CNDE Webinar Presentation
February 18, 2022, 1:00 pm CST
This webinar will be recorded and made available on the CNDE website

Eddy Current Nondestructive Evaluations
Presented by:
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Iowa State University, Ames, Iowa

Speakers:

Jiming Song received Ph.D. degree in Electrical Engineering from Michigan State University in 1993. From 1993 to 2000, he worked as a Postdoctoral Research Associate, a Research Scientist and Visiting Assistant Professor at the University of Illinois at Urbana-Champaign. From 1996 to 2000, he worked part-time as a Research Scientist at SAIC-DEMACO. Dr. Song was the principal author of the Fast Illinois Solver Code (FISC). He was a Principal Staff Engineer/Scientist at Semiconductor Products Sector of Motorola in Tempe, Arizona before he joined Department of Electrical and Computer Engineering at Iowa State University in 2002.

Dr. Song currently is a Professor at Iowa State University's Department of Electrical and Computer Engineering. His research has dealt with modeling and simulations of interconnects on lossy silicon and RF components, electromagnetic wave scattering using fast algorithms, the wave propagation in metamaterials, acoustic and elastic wave propagation and non-destructive evaluation, and transient electromagnetic field. He received the NSF Career Award in 2006 and is an IEEE Fellow and ACES Fellow. He is an associate editor of Research in Nondestructive Evaluation (RNDE) and several other journals.

Yuan Ji received Ph.D. degree in Electrical Engineering from Iowa State University in 2016. Right after graduation, he joined Exxam Systems as research director and was in charge of developing a novel artificial intelligence enhanced eddy current pipeline inspection system for oil pipelines. He was awarded three international and US patents for this work. In May of 2021, he joined CNDE as a research scientist with specialty in experimental eddy current testing. He is an expert in designing, testing and manufacturing precision electronic systems from DC to RF band. His current research interest also includes machine learning for non-destructive evaluation (NDE), hardware acceleration of neural network training, and NDE for additive manufacturing.

Abstract: Eddy current nondestructive evaluation (NDE) involves the detection of electromagnetic field irregularities due to non-conducting inhomogeneities in an electrically conducting material such as cracks, fasteners, sharp corners/edges, multi-layered structures, etc. In this webinar, we will give an introduction first on eddy current NDE at Iowa State University, including measurement capabilities, the eddy-current NDE course, and modeling and simulations. Then we will focus on applying boundary element method (BEM) in the modeling and simulations. The eddy-current problem is formulated by the boundary integral equations (BIE) and discretized into matrix equations by the BEM or the method of moments (MoM). The solutions of the matrix equations are accelerated using fast algorithms such as adaptive cross approximation (ACA) to reduce the memory and CPU time requirements. Finally, several benchmark cases in NDE applications are will be presented to demonstrate the accuracy and capability of the BEM for three-dimensional structures described by a number of triangular patches.

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