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Recent Advances in Adaptive Metastructures for Structural Dynamics Enhancement



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ABSTRACT:

During the past couple of decades, due to the advances in materials, electronics, and system integration technologies, structural dynamics and controls researchers in various engineering disciplines have been investigating the feasibility of creating adaptive structures. The ultimate vision is to develop a multifunctional structural system that has various distributed and built-in autonomous abilities, such as vibration and stability controls, shape configuration and morphing, materials and mechanical property variations, energy harvesting, and health monitoring. From a structural system point of view, one of the major challenges is on how to best synthesize the cross-field and local-global coupling characteristics of the various adaptive materials and elements to optimize the overall structure performance. In recent years, interesting approaches have been explored to achieve adaptive metastructures based on synergistic modular architectures, often observed in biological and atomistic systems or in artificial meta materials. It is recognized that to achieve significant new advances in adaptive structural systems, researchers have to conduct even more cross talks with various disciplines. This presentation will review and discuss some of the recent interdisciplinary research efforts in synthesizing adaptive metastructures for dynamics and controls enhancement.

BIOGRAPHY:

Kon-Well Wang is the Stephen P. Timoshenko Collegiate Professor and Tim Manganello BorgWarner Department Chair of Mechanical Engineering at the University of Michigan. He received his Ph.D. degree from the University of California at Berkeley in 1985, worked at the General Motors Research Labs as a Senior Research Engineer, and started his academic career as a faculty at the Pennsylvania State University in 1988. During his Penn State years, Professor Wang has served as the William E. Diefenderfer Chaired Professor in Mechanical Engineering, Director of the Structural Dynamics and Controls Lab, Associate Director of the Vertical Lift Research Center of Excellence, and Group Leader for the Center for Acoustics and Vibration. Dr. Wang joined the University of Michigan in 2008. Professor Wang's main technical interests are in adaptive structural systems and structural dynamics & controls. He has received various recognitions for his accomplishments; such as the SPIE Smart Structures and Materials Lifetime Achievement Award, the ASME Adaptive Structures and Materials Systems Prize, the ASME N.O. Myklestad Award, the ASME Adaptive Structures and Material Systems Best Paper Award, the ASME Rudolf Kalman Best Paper Award, the NASA Tech Brief Award, and the SAE Ralph Teetor Award. He is a Fellow of the ASME, AAAS, and IOP. Professor Wang has been the Chief Editor for the ASME Journal of Vibration and Acoustics. He is currently an Associate Editor for the Journal of Intelligent Material Systems and Structures and an Editorial Advisory Board Member for the Journal of Sound and Vibration.