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EDITORIAL

Editorial for Special Issue Dedicated to VETOMAC XIV: Part 2

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The 14th International Conference on Vibration Engineering and Technology of Machinery (VETOMAC XIV) was successfully closed in September 2018 at Instituto Superior Técnico of the University of Lisbon under the joint organization of IDMEC—Institute of Mechanical Engineering, Instituto Superior Técnico, University of Lisbon (IDMEC/IST/UL) and the Department of Civil Engineering, NOVA School of Science and Technology, NOVA University of Lisbon (DEC/FCT/UNL).

The Scientific Program consisted of 6 Plenary lectures, around 150 regular presentations and almost 20 poster presentations. Presentations were grouped according to 13 Mini-Symposia and 13 General Conference Topics. The conference was attended by almost 170 participants from 34 countries. The main objective of the conference was to bring together researchers and engineers devoting their work to vibration-related problems in different areas of engineering applications on a common platform.

We strongly believe that VETOMAC XIV had a significant impact on the development of contemporary analytical, numerical and experimental methods in vibration problems, and created an opportunity for opening a forum for discussion and collaboration among the participants. Several VETOMAC participants have opted to get their papers published in this journal. From among them two special issues are prepared containing the papers that have been accepted in accordance with the review procedure of *Journal of Vibration Engineering and Technologies*. I wish to thank the authors for contributing a diverse set of topics covered by their research articles to the special issues. The assistance of the reviewers is greatly appreciated as well. Accepted papers are separated into two groups according to a criterion whether they were conceived mainly as theoretical studies or as some practical industrial application. This is the second issue dedicated to VETOMAC XIV grouping together ten selected papers covering relevant industrial applications.

The first two papers are concerned with fault detection by techniques which were recently enriched by several artificial intelligence methods. In the one by Turki Haj Mohamad et al., fault identification is enabled by alterations in nonlinear behavior of studied dynamic systems. In particular, the paper presents an overview of a technique developed by this research team, known as Phase Space Topology, which provides gratifying results and remarkable effectiveness in machinery fault detection. The method is based on the hypothesis that the nonlinear response of dynamic systems contains valuable information about the system, given the intrinsic nonlinear nature of real systems. The other paper by Thiago Lobato et al. bases the identification on ensemble empirical mode decomposition and support vector machine. Augmented data and feature selection with a genetic algorithm are used to improve the accuracy of the analysis. The method is then tested on vibration signals obtained from a rotor test rig with different types of faults. Experimental results showed that the proposed method successfully detected these faults with very high accuracy.

The next paper by Romuald Jerzy Rzadkowski et al. deals with the last stage of the low-pressure mistuned steam turbine bladed disc during run-down. Mistuned bladed disc on shaft was analyzed experimentally in a vacuum spin chamber and the corresponding vibration modes and frequencies were identified from measurements provided by the tip-timing method. The natural frequencies and mode shapes were also obtained numerically by the finite element method. In some modes, the agreement between experimental and numerical results was satisfactory only for mistuned bladed disc on shaft, confirming the importance of such dynamic interaction.

The paper by Ravindra S Birajdar et al. is dedicated to better understanding of mechanical and hydraulic unbalances originating strong dynamic effects in vertical turbine pumps. It is known that in many cases, the resulting hydraulic forces due to hydraulic unbalance can have the same

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effect as forces arising from the mechanical unbalance. The vibration prediction should be based on coupled fluid–structure interaction, but this paper highlights the advantages of a one-way approach. At a specific operating condition, reasonable correlation with measured data can be obtained.

The paper by Alexander Taratorkin et al. deals with all-wheel drive vehicle where gear shifting generates on the transmission shafts low-frequency high-energy torsional oscillations, which reduce driving comfort due to excitation of longitudinal oscillations with high acceleration levels. It was concluded by numerical simulations that the effectiveness of a control algorithm to mitigate these vibrations, based on a power control input redistribution, is largely influenced by the initial conditions at the moment of kinematic equalizing of the driving and driven elements of the shifted gear.

The next three papers are concerned with machining accuracy. The paper by Wenhua Ye et al. concluded that machining accuracy is highly influenced by a nonlinear thermo-mechanical coupling in a spindle feed system, due to exposure to cutting forces, cutting heat and frictional heat. A thermo-mechanical coupling model is deduced and solved by the finite element method. For initial conditions, real-time dynamic cutting force and the associated heat values of the machine tool during machining are determined. Experimental measurements confirmed conclusions obtained numerically with quite acceptable agreement. The aim of the paper by Nitin Ambhore et al. is to evaluate vibration acceleration and surface roughness with dependence on machining parameters such as cutting speed, feed and depth of cut to develop a predictive mathematical model. In focus are hardened steels that are being extensively used in aerospace, automobile and other industries. The results of several experimental runs were subjected to regression analysis to develop a suitable mathematical model. The artificial neural network was further implemented in MATLAB tool and mathematical predictions obtained were contained within acceptable deviations from experiments. Laminates of carbon fiber polymer and titanium alloy are widely used in aerospace industry as written in the paper by Sheng Leng et al., focusing on tool wear detection during drilling of such laminates. The tool wear was experimentally evaluated by acoustic emission signals, which were after that carefully analyzed by methods of statistical analysis, spectral analysis and wavelet packet. It has been found that the percentage of wavelet packet energy within certain frequency intervals varies with the tool wear, which can be used for predictions in monitoring systems.

The structural coupling of adjacent buildings was analyzed in the paper by Augusto de Souza Pippi et al. The aim is to evaluate a control technique effectiveness designed to reduce the vibrations originated by seismic actions. Realistic models of adjacent buildings calibrated by experimental results and connected by passive control devices were subjected to numerical analyses with alternate directions of the seismic action. Particle swarm optimization method applied on quantity, position and mechanical properties of the controlling devices achieved significant reductions in maximum displacements.

The last paper of this issue presents an experimental analysis of an inverted pendulum type tuned mass damper, conducted by Diogo V. Resende et al. The damper is used to control vibrations of a main dynamic system with one degree of freedom. Such a configuration is simple and can therefore be solved semi-analytically, but the main purpose of this paper is to confirm the results obtained numerically by experimental analysis with video system data acquisition. In addition, sensitivity analysis and optimization of tuned mass damper parameters under several configurations are performed.

It is hoped that these special issues dedicated to VETOMAC XIV will give an overview of the current research efforts and hence will serve as a useful resource for researchers and students interested in vibration engineering and science. I take this opportunity to thank my colleague, Nuno Maia for accepting to join me as VETOMAC chairperson. I am grateful to Mini-Symposia organizers for their contribution to the success of the conference. I would also like to thank the members of the Steering and Scientific Committee for their support.

I am especially grateful to Jammi Srinivasa Rao, Editor in Chief of "Journal of Vibration Engineering & Technologies" for giving me the opportunity to organize VETOMAC XIV and conduct the editorial work on these two special issues.

Guest editor, Chairperson of VETOMAC XIV.