Robots and Sensors for Sustainable Infrastructure

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Engineers and policymakers charged with building and maintaining sustainable critical infrastructure need objective and actionable data to characterize their inventories and guide their decisions. However, characterization and inspection of large inventories of our built environment such as utilities and major lifeline structures remain elusive partly because of their remoteness, spatial extent, and hazardous environments. This challenge is exacerbated by prevailing cumbersome and manual data collection, interrogation, and intervention processes.

Recent synergistic developments in robotics, internet of things (IoT), computer vision, computing, and control have led to systems that have revolutionized many areas, including autonomous driving and the internet of things. In this talk, the speaker will present robotic systems developed by his team to address the problem of infrastructure management such as condition assessment, inspections, and material re-use. These systems include terrestrial and aquatic robots which can perceive the environment to build 3D maps of assets, e.g., nuclear and transportation, and IoT devices that can assess the condition of water and building infrastructure. The speaker will touch on the theoretical underpinnings and practical challenges in developing such sensing platforms while also underscoring the unique sustainable infrastructure management-related challenges that data from such platforms help address.

Dr. Sriram Narasimhan is a Professor in Civil and Environmental Engineering & Mechanical and Aerospace Engineering at the University of California, Los Angeles. His research areas include autonomous sensing systems and condition assessment of civil and mechanical systems. After receiving his Ph.D. in 2005 from Rice University, he joined the University of Waterloo in Canada. In 2021, he joined the Samueli School of Engineering at UCLA where he leads the Sensors and Robotics for Infrastructure Lab. Dr. Narasimhan is active in various international technical committees and is currently the Chief Editor for the ASCE Journal of Bridge Engineering. He has served as a reviewer and panelist for various granting agencies, including the US National Science Foundation and Canada's Natural Sciences Engineering Research Council. He is a recipient of multiple awards, including the 2018 ASCE Associate Editor Award and the Alexander von Humboldt Fellowship. He is a registered Professional Engineer in Ontario, Canada, and a Fellow of ASCE.