26-07-11 Course on structural health monitoring through time series and vibration based techniques

July 26th - 29th, 2011

Ikerlan Pº. J. Mª. Arizmendiarrieta, 2 Arrasate - Mondragón
Gipuzkoa

Objectives of the course

In many industrial applications it is important to identify relationships between some output signal and a set of input signals. For example, in the automotive industry there is an interest on identifying the degree of contribution from noise sources (aerodynamics, tyres, engine,...) in the driver's cab. This would help to know the dominant source of noise in order to improve comfort. Moreover, in the field of structural health monitoring SHM methods based on the comparison between the response to specific excitations of healthy structures with respect to a structure eventually containing faults are becoming popular. In both situations it is crucial to study the time series, to estimate their spectrum (used in the calculation of coherences) and to model them in order to be able to predict their behavior.

This course will introduce researchers with some mathematical background to the time series, spectral analysis by diferent techniques, coherence computations, signals modeling, prediction techniques and structural monitoring techniques (vibration based methods) using time series.

Organizing Committee

- Alfredo Bermúdez de Castro, Universidade de Santiago de Compostela.

- Fernando Martínez, Centro de Investigaciones Tecnológicas, Ikerlan, IK4.

- Jerónimo Rodríguez, Universidade de Santiago de Compostela.

- Xabier Sagartzazu, Centro de Investigaciones Tecnológicas, Ikerlan, IK4.

Lecturers

- Spilios Fassois. PhD, Professor. University of Patras, Greece.

Professor Fassois is the Director of the Stochastic Mechanical Systems & Automation (SMSA) Laboratory at the University of Patras, Greece (1992-present). He has also served on the faculty of the Department of Mechanical Engineering of the University of Michigan, Ann Arbor, USA, (1986-1994).

His research interests are in the area of stochastic mechanical and aerospace systems, with emphasis on non-stationary vibration modeling, identification, fault detection, and Structural Health Monitoring. He has been the recipient of several honors and awards, and has published over 200 technical papers in international journals and conference proceedings.

Professor Fassois has been teaching short courses in Europe and USA, and his research has been supported by various international organizations, companies, and the European Commission. He participates in several international technical committees and panels and has served on the
editorial board of various journals.

- Claus-Peter Fritzen. PhD, Professor. University of Siegen, Germany.
Prof. Fritzen received his diploma in Mechanical Eng. and his doctor-degree from the University of Kaiserslautern. Since 1993, he is Professor of Mechanics at the University of Siegen, Germany.

In 2001 he was a visiting professor at Stanford University, USA. With regard to Structural Health Monitoring (SHM), the working group has 20 years of experience with the development and application of methods for damage diagnosis and structural health monitoring (SHM), documented by more than 200 publications in intl. journals, conference proceedings and a coauthored monograph on SHM.

The work focuses on vibration - as well as wave propagation- based SHM principles and deals with methodological aspects including soft and hardware development. Since 2008, Prof. Fritzen is also member of the executive board of the Northrhine-Westphalian “Center of Sensor Systems” at the Univ. of Siegen.

In 2010, he received the “SHM-Person of the Year-Award". He is associated editor of the Int. Journal of Structural Health Monitoring, member of scientific committees of numerous intl. conferences and reviewer for national and European research funding institutions and international journals.

Prof. Fritzen cooperates with academic and industrial partners in various fields of aerospace, mechanical and civil engineering including several European research projects.

- Luis Eduardo Mújica. PhD, Researcher. Universidad Politécnica de Catalunya, Spain.
Luis Eduardo Mujica is graduated with bachelor degrees in electrical engineering and electronic engineering from the Universidad Industrial de Santander, Colombia in 2000.

His doctoral degree in information technologies was obtained in 2006 from the University of Girona, Spain. During 2007-2010, he was a postdoctoral researcher at the Technical University of Catalonia (UPC) in the “Juan de la Cierva" programme.

Currently, he is assistant professor in Applied Mathematics Department at UPC. In recent years, he has been a visiting researcher at the University of Sheffield (UK), Ghent University (Belgium), the Catholic University of Louvain (Belgium) and the Universidad Politécnica de Madrid (Spain). His present research interests include intelligent and advanced signal processing for damage assessment in structural health monitoring.

- José Rodellar. PhD, Professor. Universidad de Catalunya, Spain.
José Rodellar is currently a professor in the School of Civil Engineering at the Technical University of Catalonia, Spain.

He has been with the university since 1976 and is now director of the Control, Dynamics and Applications group, which carries out theoretical and applied research on modelling and control, with applications in structural control and smart structures. Before this, he was a visiting professor in the Department of Civil Engineering at the State University of New York, Buffalo, and a visiting scholar at the Department of Mechanical Engineering, University of California, Berkeley.

He is a member of the Board of Directors of the International Association for Structural Control and Monitoring.

Course Program

Tuesday, July 26th
9h00 - 10h30
Spilios Fassois:Introduction to Statistical Time Series Methods for SHM
10h30 - 11h00
Break
11h00 - 12h30

Spilios Fassois: Identification of Statistical Time Series Models 12h30 - 14h00

Lunch
14h00 - 15h30
Spilios Fassois: Non-Parametric & Parametric Time Series Methods
15h30 - 16h00
Break
16h00 - 17h30
Spilios Fassois: Parametric Time Series Methods

Wednesday, July 27th
9h00 - 10h30
Spilios Fassois: Applications 10h30 - 11h00
Break
11h00 - 12h30
Spilios Fassois: Recent Developments and Outlook
12h30 - 14h00

Lunch
14h00 - 15h30 Claus-Peter Fritzen: Introduction and Overview of SHM-Methods
15h30 - 16h00
Break
16h00 - 17h30
Claus-Peter Fritzen: Damage Identi cation using Modal Data and Model-Updating Methods

Thursday, July 28th
9h00 - 10h30
Claus-Peter Fritzen: Damage Detection from Time Series, Influence of Environmental Conditions
10h30 - 11h00
Break
11h00 - 12h30
Claus-Peter Fritzen: Electro-Mechanical Impedance Method, Simulation based on Spectral Element Method
12h30 - 14h00

Lunch
14h00 - 15h30
Claus-Peter Fritzen: Monitoring of External Loads using Vibration Data
15h30 - 16h00
Break
16h00 - 17h30
Claus-Peter Fritzen: Sensor Fault-Detection and Vibration-Based Monitoring of Rotating Machines

Friday, July 29th
8h00 - 9h30
José Rodellar: Data-driven SHM based on Principal Component Analysis. Background (I)
9h30 - 9h45 Break
9h45 - 11h15 José Rodellar: Data-driven SHM based on Principal Component Analysis.
Background (II)

11h15 - 11h30 Break
11h30 - 13h00 Luis Eduardo Mújica: Data-driven SHM based on Principal Component Analysis. Case studies (I)
13h00 - 13h15 Break
13h15 - 14h45 Luis Eduardo Mújica: Data-driven SHM based on Principal Component Analysis. Case studies (II)

Inscripción

To register, please fill this form. Registration closed.

Note that registration is free but mandatory and there are limited places.

Coffee breaks will be offered.

Course venue and contact

IKERLAN

Polo de Innovacion GaraiaGoiru Kalea20500

Arrasate-MondragónGipuzkoa GPS coordinates: 43.06258, -2.50481.

View Larger Map

Contact
For further information, please contact

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