Adaptive Intelligent Materials and Systems Center

Fulton School of Engineering, ASU
Cordially invites you to attend a seminar presented by

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DETECTING LOW ENERGY IMPACT DAMAGE IN A COMPOSITE WING USING BICOHERENCE

November 14, 2008
ERC 490
11:00 a.m. – 12:00 p.m.

Abstract: The detection of structural damage in its earliest stages using vibration based methods is very difficult due to the need for baseline information from the undamaged structure and the sensitivity of damage indicators (features) to changes in ambient conditions. One approach to avoiding these two problems is to assume that the structural response is linear and that damage introduces nonlinearity. This presentation will focus on applying a nonlinearity indicator called the Bicoherence, a third order spectrum estimator, to the detection of low energy impact damage to a sandwich composite wing composed of a PVC foam core and a carbon fiber skin. Damage is introduced into the wing through a series of non-overlapping, low energy impacts. Static approaches to damage evaluation include static strain measurements vs wing tip deflection, flash thermography, and an autopsy of a duplicate wing subjected similar impacts. Dynamic vibrational response measurements are made with 8 fiber Bragg grating strain gauges and 3 conventional accelerometers. The dynamic response is evaluated for second order nonlinearity using the Bicoherence. The results allow us to compare the static and dynamic sensitivity as well as the type and location of sensors with respect to damage detection.

Bio: Mark Seaver received a Ph. D. in Chemical Physics from Indiana University, Bloomington, in 1978. He joined the permanent staff at the Naval Research Laboratory in 1986 and has been a research physicist in the Optical Sciences Division ever since. During that time he has developed optical sensors in the ultraviolet, visible, and infrared spectral regions and applied them to a variety of detection problems. In 2000, he joined the Fiber Optic Smart Structures Section and has worked with fiber Bragg gratings (FBGs) and their uses in vibration based damage detection for structural health monitoring applications. His current focus is on the development of a high frequency (< 200 kHz) FBG demodulation system and the use of nonlinear data analysis in vibration based damage detection.

Refreshments will be served
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