

Proceedings of the ASME

**INTERNATIONAL DESIGN ENGINEERING TECHNICAL
CONFERENCES & COMPUTERS AND INFORMATION IN
ENGINEERING CONFERENCE
- 2019 -**

VOLUME 8

**31ST CONFERENCE ON MECHANICAL
VIBRATION AND NOISE**

presented at

**ASME 2019 INTERNATIONAL DESIGN ENGINEERING TECHNICAL CONFERENCES &
COMPUTERS AND INFORMATION IN ENGINEERING CONFERENCE**

AUGUST 18-21, 2019

ANAHEIM, CALIFORNIA, USA

sponsored by

**DESIGN ENGINEERING DIVISION, ASME
COMUTERS AND INFORMATION IN ENGINEERING DIVISION, AMSE**

**THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Two Park Avenue * New York, NY. 10016**

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Statement from By-Laws: The Society shall not be responsible for statements or opinions Advanced in papers...or printed in its publications (7.1.3)

INFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY ASME FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NEITHER ASME NOR ITS AUTHORS OR EDITORS GUARANTEE THE ACCURACY OR COMPLETENESS OF ANY INFORMATION PUBLISHED IN THIS WORK. NEITHER ASME NOR ITS AUTHORS AND EDITORS SHALL BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR DAMAGES ARISING OUT OF THE USE OF THIS INFORMATION. THE WORK IS PUBLISHED WITH THE UNDERSTANDING THAT ASME AND ITS AUTHORS AND EDITORS ARE SUPPLYING INFORMATION BUT ARE NOT ATTEMPTING TO RENDER ENGINEERING OR OTHER PROFESSIONAL SERVICES. IF SUCH ENGINEERING OR PROFESSIONAL SERVICES ARE REQUIRED, THE ASSISTANCE OF AN APPROPRIATE PROFESSIONAL SHOULD BE SOUGHT.

For authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act, contact the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, Tel: 978-750-8400

Requests for special permission or bulk reproduction should be addressed to permissions@asme.org.

ISBN NO. 978-0-7918-5928-5

**© 2019 ASME
All rights reserved.**

Printed in U.S.A with permission by Curran Associates, Inc. (2020)

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

CONTENTS

31ST CONFERENCE ON MECHANICAL VIBRATION AND NOISE

DYNAMICS AND WAVES IN SOLIDS AND METAMATERIALS

DETC2019-97186..... **V008T10A001**

Using Complex Orthogonal Decomposition to Extract Dispersion Relationships for
Mass Chain

N. A. Valente, R. A. Caldwell Jr.

DETC2019-97673..... **V008T10A002**

Experimental Investigations Into Broadband Vibration Absorption of Metastructures
With Lattice Designs

Joshua R. Tempelman, Audun Myers, Melih C. Yesilli, Firas A. Khasawneh

DETC2019-97879..... **V008T10A003**

Internal Resonance of Plane Waves in Nonlinear Lattices

Matthew D. Fronk, Michael J. Leamy

DETC2019-97888..... **V008T10A004**

Acoustic Non-Reciprocal Band Structure in a Passive, Nonlinear, 1D Material

Lezheng Fang, Amir Darabi, Alexander F. Vakakis, Michael J. Leamy

DETC2019-98414..... **V008T10A005**

On the Spectro-Spatial Wave Features in Nonlinear Metamaterials With Multiple Local
Resonators

Mohammad A. Bukhari, Oumar R. Barry

DYNAMICS OF MEMS AND NEMS

DETC2019-97295..... **V008T10A006**

Experimental Study of Cochlear Dynamics With an Intracochlear Acoustic Micro-
Actuator

Sergiy Taylakov, I. Y. Shen

DETC2019-98505..... **V008T10A007**

On Quality Factor Improvement in a NEMS Resonator With Nonlinear Damping

Subramanian Ramakrishnan, Md Raf E Ul Shoukat

DYNAMICS OF SOFT MEDIA AND ROBOTICS

DETC2019-97706..... **V008T10A008**

Design and Optimization of an Origami-Inspired Jumping Mechanism With Nonlinear
Stiffness Properties

Sahand Sadeghi, Blake D. Betsill, Suyi Li

ENERGY HARVESTING

DETC2019-97224..... V008T10A009

Nonlinear Response Identification of an Asymmetric Bistable Harvester Excited at Different Bias Angles by Multiscale Entropy and Recurrence Plot

Wei Wang, Junyi Cao, Chris R. Bowen, Grzegorz Litak

DETC2019-97271..... V008T10A010

Theoretical Modeling and Performance Analysis for Electromagnetic Energy Harvesting From Galloping

Ting Tan, Weipeng Sun, Zhimiao Yan, Wenming Zhang

DETC2019-97273..... V008T10A011

Design and Simulation Analysis of Vibration Energy Harvesting System Based on ADAMS

Ziheng Zhu, Lin Xu, Mohamed A. A. Abdelkareem, Junyi Zou, Jia Mi

DETC2019-97291..... V008T10A012

Framed Harvesters for Collecting Energy From Vibrations in Industrial Plants

Alberto Doria

DETC2019-97363..... V008T10A013

A Non-Traditional Variant Nonlinear Energy Sink: Transient Responses

Youzuo Jin, Kefu Liu, Deli Li, Liuyang Xiong, Lihua Tang

DETC2019-97555..... V008T10A014

Mathematical Modeling of a Two Degree of Freedom Vibration Energy Harvester for Low Speed Rotary Structure Application

Saman Nezami, Soobum Lee

DETC2019-97588..... V008T10A015

An Underwater Magnetically Coupled Bistable Vibration Energy Harvester Using Wings

Hong-Xiang Zou, Ke-Xiang Wei, Lin-Chuan Zhao, Wen-Ming Zhang, Lei Zuo, Feng Qian

DETC2019-97807..... V008T10A016

Orbit Jumps of Monostable Energy Harvesters by a Bidirectional Energy Conversion Circuit

Jiahua Wang, Bao Zhao, Junrui Liang, Wei-Hsin Liao

DETC2019-97862..... V008T10A017

Exploiting Nonlinear Dynamics and Energy Localization to Enhance the Performances of an Electromagnetic Vibration Energy Harvester

Kaouthar Aouali, Najib Kacem, Noureddine Bouhaddi, Elyes Mrabet, Mohamed Haddar

DETC2019-98040..... V008T10A018

Design and Dynamics of Hybrid Wave and Current Energy Converter

Shuo Chen, Boxi Jiang, Xiaofan Li, Qiuchi Xiong, Jianuo Huang, Lei Zuo

DETC2019-98127..... **V008T10A019**
An Archimedean Screw Based Energy Harvester for Oil Extraction, Water Injection,
and Related Activities
Rui Lin, Boxi Jiang, Lei Zuo

DETC2019-98209..... **V008T10A020**
Maximizing the Power Extraction From Train Suspension Energy Harvesting System
Luigi Costanzo, Massimo Vitelli, Yu Pan, Lei Zuo

DETC2019-98370..... **V008T10A021**
Multi-Parameter Coupling Effect of Wearable Energy Harvesting Backpack From
Human Motion
Zehao Hou, Junyi Cao, Lei Zuo

DETC2019-98499..... **V008T10A022**
Key Issues on Flextensional Piezoelectric Energy Harvester Developments
Tian-Bing Xu, Lei Zuo

FLUID-INDUCED VIBRATIONS

DETC2019-97250..... **V008T10A023**
Independent Asymmetric Period-3 Motions in a Periodically Forced Double-Pendulum
Albert C. J. Luo, Chuan Guo

DETC2019-97259..... **V008T10A024**
On Period-1 and Period-2 Motions of a Jeffcott Rotor System
Yeyin Xu, Albert C. J. Luo

DETC2019-97292..... **V008T10A025**
Period-1 to Period-2 Motions in a Periodically Forced Nonlinear Spring Pendulum
Albert C. J. Luo, Yaoguang Yuan

DETC2019-97716..... **V008T10A026**
Periodic Motions in a Single-Degree-of-Freedom System Under Both an Aerodynamic
Force and a Harmonic Excitation
Bo Yu, Albert C. J. Luo

DETC2019-98291..... **V008T10A027**
Reduced-Order Modeling and Experimental Studies of Two-Way Coupled Fluid-
Structure Interaction in Flapping Wings
Ryan K. Schwab, Heidi E. Reid, Mark A. Jankauski

DETC2019-98313..... **V008T10A028**
Real-Time Simulation of Unmanned Rotorcraft With Ground Effect Through Adjoint
Theorem
Jianzhe Huang

INDUSTRIAL APPLICATIONS OF VIBRATION AND ACOUSTICS

DETC2019-97331..... V008T10A029

Transient Vibrations of Two-Dimensional Beam Frames at Mid- and High-Frequencies
Yichi Zhang, Bingen Yang

JOINTED STRUCTURES, CONTACT, AND FRICTION

DETC2019-97643..... V008T10A030

Belt-Drive Mechanics: Energy Losses in the Presence of Detachment Waves
Yingdan Wu, Michael J. Leamy, Michael Varenberg

NONLINEAR SYSTEMS AND PHENOMENA

DETC2019-97262..... V008T10A031

Regenerative Cutting Dynamics for a Periodically Forced Machine-Tool System
Siyuan Xing, Albert C. J. Luo

DETC2019-97322..... V008T10A032

Identification of a Laboratory Slide Drilling Experiment: The Relationship Between the Top Drive Rotation and the Tool-Face Angle
Kaidong Chen, Xiaoyu Zhong, Zaibin Cheng, Yingjie Lu, Qiucai Lu

DETC2019-97325..... V008T10A033

Laboratory Experiment of Slide Drilling Tool-Face Control Based on Model Similarity Theory
Xiaoyu Zhong, Kaidong Chen, Zaibin Cheng, Yingjie Lu, Qiucai Lu

DETC2019-97644..... V008T10A034

On Nonlinear Dynamics and Control of an Inverted Flexible Pendulum System With Chaos
Hartiny Kahar, Dirk Soffker

DETC2019-97697..... V008T10A035

Nonlinear Dynamics of Nonlinear L-Shape Piezoelectric Systems for Positive and Reverse Sweep Waveform
Ming Hui Yao

DETC2019-97867..... V008T10A036

Backward Mechanical-Electric Coupling Effect of a Frequency-Up-Conversion Piezoelectric Energy Harvester
Fengxia Wang, Saeed Onsorynezhad

DETC2019-97883..... V008T10A037

Discontinuous Dynamics of a Frequency Up-Conversion Piezoelectric Harvester
Saeed Onsorynezhad, Fengxia Wang

DETC2019-97944..... **V008T10A038**

Modeling Nonlinear Oscillators via Variable-Order Fractional Operators
Sansit Patnaik, Fabio Semperlotti

DETC2019-97947..... **V008T10A039**

Stability Analysis of High-Performance Drones With Suspended Payloads
Samantha Hoang, Yifeng Liu, Alberto Aliseda, I. Y. Shen

PASSIVE AND ACTIVE CONTROL OF VIBRATION, SHOCK, AND NOISE

DETC2019-97028..... **V008T10A040**

IBM POWER9 Systems, Shock Simulation and Testing Validation
Arshad Alfoqaha, Kevin O'Connell, Eric Campbell

DETC2019-97572..... **V008T10A041**

Tip Position Control of Single Flexible Links via Parallel Feedforward Compensation
Keyvan Noury, Bingen Yang

DETC2019-98044..... **V008T10A042**

Optimum Design of a New Tuned Inerter Mass Damper (TIMD) Passive Vibration Control for Stochastically Motion-Excited Structures
Wei-Che Tai

DETC2019-98092..... **V008T10A043**

Piezoelectric Subordinate Oscillator Arrays: Performance Recovery and Robustness to Uncertainty
John Sterling, Sai Tej Paruchuri, Pablo Tarazaga, Joseph Vignola, Andrew Kurdila, Vijaya V. N. Sriram Malladi, Teresa Ryan

ROTATING SYSTEMS AND ROTOR DYNAMICS

DETC2019-97052..... **V008T10A044**

Influence of Different Design Parameters on the Theoretical Flow Ripple in Balanced Vane Pumps
Mattia Battarra, Emiliano Mucchi

DETC2019-97334..... **V008T10A045**

Two Way Coupled Analysis of Fluid Force in the Annular Plain Seal and Vibration of the Rotor System Using Shooting Method
Yudai Kunori, Tsuyoshi Inoue, Kenjiro Miyake

DETC2019-97404..... **V008T10A046**

Nonlinear Vibration Analysis of a Flexible Rotor Supported by a Journal Bearing Considering Journal Angular Motion
Nuntaphong Koondilopiboon, Tsuyoshi Inoue

DETC2019-97531..... **V008T10A047**

Unsteady Aerodynamic Modeling and Prediction of Loads for Rotary Wings in Forward Flight

Abdallah Dayhoum, Mohamed Y. Zakaria, Omar E. Abdelhamid

DETC2019-97737..... **V008T10A048**

Study on the Dynamic Response of an Unbalanced Rotor System Supported by Ball Bearings

Bin Fang, Jinhua Zhang, Ke Yan, Jun Hong

DETC2019-97903..... **V008T10A049**

Command Shaping Control of a Vertically Rotating Flexible Beam

Khaled A. Alhazza

DETC2019-98010..... **V008T10A050**

Numerical Study of Superharmonic Resonances in a Mistuned Horizontal-Axis Wind-Turbine Blade-Rotor Set

Ayse Sapmaz, Gizem D. Acar, Brian F. Feeny

DETC2019-98101..... **V008T10A051**

A Lower Pad Adjustable Bearing Reducing Vibration Response of Rotor Systems During Acceleration

Lei Zhang, Hua Xu, Shenglun Zhang, Shiyuan Pei

STRUCTURAL DAMAGE DETECTION AND DIAGNOSTICS

DETC2019-97026..... **V008T10A052**

A Hierarchical Bayesian Method for Time Domain Structure Damage Detection

Wei Feng, Qiaofeng Li, Qiucai Lu

DETC2019-97072..... **V008T10A053**

Model Based Determination of Size and Location of a Crack in a Rotor System Using Wavelet Transformation and Pattern Search Optimization

Rajiv Kumar Vashishtha

DETC2019-97290..... **V008T10A054**

Investigation on Adaptive Filter for On-Line Detection and Active Control of Chatter Vibration in Milling Process

Shaoke Wan, Xiaohu Li, Wenjun Su, Jun Hong

DETC2019-98004..... **V008T10A055**

A Computational Investigation Into the Impact of Sensor Location on the Acoustics-Based Damage Detection From an Airfoil Structure

Caleb Traylor, Murat Inalpolat

DETC2019-98119..... **V008T10A056**

Evaluation of the ISHM Method Applied for Composite Rotors

Karina M. Tsuruta, Lucas A. A. Rocha, Aldemir Ap. Cavalini Jr, Roberto M. Finzi Neto, Valder Steffen Jr.

DETC2019-98123..... **V008T10A057**
Experimental and Numerical Investigation of Residual Stress Stiffening Influence on
Dynamic Response of Welded Structures
AmirHossein MajidiRad, Yimesker S. Yihun

DETC2019-98140..... **V008T10A058**
The Importance of Energy Criteria for Selecting Modes in Reduced Order Modeling
Suparno Bhattacharyya, Joseph P. Cusumano

TIME-DELAY SYSTEMS AND DISCONTINUOUS DYNAMICAL SYSTEMS

DETC2019-97060..... **V008T10A059**
A SPICE Sub-Circuit Model for Backward Diode
Wei Wu, Fengxia Wang, Andy G. Lozowski

DETC2019-97260..... **V008T10A060**
Complete Bifurcation Trees of Independent Period-2 Motions to Chaos in a
Parametrically Excited Pendulum
Yu Guo, Albert C. J. Luo

DETC2019-97876..... **V008T10A061**
Periodic Motions in a Discontinuous Dynamical System With Two Circular Boundaries
Siyu Guo, Albert C. J. Luo

VIBRATION AND STABILITY OF MECHANICAL SYSTEMS

DETC2019-97166..... **V008T10A062**
A Transient Model of Inductrack Dynamic Systems
Ruiyang Wang, Bingen Yang

DETC2019-97203..... **V008T10A063**
Damping-Induced Stability Transitions in Non-Conservative Systems: New Thoughts
on an Old Paradox
Mahmoud Abdullatif, Ranjan Mukherjee, Aren Hellum

DETC2019-97204..... **V008T10A064**
Effect of Intermediate Support on Instabilities of a Cantilever With Terminal Dynamic
Moment
Mahmoud Abdullatif, Ranjan Mukherjee

DETC2019-97773..... **V008T10A065**
Aeroservoelastic Modeling and Stability Analysis
Yu Wang, Wei Tang, Mao Cui, Gongping Zhang

DETC2019-97893..... **V008T10A066**
Critical Stability of a Hinged Beam With Dynamic Moment: With and Without External
Flow
Mahmoud Abdullatif, Ranjan Mukherjee, Aren Hellum

DETC2019-98354..... **V008T10A067**

On the Friction Isolator for Precision Motion Control and its Dynamics

Xin Dong, Chinedum Okwudire, Jiamin Wang, Oumar Barry

VIBRATION OF CONTINUOUS SYSTEMS

DETC2019-97044..... **V008T10A068**

Cross-Well Dynamics of Bistable Cross-Ply Laminates

Samir A. Emam, Daniel J. Inman

DETC2019-97139..... **V008T10A069**

Vibrations of a Double Beam Structure Carrying a High-Pressure Driven Projectile

Alexander Khair, Bingen Yang

DETC2019-97257..... **V008T10A070**

Dynamic Analysis and Parametric Resonance of a Fast Projection System

Hao Gao, Bingen Yang

DETC2019-97263..... **V008T10A071**

A New Approach to Compute Natural Frequencies and Mode Shapes of Non-Uniform

Continuous Bar, Circular Shaft and Beam Vibration

Alok Sinha

DETC2019-97582..... **V008T10A072**

An Incremental Harmonic Balance Method With Two Time Scales for Quasi-Periodic

Motion of Nonlinear Systems With Cubic Nonlinearity

Jianliang Huang, Weidong Zhu, Shuhui Chen

DETC2019-98058..... **V008T10A073**

Dynamic Analysis of a Rotating Planar Timoshenko Beam Using an Accurate Global

Spatial Discretization Method

W. Fan, W. D. Zhu, H. Zhu

DETC2019-98085..... **V008T10A074**

Comparison of Frequency Response of Primary Resonance of DWCNT and CNT

Resonators Under Electrostatic Actuation

Dumitru I. Caruntu, Ezequiel Juarez

DETC2019-98104..... **V008T10A075**

Frequency Response of Parametric Resonance of Electrostatically Actuated Circular

Plates Under Hard Excitations

Julio Beatriz, Dumitru I. Caruntu