SHING STOP	CREEKSIDE INN	CROWNE PLAZA	SHERATON	TERMAN - WELCOME DINNER
BUS 1	4:30 PM	4:40 PM	4:50 PM	5:10 PM	5:25 PM
BUS 2	5:00 PM	5:10 PM	5:20 PM	5:40 PM	5:55 PM
BUS 3	5:30 PM	5:40 PM	5:50 PM	6:10 PM	6:25 PM
BUS 4	6:00 PM	6:10 PM	6:20 PM	6:40 PM	6:55 PM
BUS 5	6:30 PM	6:40 PM	6:50 PM	7:10 PM	7:25 PM
BUS 6	7:00 PM	7:10 PM	7:20 PM	7:40 PM	7:55 PM

Night (From Welcome Dinner to Hotels)				
BUS	TERMAN - WELCOME DINNER	CREEKSIDE INN	CROWNE PLAZA	SHERATON
BUS 1	9:00 PM	9:10 PM	9:20 PM	9:40 PM
BUS 2	9:30 PM	9:40 PM	9:50 PM	10:10 PM
BUS 3	10:00 PM	10:10 PM	10:20 PM	10:40 PM
BUS 4	10:30 PM	10:40 PM	10:50 PM	11:10 PM

Wednesday, September 13th

Morning (To Workshop)				
BUS	CREEKSIDE INN	CROWNE PLAZA	SHERATON	STANFORD - LI KA SHING STOP
BUS 1	6:15 AM	6:25 AM	6:45 AM	6:55 AM
BUS 2	6:45 AM	6:55 AM	7:15 AM	7:25 AM
BUS 3	7:15 AM	7:25 AM	7:45 AM	7:55 AM
BUS 4	7:45 AM	7:55 AM	8:15 AM	8:25 AM
BUS 5	8:15 AM	8:25 AM	8:45 AM	8:55 AM
BUS 6	8:45 AM	8:55 AM	9:15 AM	9:25 AM

Afternoon (From Workshop to Banquet)					
BUS	STANFORD - LI KA SHING STOP	CREEKSIDE INN	CROWNE PLAZA- BANQUET	SHERATON	STANFORD - LI KA SHING STOP
BUS 1	4:30 PM	4:40 PM	4:50 PM	5:10 PM	5:20 PM
BUS 2	5:00 PM	5:10 PM	5:20 PM	5:40 PM	5:50 PM
BUS 3	5:30 PM	5:40 PM	5:50 PM	6:10 PM	6:20 PM
BUS 4	6:00 PM	6:10 PM	6:20 PM	6:40 PM	6:50 PM
BUS 5	6:30 PM	6:40 PM	6:50 PM	7:10 PM	7:20 PM
BUS 6	7:00 PM	7:10 PM	7:20 PM	7:40 PM	7:50 PM

Night (From Banquet to Hotels)			
BUS	CROWNE PLAZA- BANQUET	SHERATON	CREEKSIDE INN
BUS 1	9:00 PM	9:20 PM	9:35 PM
BUS 2	9:30 PM	9:50 PM	10:05 PM
BUS 3	10:00 PM	10:20 PM	10:35 PM
BUS 4	10:30 PM	10:50 PM	11:05 PM

Thursday, September 14th

Morning (To Workshop)				
BUS	CREEKSIDE INN	CROWNE PLAZA	SHERATON	STANFORD - LI KA SHING STOP
BUS 1	6:45 AM	6:55 AM	7:15 AM	7:25 AM
BUS 2	7:15 AM	7:25 AM	7:45 AM	7:55 AM
BUS 3	7:45 AM	7:55 AM	8:15 AM	8:25 AM
BUS 4	8:15 AM	8:25 AM	8:45 AM	8:55 AM
BUS 5	8:45 AM	8:55 AM	9:15 AM	9:25 AM
BUS 6	9:15 AM	9:25 AM	9:45 AM	9:55 AM

Afternoon (From Workshop)				
BUS	STANFORD - LI KA SHING STOP	CREEKSIDE INN	CROWNE PLAZA	SHERATON
BUS 1	3:30 PM	3:40 PM	3:50 PM	4:10 PM
BUS 2	4:00 PM	4:10 PM	4:20 PM	4:40 PM
BUS 3	4:30 PM	4:40 PM	4:50 PM	5:10 PM
BUS 4	5:00 PM	5:10 PM	5:20 PM	5:40 PM
BUS 5	5:30 PM	5:40 PM	5:50 PM	6:10 PM
BUS 6	6:00 PM	6:10 PM	6:20 PM	6:40 PM

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