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Active Vibration Control of Nonlinear Systems by Exploiting Nonlinear Benefits: A Totally New Energy-Saving Robust Control Approach



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摘要:

Nonlinearity plays a crucial role in engineering systems and cannot be overlooked in structural design, dynamic response analysis, and parameter selection. This presentation will provide an up-to-date overview of a novel approach to robust control of nonlinear vibration systems by leveraging potential nonlinear benefits. Key points include:

1. Introducing beneficial nonlinearity in stiffness or damping as a dynamic reference model for nonlinear vibration control systems can enhance control performance and robustness while significantly reducing energy costs compared to traditional methods.
2. Inherent nonlinearity can be effectively utilized rather than eliminated, as is common in traditional methods.
3. Various practical issues related to robustness and adaptability of a control system can be addressed using this beneficial nonlinear reference model-based control scheme.

Extensive experimental results validate the claimed performance and suggest a promising, energy-saving, and innovative robust control approach.

简介:

Xingjian Jing (M' 13, SM' 17) received the B.S. degree from Zhejiang University, China, the M.S. degree and PhD degree in Robotics from Shenyang Institute of Automation, Chinese Academy of Sciences, respectively. He also achieved the PhD degree in nonlinear systems and signal processing from University of Sheffield, U.K..

He is now a Professor with the Department of Mechanical Engineering, City University of Hong Kong. Before joining in CityU, he was a Research Fellow with the Institute of Sound and Vibration Research, University of Southampton, followed by assistant professor and associate professor with Hong Kong Polytechnic University. His current research interests include: Nonlinear dynamics, Vibration, Control and Robotics, with a series of 250+ publications of 13000+ citations and H-index 60 (in Google Scholar), with a number of patents filed in China and US. He is one of the world top2% highly cited scientists and IEEE senior member.

Prof Jing is the recipient of a number of academic and professional awards including 2016 IEEE SMC Andrew P. Sage Best Transactions Paper Award, 2017 TechConnect World Innovation Award in US, 2017 EASD Senior Research Prize in Europe and 2017 the First Prize of HK Construction Industry Council Innovation Award, etc.

He currently serves (or served) Senior Editor of Mechanical Systems and Signal Processing, Topic Associate Editor of Nonlinear Dynamics, and Associate Editors of IEEE Transactions on Systems, Man, Cybernetics - Systems, IEEE Transactions on Industrial Electronics (2021-2024), and Technical Editor of IEEE/ASME Trans. on Mechatronics (2015-2020). He was lead editors of special issues on "Exploring nonlinear benefits in engineering" during 2018-2019 and "Next-generation vibration control exploiting nonlinearities" during 2021-2022 both published in Mechanical Systems and Signal Processing. He is the general conference chair of ICANDVC 2021-2025.