Paul / Yu
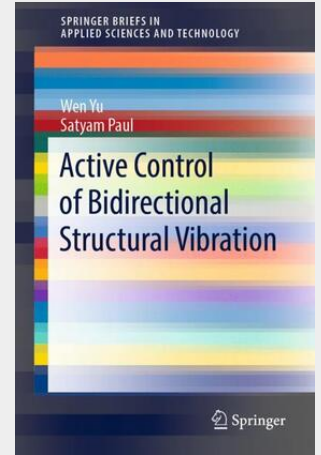
Active Control of Bidirectional Structural Vibration

This book focuses on safeguarding civil structures and residents from natural hazards such as earthquakes through the use of active control. It proposes novel proportional-derivative (PD) and proportional-integral-derivative (PID) controllers, as well as discrete-time sliding mode controllers (DSMCs) for the vibration control of structures involving nonlinearities. Fuzzy logic techniques are used to compensate for nonlinearities. The first part of the book addresses modelling and feedback control in inelastic structures and presents a design for PD/PID controllers. In the second part, classical PD/PID and type-2 fuzzy control techniques are combined to compensate for uncertainties in the structures of buildings. The methodology for tuning the gains of PD/PID is obtained using Lyapunov stability theory, and the system's stability is verified. Lastly, the book puts forward a DSMC design that does not require system parameters, allowing it to be more flexibly applied. All program codes used in the paper are presented in a MATLAB®/Simulink® environment. Given its scope, the book will be of interest to mechanical and civil engineers, and to advanced undergraduate and graduate engineering students in the areas of structural engineering, structural vibration, and advanced control.

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