Smart devices for vibration control

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Polo scientifico-tecnologico Fabio Ferrari – via Sommarive 9 - Trento

Abstract: Smart devices are multifunctional devices which have opened new engineering avenues and given mechanical engineers a creativity boost. Smart devices are able to adapt to changes in the external environment or in the working conditions so to always provide optimal vibration control. In order to do so, the device needs to have sensors, a controlling algorithms, and fundamentally, to be able to react to environmental changes thanks to a transduction mechanism. Smart devices may have potential impact in the future market due to the increasing availability of cheap electronics, and thanks to their lightweight construction and their new manufacturing opportunities. This presentation will focus on the working principles of few different devices and mention on the control algorithms.

A panoramic of some different approaches for the design of smart devices for the control of the vibrational response of mechanical structures will be given. In particular, this presentation will show how shape memory alloys and thermoplastic polymers can be used for the design of adaptive dynamic vibration absorbers, how magnetorheological elastomers can be used to design adaptive isolator and rotor supports, or how dielectric-electro-active-polymers can be used for flat loudspeakers’ and hybrid isolators’ realization.

Biosketch: Dr Rustighi has 18 years’ experience on a wide range of vibration and engineering problems focusing on smart structures and seismic detection. Dr Rustighi graduated in Mechanical Engineering from the University of Pisa in 2000 and received his Ph.D. degree in 2004. He joined ISVR in April 2004 working on the integration of smart materials into flexible structures. He is now Associate Professor, Chartered Engineer member of the IMechE, Programme Leader of the MSc in Acoustical Engineering and Associate Editor of the Journal of Vibration and Control. He has chaired three international conferences in Structural Dynamics (RASD) and he has held visiting positions at the LBF Fraunhofer, INSA-Lyon, and IPPT PAN.

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