ACOUSTICS2008/1366
Decentralised active control of single - frequency panel vibrations using piezoelectric actuator - sensor pairs

Alain Berry, Philippe Micheau, Rémi Louviot and Yvonnick Brunet
Univ. de Sherbrooke, Mechanical Engineering Depart., 2500 Boulevard de l'Université, Sherbrooke, QC, Canada J1K 2R1

This paper addresses active control of the bending response of a panel using independent PZT (piezoceramic) actuator - PVDF (piezopolymer) sensor pairs distributed on the panel. Previous work showed that under the assumption of collocated, dual actuator - sensor pairs, decentralised static gain control is stable due to plant matrix passivity at all frequencies. However, duality is not guaranteed for collocated PZT - PVDF pairs because of the coupling of piezoelectric transducers with both bending and extensional modes of the panel. Moreover, the spatially local nature of PZT actuator to PVDF sensor transfers on the panel can lead to a diagonal - dominant FRF matrix but is detrimental to global control of the panel vibration or acoustic radiation; hence, a non-diagonal dominant plant matrix is more likely to result in global control for this problem. In the case of single-frequency disturbance, stability analysis shows that plant matrix passivity is only required at the disturbance frequency and that a phase - shift compensation, identical for all independent units, can ensure stable decentralized control. Guidelines for the design of decentralised PZT - PVDF pairs are provided, with the objective of global vibroacoustic control of a panel.