Sessions by Day

9th Forum on New Materials

Perugia, Italy • June 25-29, **2022**

CIMTEC2022

SYMPOSIUM FO

EMBODYING INTELLIGENCE IN STRUCTURES AND INTEGRATED SYSTEMS

Room: **SALA STAMPA**

Chair: Oded GOTTLIEB, Israel

14.30 *FO-2:IL01* **On the Use of Gyroscope and Accelerometer Sensors for Direct Displacement Measurements**
YIZHENG LIAO, **A.S. KIREMIDJIAN**, K. BALAFAS, R. RAJAGOPAL, Stanford University, Stanford, CA, USA; H.-C. LOH, University of California San Diego, USA

15.10 *FO-3:L01* **Efficient Method for Optimal Sensor Placement in Large-scale Structures**
M. OSTROWSKI, B. BLACHOWSKI, A. SWIERCZ, P. TAUZOWSKI, Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland; P. OLASZEK, Road and Bridge Research Institute, Warsaw, Poland; L. JANKOWSKI, Institute of Fundamental Technological Research, Polish Academy of Sciences, Poland

15.40 *FO-3:L02* **Semi-active Decentralized Vibration Damping Strategy in Two-dimensional Frame Structures**
B. POPLAWSKI, G. MIKUŁOWSKI, Ł. JANKOWSKI, Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland

16.10 *Break*

Chair: Anne S. KIREMIDJIAN, USA

16.40 *FO-3:L03* **Structural Glass Panels: an Integrated System**
G. BIDINI, L. BARELLI, C. BURATTI, G. CASTORI, E. BELLONI, **E. SPERANZINI**, University of Perugia, Department of Engineering, Perugia, Italy

17.10 *FO-3:IL04* **Adaptive Stiffness Structural Systems: State of the Art and Practice**
S. NAGARAJAIAH, Rice University, Houston, TX, USA

Poniższy abstrakt jest dostępny na stronie: Symposium FO (cimtec-congress.org)

FO-3:L01 **Efficient Method for Optimal Sensor Placement in Large-scale Structures**

M. OSTROWSKI, B. BLACHOWSKI, A. SWIERCZ, P. TAUZOWSKI, Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland; P. OLASZEK, Road and Bridge Research Institute, Warsaw, Poland; L. JANKOWSKI, Institute of Fundamental Technological Research, Polish Academy of Sciences, Poland

In practice, the broadly used finite element (FE) models can have very large number of degrees of freedom (DOFs). A small subset of DOFs representing sensor locations that provides an extremum of a selected objective function corresponding to a metric of the expected measurement accuracy is sought. Thus, optimal sensor placement is characterized by its complex combinatorial nature and tremendous computational effort required. With the aid of convex relaxation, the proposed approach allows one to transform the original combinatorial problem into its continuous counterpart, which requires smaller computational effort – by a few orders of magnitude than famous Effective Independence method. The effectiveness of the method has been demonstrated using an example of a FE model of an existing railway bridge. First, the FE model has been calibrated with measured responses of the bridge under the moving load of a passing train. Then, sensor layout has been obtained in such a way that it optimises the estimate of modal coordinates of the mode shapes participating most significantly in the measured structural response.

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