

5th International Conference on **ARTIFICIAL INTELLIGENCE**
&
5th International Conference on **AUTOMATION & ROBOTICS**
April 16-17, 2018 | Las Vegas, USA

Active vibration control of piezoelectric self-sensing actuators based on velocity observer

Mi-Ching Tsai, Lien-Kai Chang and Zhen-Liang Lu
National Cheng Kung University, Taiwan

Piezoelectric self-sensing actuators (SSAs) have been extensively used in vibration control of flexible structures over the last three decades. Compared to separated sensor/actuator systems, the SSA is simple, robust, and cost-effective. According to the literature, the specially designed electric circuit, referred to as a bridge circuit, is required to realize the concept. A method of achieving self-sensing capability without a bridge circuit is proposed by utilizing a velocity observer, and then the vibration velocity of a SSA can be estimated by the measured voltage and current signals. Thus, the SSA active vibration control can be implemented without using a physical velocity sensor to achieve the required vibration suppression based on feedback control design. The SSA vibration suppression performance is highly dependent on the equivalent mechanical admittance, which consists of equivalent mass, stiffness, and damping. Furthermore, the equivalent stiffness and damping will be directly influenced by the controller parameters. Thus, the SSA vibration suppression performance can be adjusted by the control design. The experimental results show that the proposed method can effectively reduce the structural resonance phenomenon when the controller parameters of the SSA are properly designed with a required mechanical admittance.

Biography

Mi-Ching Tsai has completed his PhD in Engineering Science from the University of Oxford UK in 1990. He is currently a Chair Professor at the Department of Mechanical Engineering, National Cheng Kung University, Taiwan. He has authored or coauthored more than 117 journal papers and holds more than 100 patents. His research interests include robust control, servo control, motor design, and applications of advanced control technologies using DSPs. He is a Fellow of the Institution of Engineering and Technology, UK and previously served as an Associate Editor of the *IEEE/ASME Transactions on Mechatronics* from 2003 to 2007 and the Deputy Minister of the Ministry of Science and Technology, Taiwan from 2016 to 2017.

mctsai@mail.ncku.edu.tw

Notes: