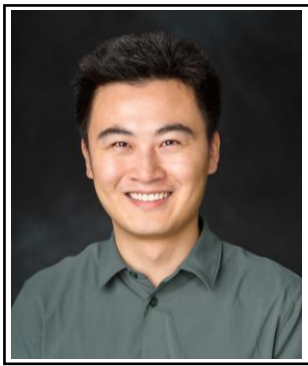
IOWA STATE UNIVERSITY
Center for Nondestructive Evaluation

CNDE Webinar Presentation
March 13, 2025 - 10:00 a.m. CST

This webinar will be recorded and made available on the CNDE website



Guided Wave Time Reversal Techniques for NDE Applications

Presented by:

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Abstract:

The integration of ultrasonic guided waves and time reversal (TR) methods has aroused significant interest within the nondestructive evaluation (NDE) and structural health monitoring (SHM) communities. This combination offers a powerful and baseline-free tool for damage detection and characterization. In this webinar, we will explore the fundamentals and advancements of guided wave TR techniques for NDE applications. The webinar will begin by introducing the traditional TR concept and its capability to compensate for Lamb wave dispersive features. Subsequently, we will move to several innovative variations of TR methods, such as modified time reversal and virtual time reversal (VTR). A focus will be placed on an enhanced Lamb wave VTR technique, which addresses the challenge of transducer tuning effects in the application of TR methods. By compensating with the transducer transfer function, the time-reversibility for multi-modal and dispersive Lamb wave modes is significantly improved. Furthermore, we will extend the TR methods into the realm of nonlinear Lamb waves. A novel fatigue crack detection and quantification method, called physical-virtual TR technique, will be presented, which leverages the difference between the nonlinear TR method and the conventional VTR algorithm. The webinar will finish with some additional NDE applications of guided wave TR techniques, highlighting their versatility and potential to advance the NDE and SHM fields.

Speaker:

Dr. Junzhen Wang is a Research Scientist II at the Center for Nondestructive Evaluation (CNDE), Iowa State University, USA. He received his Ph.D. in Mechanical Engineering from Shanghai Jiao Tong University, China, in 2022. Prior to joining CNDE, he worked as a Postdoctoral Research Fellow in Department of Mechanical Engineering at Stevens Institute of Technology, New Jersey. His research focus on guided waves, nonlinear ultrasonics, nondestructive evaluation, structural health monitoring, and machine learning. Dr. Wang has authored 24 journal and conference papers, and has a growing excitation index of 247. He serves as a reviewer for more than 10 journals. He was a recipient of the 2021 International Mechanical Engineering Congress and Exposition (IMECE) Second Place Student Paper and the 4th International Conference on Structural Health Monitoring and Integrity Management (ICSHMIM) Best Paper Award. With a focus on advancing NDE techniques, his work continues to address critical challenges in practical applications.

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A copy of the recorded webinar will be posted at: https://www.cnde.iastate.edu/