Active and Passive Vibration Control of Structures
Peter Hagedorn and Gottfried Spelsberg-Korspeter, Editors Springer (2014), 311 pp., hardcover, 209 USD, eBook, 159 USD, ISBN 978-3-7091-1820-7.

This book has been written with the focus on linking the gaps between structural mechanics, vibrations and modern control theory. The major contents should be very helpful to young scientists and graduate-level students, and could also bring certain guidance to engineers working in the vibration control fields. This book was also prepared as the CISM (International Centre for Mechanical Sciences) course No. 418 held in Udine from the 27th to 31st of May 2013.

Some chapters are fully illustrated and some are fundamentally introduced. The authors give some links between the vibration, mechanics and control theory, which fits the title of this book as *Active and Passive Vibration Control of Structures*. However, there are certain weak points dealing with control because it is very difficult to cover most of the state-of-the-art. Hence, the readers should not only use this book as a sole reference, especially dealing with the adaptive control algorithms that have been widely adopted in active vibration control (i.e., engine vibration) and structural vibration control using smart actuators and/or sensors. More specific comments for individual chapters are as follows:

- Chapter 1 covers relatively a large portion of this book that gives an introduction and fundamentals of vibrations for both discrete and continuous mechanical systems. This part may be very helpful for graduate level students to understand the vibration problem and how it is explained mathematically, as well as how the design of vibration control systems will be made by knowing the plant dynamics. In addition, the hybrid modelling of the continuous system with the discrete system is very important to the understanding of vibration isolation in civil structures later covered in Chapter 3.
- Chapter 2 tends to lay out the adoption of variational principles for the derivation of equation of motion for discrete and continuous systems, and the links to their control. This part is good for young researchers to understand the modelling other than the classic Newtonian mechanics.
- Chapter 3 gives a tutorial on the using of hybrid mass damper that is typically applied on building vibration control. Three different approaches of reducing the dynamic response of buildings are composed of dynamic vibration absorber, active mass damper and hybrid mass damper.
- Chapter 4 presents the physical modelling of two primary types of transducers employed in the active vibration control: electromagnetic and piezoelectric types. The electromagnetic actuator is also known as voice coil type such as the typical loudspeaker used in the active noise control, while the piezoelectric is mainly for smart materials, used also in various applications in structural vibration control. The fundamental mathematical modelling of these standard transducers could be very helpful to the young researchers and engineers. At the end of this chapter, the application of the modelling in vibration control is illustrated in terms of vibration isolation using voice coil type and structural vibration control using the piezoelectric type. It seems the functions of these two actuators are explained most in the context of adjusting the damping effect of the coupled system, which could only belong to passive control. However the authors did not discuss the active vibration control through generating "anti-phase" response by the external forces from these actuators using the adaptive digital filter controller configured with the adaptive algorithms. Some of the applications that could have been treated include the active engine mount and active suspension system in automotive industry as well as the active flutter control for the airplane wing.
- Chapter 5 gives a brief introduction on the LMIs (linear matrix inequalities) used in control optimization. This part is probably simplified since there are many textbooks on control theory. This optimization method normally requires more in-depth understanding, without which it may be difficult for engineers and/or young researchers to employ this approach in active vibration control. Actually, there is an increasing interest on the adaptive algorithm like the LMS (least mean square) algorithm that is also part of the optimization that is very effective for the active vibration control. It could be beneficial to future readers if the authors could give some indications on this part.
- Chapter 6 shows various damping mechanisms on vibration response. After that, various mechanisms of damping in structures and dissipation mechanisms are given. The categorization and summary made by the authors are very educative. It would be very nice to give more discussions on the MR (magnetorheological) or ER

(electrorheological) type damping mechanism from the fluids since there are quite a few applications in semi-active suspension and engine mount in road disturbance and engine vibration control in the automotive industry.

- Chapter 7 shows the typical application of vibration path control using active magnetic bearings and shows how the active bearings can be employed for identification, failure diagnosis etc. I liked this part: it should be very useful for new researchers. In the vibration control of rotatory machines like geared-rotor system, the vibration and radiated noise is primary due to the dynamic mesh force of the gear teeth which subsequently generate vibrations propagated along the shaft and through the transmission path of bearing, which results into the vibration of housing radiating noises. The path control using the active bearing is an effective way to suppress the unwanted responses; however, the cost of the active bearing system has been a big concern.

Overall, I like this book because it does give a general introduction on vibration modelling and its control. This fundamental theory is very important for young researchers to use as a reference to further conduct the research and apply the techniques for noise control engineering fields.

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