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EDITORIAL

SPECIAL SECTION

Recent advances in structural control and health monitoring

Jan HOLNICKI-SZULC[1], David WAGG[2], Fabio CASCIATI[3], Lucia FARAVELLI[3], and Łukasz JANKOWSKI[1]*

[1] Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland
[2] University of Sheffield, Sheffield, United Kingdom
[3] Zhejiang University, Hangzhou, China

1. THE CONFERENCE

The European Conferences on Structural Control are a series of international conferences that began in 1996 and have progressed successfully over the years under the auspices of the *European Association for the Control of Structures* (EACS). Previous editions were organized in Barcelona (1996), Paris (2000), Vienna (2004), St. Petersburg (2008), Genoa (2012), and Sheffield (2016). The subsequent 8th conference in the series is planned to be organized at the École Centrale de Lyon in France. The conferences provide a lively forum for presentation and discussion of recent developments and emerging trends in structural control and related fields. The conference topics typically cover a wide range of areas, including:

- active, semi-active and hybrid structural control, as well as passive structural control,
- structural health monitoring and nondestructive testing,
- structural dynamics and earthquake engineering,
- sensor and actuator technology,
- smart materials,
- applications to civil engineering, aerospace, marine, and robotic systems,
- biological and bio-inspired systems.

The 7th edition of the conference, originally planned for 2020 and postponed to 2022 due to the COVID-19 pandemic, was organized by the Institute of Fundamental Technological Research (IPPT PAN) and co-organized by the Committee on Mechanics, both of the Polish Academy of Sciences. The conference hosted 4 general lectures and 7 thematic sessions. A total of 92 researchers from 21 European and non-European countries (56% of them from outside Poland) attended the conference. They submitted and presented 77 original contributions.

*e-mail: ljank@ippt.pan.pl

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2. PAPERS IN THIS SPECIAL SECTION

The papers included in this Special Section are authored by recognized researchers and focus on different aspects and developments in the field of structural control and health monitoring. They can be divided into three broad groups, as discussed in the following subsections.

2.1. Structural control (5 papers)

Five papers can be categorized into the first core topic of the EACS conference series, which is structural control. Three of these five papers employ and exploit inertial effects for the purpose of structural control, while the fourth paper studies the dependence of a passive control scheme on the structural system topology. The fifth paper considers the problem of actuator calibration and excitation replicability.

Applications of the inerter for the purpose of mitigating structural vibrations are studied in two papers. D. Wagg (*Some recent developments in inerter-based devices for vibration mitigation*) presents an overview of some recent developments in this area, while K. Mnich and P. Perlikowski (*The optimization of the TMDI for efficient mitigation of the vibration*) examine the usefulness of two specific indices in the optimization process of a tuned mass damper with inerter (TMDI) device.

An inerter-like approach is used also at a smaller scale by A. Kras and P. Gardonio (*Flywheel proof mass actuator for active vibration control*), where a flywheel proof mass is applied for active vibration control of a thin plate.

An original large-scale structural problem is considered by S. Casciati (*Comparing the efficiency of different structural skeleton for base isolated domes*). The author investigates the influence of different structural skeletons on the dynamic response of base-isolated domes.

Finally, C. Peláez-Rodríguez, Á. Magdaleno S. Salcedo-Sanz, and A. Lorenzana (*Human-induced force reconstruction using a non-linear electrodynamic shaker applying an iterative neural network algorithm*) consider an untypical control application, in which a neural network is used to control an electro-

dynamic shaker and reliably replicate human-induced ground reaction forces.

2.2. Structural health monitoring (3 papers)

Further three papers belong to the general area of structural health monitoring, which is the second core topic of the EACS conferences. All these publications consider larger-scale applications, ranging from concrete beams and wind turbine foundations up to reinforced concrete (RC) buildings.

J.X. Leon-Medina, N. Parés, D.A. Tibaduiza, M. Anaya, and F. Pozo (*Ensemble of feature extraction methods to improve the structural damage classification in a wind turbine foundation*) propose and test experimentally an ensemble feature extraction technique for classification of damages in wind turbine foundations using machine-learning classification by extreme gradient boosting (XGBoost).

M. Knak, E.J. Wojtczak, and M. Rucka (*Coda wave interferometry for monitoring the fracture process of concrete beams under bending test*) present and experimentally test a non-destructive monitoring approach of coda wave interferometry in the task of characterization of the fracture process in concrete beams.

A. Kwiecień, Z. Rakicevic, J. Chełmecki, A. Bogdanovic, M. Tekieli, Ł. Hojdys, M. Gams, P. Krajewski, F. Manojlovski, A. Soklarovski, O.F. Halici, T. Rousakis, and V. Vanian (*Experimental dynamic damage assessment of PUFJ protected brick infilled RC building during successive shake table tests*) present selected results of a Horizon 2020 EU project INMASPOL, focusing on experimental techniques for damage assessment of RC buildings with brick infill walls protected by polyurethane seismic joints (PUFJ) or polyurethane-bonded glass fibre grid (FRPU).

2.3. Other topics (2 papers)

The two remaining papers consider problems related to other areas within the conference scope.

H. Irschik and K. Krommer (*Dynamic displacement tracking in viscoelastic solids by actuation stresses: one-dimensional analytic example involving shock waves*) consider a closed-form analytic example involving uniaxial deformations of viscoelastic and purely elastic half-spaces under the action of a suddenly applied tensile surface traction that induces a propagating shock wave.

Finally, E. Jarzębowska, K. Augustynek, and A. Urbaś (*Motion tracking of a rigid-flexible link robotic system in an underactuated control mode*) study the problem of tracking control design in mechanical systems in the underactuated mode of operation. A computational procedure is obtained based on the constrained dynamics of structural joints.

3. CONCLUSIONS

Structural control and health monitoring is an area of active and dynamic research. It also has a large and obvious potential for important practical applications. This Special Section and the EACS conference series provide a snapshot of these new research directions. The authors, editors, and organizers foresee that this trend will continue to grow in the future.

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We are grateful to the participants, plenary and keynote lecturers, organizers of the special sessions, and members of the International Scientific Committee and the Organizing Committee of the EACS conference for shaping and creating this unique and lively event. We are also grateful to the Institute of Fundamental Technological Research (IPPT PAN) and the Committee on Mechanics of the Polish Academy of Sciences for providing a friendly and supportive environment for the conference. Finally, we are all indebted to the initiator and long-term patron of the conference, the European Association for the Control of Structures, for initiating the conference series, supporting it, and ensuring its growth over all these years.

holnicki
@ippt.pan.pl

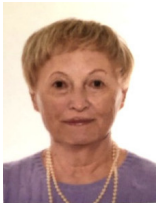
Jan Holnicki-Szulc is a Professor at the Institute of Fundamental Technological Research of the Polish Academy of Sciences (IPPT PAN). He graduated from the Warsaw Technical University (Civil Engineering) and Warsaw University (Mathematics) and is affiliated with the IPPT PAN since 1973. He has promoted the Department of Intelligent Technologies, devoted mostly to structural health monitoring problems, adaptive impact absorption, and dynamic load identification (both off-line and on-line). An author or co-author of 12 books and over 160 scientific papers. He has successfully supervised 17 PhD students up to now and accomplished 10 European research projects (FP4–FP7, H2000).

david.wagg
@sheffield.ac.uk

David Wagg is a Professor in the Department of Mechanical Engineering at the University of Sheffield, and Co-director for the Alan Turing Institute Research and Innovation Cluster for Digital Twins. David was awarded his undergraduate degree and PhD from University College London. From 1998 until 2013 he worked at the University of Bristol. In 2013 he moved to the University of Sheffield as a Professor of Nonlinear Dynamics. He is an expert on nonlinear dynamics and digital twins for engineering systems, and has published extensively including the book Nonlinear Vibration with Control (Springer, 2015, 2nd Ed).

fabio@dipmec.it

Fabio Casciati, degree in 1972, became a Full Professor of Strength of Materials in 1980 at the University of Pavia (Italy), from where he retired in 2019. He is currently an Aggregate Professor at Zhejiang University in Hangzhou (China). He has been one of the Editors in Chief of the Journal Smart Structures and Systems since 2005. The research interests include experimental dynamics and structural control, including active, semi-active and passive control as well as smart materials and structural monitoring.



lucia@dipmec.it

Lucia Faravelli, degree in 1972, became a Full Professor of Strength of Materials in 1990 at the University of Perugia (Italy). She moved in 1991 to the University of Pavia (Italy), from where she retired in 2017. She is currently an Aggregate Professor at Zhejiang University in Hangzhou (China). She is Editor in Chief of the Journal of Structural Control and Health Monitoring since 1994. The research interests include structural reliability and smart structures, including active and passive control as well as smart materials and structural monitoring.

ljank@ippt.pan.pl

Łukasz Jankowski is an Associate Professor at the Institute of Fundamental Technological Research of the Polish Academy of Sciences (IPPT PAN). He received the MSc degrees in mathematics (2001) and in computer science (2000), the PhD degree in mathematical physics (2004), and the DSc in mechanics (IPPT PAN, 2014). The research interests involve the area of inverse problems in structural mechanics and include smart, adaptive structures, semi-active structural control and structural health monitoring.