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Transverse wind effect on a slender beam with variable cross-section and its vibration control using smart materials

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Abstract

The transverse wind effect could lead to the dramatic vibration of the slender engineering structures, such as the wing of aircrafts during their taking off and landing process. In this paper, the transverse wind effect on a slender beam structure with variable cross-section is studied by an accurate numerical model solving the vibration response of the slender beam. Furthermore, a piezoelectric patch connected with a feed-back control circuit is employed to realize the active vibration control of the beam structure subjected to a strong wind excitation. From numerical simulations, an optimal design of the feed-back control gain factor, the size and location of the piezoelectric patch is given to reduce the vibration amplitude of the slender beam structure at the most.

Biography

Nan Wu received his PhD degree from the Department of Mechanical and Manufacturing Engineering at University of Manitoba in 2012. From 2006 to 2008, he worked as a research assistant and lab technologist in the field of the vibration test, fault diagnoses and vibration control of vehicle and aero-engine rotor system. Currently, he is working as a research assistant in Department of Mechanical and Manufacturing Engineering at University of Manitoba. His main research interests are in the area of the application of smart materials to the advanced engineering structures and nano-technology. Dr. Wu is a member of the editorial board in ‘British Journal of Applied Science and Technology’ and ‘Journal of Aeronautics and Aerospace Engineering’. He also serves as a reviewer for other 10 international journals.