

The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar



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Professor

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Lecture Title: Vibration and Stability of Distributed Structural Systems

Monday, November 10, 2008, 1:30 PM, Room 173 Light Engineering

Abstract

In this talk I will describe some recent advances in analyzing the vibration and stability of distributed structural systems. The vibration and stability of translating media with time-varying lengths and/or velocities will be addressed first. Two types of dynamic stability problems are analyzed from an energy viewpoint: the dynamic stability of translating media during extension and retraction, and the parametric instabilities of some second-order distributed systems with periodically varying parameters. The methodology for the former is applied to elevator hoist cables, and the experimental results show excellent agreement with the theoretical predictions. The use of the incremental harmonic balance method for analyzing the nonlinear and/or time-varying dynamics of high-dimensional spatially-discretized models of distributed systems with general nonlinearities will be addressed next. The methodology is demonstrated on a translating tensioned beam with a stationary load subsystem. It is shown that a low-dimensional spatially-discretized model of the nonlinear distributed system can yield quantitatively and qualitatively inaccurate predictions. Finally, a new spatial discretization method, which overcomes the drawbacks of the classical assumed modes method, will be discussed. The method can accurately predict higher spatial derivatives of the displacements, and hence the internal forces and moments, of distributed systems.

Biography

Weidong Zhu is a Professor in the Department of Mechanical Engineering at the University of Maryland, Baltimore County. He received his double major BS degree in Mechanical Engineering and Computational Science from Shanghai Jiao Tong University in 1986, and the MS and Ph.D. degrees in Mechanical Engineering from Arizona State University and the University of California at Berkeley in 1988 and 1994, respectively. His research spans the fields of dynamics, vibration, control, applied mechanics, and structural health monitoring, and involves analytical development, numerical simulation, experimental validation, and industrial application. He is a recipient of the National Science Foundation CAREER Award and the 2007 American Society for Nondestructive Testing Fellowship Award. He is an Associate Editor of the ASME Journal of Vibration and Acoustics.

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