

**Proceedings of ASME 2021
International Design Engineering
Technical Conferences and
Computers and Information in
Engineering Conference
(IDETC-CIE2021)**

Volume 10

**33RD CONFERENCE ON MECHANICAL
VIBRATION AND SOUND (VIB)**

**August 17-19, 2021
Virtual, Online**

Conference Sponsors
Design Engineering Division

Computers and Information
in Engineering Division

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Two Park Avenue * New York, N.Y. 10016

© 2021, The American Society of Mechanical Engineers, 2 Park Avenue, New York, NY 10016, USA
(www.asme.org)

All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

INFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS 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.

ASME shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B7.1.3). Statement from the Bylaws.

For authorization to photocopy material for internal or personal use under those 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, www.copyright.com.

Requests for special permission or bulk reproduction should be addressed to the ASME Publishing Department, or submitted online at: <https://www.asme.org/publications-submissions/journals/information-for-authors/journalguidelines/rights-and-permissions>

ISBN: 978-0-7918-8547-5

CONTENTS

Proceedings of ASME 2021 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference IDETC-CIE2021 Volume 10

33RD CONFERENCE ON MECHANICAL VIBRATION AND SOUND (VIB)

Dynamics and Waves in Solids and Metamaterials

- DETC2021-71319** **V010T10A001**
Frequency Tunable Phononic Crystal Flat Lens for Subwavelength Imaging
Hrishikesh Danawe and Serife Tol
- DETC2021-71840** **V010T10A002**
Negative Refractive Index in a Two-Dimensional Nonlinear Rotator Lattice
Lezheng Fang and Michael J. Leamy

Dynamics of Soft Media and Robotics

- DETC2021-70823** **V010T10A003**
A Modified Incremental Harmonic Balance Method for Periodic Forced Oscillations of a Dielectric Elastomer Membrane Undergoing In-Plane Deformation
Jian Zhang, Jian Zhao, Xuefeng Wang, and Hongyu Wang

Energy Harvesting

- DETC2021-68922** **V010T10A004**
On the Mechanical Behaviour in Stiffness Compensated Piezoelectric Beams - An Experimental Investigation Towards Energy Harvesting
E. van de Wetering, T. W. A. Blad, and R. A. J. van Ostayen
- DETC2021-69977** **V010T10A005**
Numerical Analysis and Parameter Optimization of a Portable Two-Body Attenuator Wave Energy Converter
Joseph Capper, Jia Mi, Qiaofeng Li, and Lei Zuo

Industrial Applications of Vibration and Acoustics

- DETC2021-70585** **V010T10A006**
Health Monitoring Using Acoustic Emission Technique During Fused Filament Fabrication Printing Process
Ke Xu and Souran Manoochehri

Jointed Structures, Contact, and Friction

- DETC2021-68456** **V010T10A007**
Combined Coulomb and Viscous Damping Estimation Using Topological Signal Processing
Audun Myers and Firas A. Khasawneh
- DETC2021-70590** **V010T10A008**
Guidelines for Optimizing the Error in Area Ratio Damping Estimation Method
Balija Santoshkumar and Firas A. Khasawneh
- DETC2021-70934** **V010T10A009**
3D Linear Identification of Mechanical Joint Using FRF Decoupling and Inverse Structural Modification Methods
Hossein Soleimani, Ender Cigeroglu, and H. Nevzat Özgüven

DETC2021-71360 **V010T10A010**
A Strategy for Fine Mesh Resolution in Contact Mechanics
Gaurav Chauda and Daniel J. Segalman

Machine Learning Applications in Vibrations and Dynamics

DETC2021-66701 **V010T10A011**
Data Augmentation for Roller Bearing Health Indicator Estimation Using Multi-Channel
Frequency Data Representations
Jacob Hendriks and Patrick Dumond

DETC2021-67773 **V010T10A012**
Towards Generalization of Intelligent Fault Detection for Roller Element Bearings via Distinct
Dataset Transfer Learning
Justin Larocque-Villiers and Patrick Dumond

Nonlinear Systems and Phenomena (VIB/MSNDC)

DETC2021-66815 **V010T10A013**
Non-Synchronous Vibration and Lock-in Regimes in Coupled Structures Using Reduced Models
Miroslav Byrtus, Štěpán Dyk, and Michal Hajžman

DETC2021-70228 **V010T10A014**
Analytical Study of Dry Whip Phenomena During Rotor-Stator Rub
Aman K. Srivastava, Anurag Kumar, Mayank Tiwari, and Akhilendra Singh

DETC2021-70764 **V010T10A015**
Model Order Reduction for a Piecewise Linear System Based on Dynamic Mode Decomposition
Akira Saito

DETC2021-71431 **V010T10A016**
Vibration Suppression of a Harmonically Forced Oscillator via a Parametrically Excited
Centrifugal Pendulum
Aakash Gupta and Wei-Che Tai

Passive and Active Control of Vibration, Shock, and Noise

DETC2021-71374 **V010T10A017**
Reduction of Whole Body Vibration in a Wide Frequency Range Using Inflation Pressure Control
of Air Bladder Cushion
*Pavan Nuthi, Yixin Gu, Aida Nasirian, Alexandra Lindsay, Himanshu Purandare, Nischita
Haldipurkar, Kashish Shah, and Muthu B. J. Wijesundara*

DETC2021-71674 **V010T10A018**
Vibration Suppression of a Linear Oscillator Force-Excited by Random Excitation via an Inerter
Pendulum Vibration Absorber
Joel A. Cosner and Wei-Che Tai

Rotating Systems and Rotor Dynamics

DETC2021-67674 **V010T10A019**
Operational Modal Analysis of a Rotating Structure Subject to Random Excitation Using a
Tracking Continuously Scanning Laser Doppler Vibrometer via an Improved Demodulation
Method
Linfeng Lyu and Weidong Zhu

DETC2021-70405 **V010T10A020**
Design of Band Gap Formation in Periodic Rotors via Optimization
Patrick B. Lamas and Rodrigo Nicoletti

DETC2021-70457 **V010T10A021**
Impact Dynamics in Four-Segment Tilting Pad Journal Bearings Subjected to Pad Fluttering
Jan Rendl, Luboš Smolík, Štěpán Dyk, and Michal Hajžman

Structural Damage Detection and Diagnostics

DETC2021-70375 **V010T10A022**
Model-Order-Reduction Approach for Structural Health Monitoring of Large Deployed Structures
With Localized Operational Excitations
Mohamed Aziz Bhourri

Vibration and Stability of Mechanical Systems

DETC2021-70551 **V010T10A023**
Insect Wing Buckling Influences Stress and Stability During Collisions
Mark Jankauski, Ryan Schwab, Cailin Casey, and Andrew Mountcastle

DETC2021-71896 **V010T10A024**
Finite Element/Contact Mechanics Analysis of Spur Gear Pairs With Tooth Root Cracks
Yaosen Wang, Adrian A. Hood, and Christopher G. Cooley

Vibration of Continuous Systems

DETC2021-68459 **V010T10A025**
Vibration Analysis of Beams Using Alternative Admissible Functions With Penalties
Srividyaadhare Kateel and Natalie Baddour

DETC2021-68460 **V010T10A026**
Vibration Characteristics of 3D Printed Viscoelastic Graded Polymeric Plates
Justin Carter, Kumar Vikram Singh, and Fazeel Khan

DETC2021-70415 **V010T10A027**
Subharmonic Resonance of One Fourth Order of Electrostatically Actuated MEMS Circular
Plates: Amplitude-Frequency Response
Dumitru I. Caruntu, Julio Beatriz, and Miguel Martinez