# ICANDVC-2021

## Online Keynotes on 17-18 Aug 2021
## Conference date 23-25 Aug @ Zhuhai, China

**Weidong Zhu,**
**Department of Mechanical Engineering,**
**University of Maryland, Baltimore County**

*Chaired by Xingjian Jing*
*Hong Kong Polytechnic University*

**Time**: 9:30-10:30, 17 Aug 2021

**Link:** https://meeting.tencent.com/s/XfLJSOV4vrH5

**Tencent Meeting ID**：276 642 012

**Topic**: Dynamics of time-varying, nonlinear, and flexible multibody systems and phononic structures

**Abstract**: Some interesting results on the dynamics of continuous systems are reviewed. They involve: 1) vibration and stability of translating media with time-varying lengths and/or velocities; 2) nonlinear vibrations of systems with large degrees of freedom and general nonlinearities; 3) new spatial discretization methods for one- and two-dimensional continuous systems; 4) new formulations of flexible multibody dynamics with application to elevator traveling cables; and 5) elastic wave propagation in nonlinear phononic structures. Two types of dynamic stability problems are addressed from the energy viewpoint in the first area: dynamic stability of translating media during extension and retraction, and parametric instabilities in continuous systems with periodically varying lengths and/or velocities. The incremental harmonic balance method is used in the second area to handle periodic responses of high-dimensional models of nonlinear continuous systems and their stability and bifurcations, as well as quasi-periodic responses. New

spatial discretization methods in the third area ensures that all boundary conditions of continuous systems are satisfied, and hence uniform convergence of solutions. New nonlinear models of slack cables with bending stiffness and arbitrarily moving ends are developed for moving elevator traveling cables in the fourth area. A minimal number of degrees of freedom are needed to achieve the same accuracy as that of the finite element method. Wave propagation analysis of phononic structures with finite deformations are developed in the fifth area to study influences of nonlinearities on wave propagation characteristics. Some experimental results are presented to validate theoretical predictions.

**Biographical Sketch**: Weidong Zhu is a Professor in the Department of Mechanical Engineering at the University of Maryland, Baltimore County, and the founder and director of its Dynamic Systems and Vibrations Laboratory and Laser Vibrometry Laboratory. He received his double major BS degree in Mechanical Engineering and Computational Science from Shanghai Jiao Tong University in 1986, and his MS and PhD degrees in Mechanical Engineering from Arizona State University and the University of California at Berkeley in 1988 and 1994, respectively. He is a recipient of the 2004 National Science Foundation CAREER Award. He has been an ASME Fellow since 2010, and has served as an Associate Editor of the ASME Journal of Vibration and Acoustics and the ASME Journal of Dynamic Systems, Measurement and Control, and as a Subject Editor of the Journal of Sound and Vibration and Nonlinear Dynamics. His research spans the fields of dynamics, vibration, control, applied mechanics, structural health monitoring, renewable energy, and metamaterials, and involves analytical development, numerical simulation, experimental validation, and industrial application. He has published 245 archival journal papers in these areas and holds five U.S. patents. He is a recipient of the 2020 University System of Maryland Board of Regents Faculty Award for Excellence in Research.

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**Huajiang Ouyang,**
**University of Liverpool, UK**

*Chaired by Xingjian Jing*
*Hong Kong Polytechnic University*

**Time**: 16:00-17:00, 17 Aug 2021

**Link:** https://meeting.tencent.com/s/TVVXXIWI9vtr

**Tencent Meeting ID**：457 614 797

**Topic**: Friction-induced vibration and viro-impact in triboelectric energy harvesting

**Abstract**: Electrostatic energy harvesting (EEH) is a distinct means of energy harvesting. Although it is not as widely used and studied as piezoelectric energy harvesting (PEH) and electromagnetic energy harvesting (EMEH), it has several advantages. Triboelectric energy harvesting (THE) is a special kind of EEH and has attracted much attention in recent years, advocated and largely advanced by Prof Zhonglin Wang's group at Georgia Tech in their work on triboelectric nanogenerators (TENGs) in recent years. The majority of research work on TEH is on material science, manufacturing and electric circuit design. There is a lack of research into friction-induced vibration and vibro-impact that are essential in TEH, which we think has hindered the improvement in harvesting efficiency and wide use of this new kind of energy harvesters. This talk introduces the concepts of TEH and discusses several challenging research issues concerning TEH. It presents numerical results of friction-induced vibration and vibro-impact, and electric outputs from simulations conducted by the Dynamics and Control Group at the University of Liverpool. It also covers some experimental results.

**Biographical Sketch**: Huajiang Ouyang received BEng and MSc in Engineering Mechanics in 1982 and 1985, respectively, and PhD in Structural Engineering in 1989, at Dalian University of Technology, China. He is a full Professor at the School of Engineering at the University of Liverpool and Head of the Dynamics and Control Research Group. Dr Ouyang is a Fellow of Institute of Physics and a Fellow of Higher Education Academy. He was a Royal Academy of Engineering and Leverhulme Trust Senior Research Fellow in 2009-2010. He is also a Changjiang Chair Professor. He is a Deputy Editor-in-Chief of Journal of Sound and Vibration, European Editor of International Journal of Vehicle Nosie and Vibration and on the editorial boards of Applied Sciences and Chinese Journal of Computational Mechanics. He has published 255 journal papers and 112 conference papers. His main search areas are structural dynamics and control, and structural identification. He is particularly interested in friction-induce vibration, moving-load dynamics and inverse structural modifications, and in the last few years, vibration-based energy harvesting.

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**Janko Slavič,**
**University of Ljubljana, Slovenia**

*Chaired by Xingjian Jing*
*Hong Kong Polytechnic University*

**Time**: 14:00-15:00, 18 Aug 2021

**Link:** https://meeting.tencent.com/s/N1mCyhOBqi9p

**Tencent Meeting ID**：903 975 218

**Topic**: Recent advances in vibration fatigue research

**Abstract**: Vibration fatigue describes the fatigue of flexible structures where the frequency range of the excitation forces is overlapping with the natural dynamics of the excited structure. The goal of vibration fatigue is to understand the mechanics of failure and to estimate the fatigue life. If classical fatigue is focused into time-domain fatigue life estimation, the vibration fatigue is focused into frequency-domain fatigue life estimation. Initially, the fatigue load counting methods in the frequency-domain have been researched; however, recent years have seen a significant progress in the field of structural-dynamics-based fatigue research.

This contribution will present the recent status in the field of vibration fatigue. Initially the basics of the uniaxial vibration fatigue will be presented. Due to the limitations of the uniaxial approach the multiaxial criteria have seen significant research attention; selected multiaxial criteria and modal-decomposition-based approach will be discussed. Most recent research in the field of vibration fatigue is focused into non-Gaussian, non-stationary and multi-axis loads. Recent

theoretical and experimental research will be discussed to show the importance of the non-stationarity and the non-Gaussianity.

**Biographical Sketch**: Janko Slavič, is the first author of the Elsevier book Vibration Fatigue by Spectral Methods (Sep 2020), he is a full professor of Mechanics at the University of Ljubljana, Faculty of Mechanical Engineering. He authored close to 80 SCI scientific articles, most of them in Q1 journals, his h-index is 17. He supervised 13 finished PhD projects and is currently supervising 6. His research interest are in signal processing, vibration fatigue, optical structural identification methods, and smart 3D printed structures. He is a member of the Editorial board of Mechanical Systems and Signal Processing. Prof. Slavič is also a regular contributor to open-source scientific packages; recently, he co-authored a Nature Methods publication which received close to 300 WoS citations in the first 6 months since publication.