The Department of Civil and Environmental Engineering at the University of Houston presents...

Beyer Distinguished Lecture Series

Adaptive Stiffness Structural Systems: State of the Art and Practice

Satish Nagarajaiah
Professor of Civil Engineering and of Mechanical Engineering
Rice University, Houston, TX 77005, USA
satishnagarajaiah.rice.edu

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Classroom Business Building (CBB) - Room 124
Zoom: https://uh-edu-cougarnet.zoom.us/j/97075218171

Abstract
This seminar focuses on the state of art and practice of adaptive stiffness structural systems around the world. The talk will include details of recent developments and applications of seismic isolation, adaptive passive stiffness and damping systems, and uplift systems, and smart tuned mass dampers. Base isolation is widely accepted technology, which has protected critical structures around the world. Nonlinear dynamic analysis techniques developed to analyze large base isolated structures and its impact is presented. The successful performance of seismic isolated structures in recent earthquakes is presented in detail—made possible by system identification and structural monitoring systems in place to monitor their performance in large earthquakes. Recent developments and applications of large scale tuned mass dampers for earthquake/wind protection is presented. Recent advances in development of adaptive passive stiffness systems for seismic protection is presented. Analytical and experimental results of adaptive stiffness systems in structures are presented to show the effectiveness of the new and innovative concept of adaptive negative-positive tangential stiffness, which provides significant earthquake/wind protection, while keeping the primary system essentially elastic or mildly inelastic in strong earthquakes/winds—thus preventing significant damage experienced in traditional structures.

Bio
Satish Nagarajaiah is a Professor of CE and ME at Rice University, Houston, Texas, who focuses on structural dynamics, seismic isolation, adaptive stiffness structural systems, structural control/monitoring, sparse structural system identification, and noncontact strain sensing using nanomaterials. His research is funded by the United States NSF, NASA, DOE, AFOSR, ONR, Private Agencies and Industries. He has made pioneering contributions to the development to seismic isolation and adaptive stiffness structural systems—particularly adaptive passive negative stiffness systems, smart/adaptive passive tuned mass dampers and response reduction negative stiffness systems with damping for buildings and bridges. National Science Foundation has recognized his contributions to adaptive stiffness structural systems by awarding the NSF CAREER award in 1999 and ASCE awarded the Moissieff award in 2015. He has developed widely cited sparse structural system identification algorithms for which he and his coworkers were awarded the 2017 ASCE Raymond C. Reese Research Prize and 2019 IASCM Takuji Kobori Prize. He is the earliest researcher who invented and developed noncontact structural strain sensing using nanomaterials. He co-invented and developed laser based noncontact structural strain sensing that produces detailed two-dimensional strain map. He was elected/inducted Distinguished Member of American Society of Civil Engineers (ASCE) in 2021. He was awarded the 2020 ASCE Newmark Medal jointly by ASCE Structural Engineering Institute and Engineering Mechanics Institute. Prof. Nagarajaiah was elected to United States National Academy of Inventors (NAI) in 2019. Dr. Nagarajaiah currently serves as the editor of the structural control and health monitoring international journal [Wiley], and editor (North America) of the structural monitoring and maintenance international journal [Techno-Press]. He served as the managing editor of ASCE Journal of Structural Engineering from 2011-2018. He is a fellow of ASCE since 2017, and fellow of Structural Engineering Institute (SEI) of ASCE since 2012. He served on the board of governors of ASCE SEI from 2015-2019 and on the Technical Activities Division Executive Committee from 2015-2019 and from 2006-2012. He has founded and chaired numerous committees in SEI, EMI, and IASCM on Structural Control and Monitoring. He served as president of USA-IASCM from 2002-2006.