

JOINT EVENT

28th International Conference and Expo on

Nanoscience and Nanotechnology

3rd World Congress and Expo on

&

Graphene & 2D Materials

November 26-28, 2018 | Barcelona Spain



Srinivasa M Salapaka

University of Illinois at Urbana-Champaign, USA

Micro/nanoscale research: a control systems viewpoint

Many micro/nanoscale scientific studies which span multitude of areas with diverse and unrelated motivations and objectives, pose problems that are remarkably similar. Many of these studies require regulation or estimation of certain physical variables under constraints and various uncertainties. Typically existing solutions are area specific, static or open-loop, which are often inadequate and costly. Feedback control has been embraced by very few areas, for instance in scanning probe microscopy, where it has shown a significant impact; yet it remains largely underused. This talk will focus on the common issues that arise in many nanoscale studies and present a control systems framework to analyze and address them. Specifically, this talk will present the role of robust feedback and optimal control theories in managing uncertainties in model parameters, environmental noise, other disturbances, and sensor noise; its role in managing complexities in terms of complex dynamics, multiple objectives, constraints and limitations, and noisy measurements; and its role in enabling new techniques and methods that are otherwise not possible. The framework is demonstrated on specific problems arising from areas such as scanning probe microscopy, precision positioning, X-ray microscopy, and optical probing of biocellular motor-proteins.

Recent Publications

1. Baranwal M, Gorugantu R S and Salapaka S M (2016) Robust atomic force microscopy using multiple sensors. Review of Scientific Instruments 87(8):083704.
2. Roychowdhury S, Saraswat G, Salapaka S and Salapaka M (2015) On control of transport in Brownian ratchet mechanisms. Journal of Process Control 27(2015):76–86.
3. Zhang X, Koo B, Salapaka S, Dong J and Ferreira P (2014) Robust control of a MEMS probing device. IEEE/ASME Transactions on Mechatronics 19(1):100–108.
4. Salapaka S M and Salapaka M V (2008) Scanning probe microscopy. IEEE Control Systems 28(2):65–83.
5. Salapaka S A C J P, Sebastian A, Cleveland J P and Salapaka M V (2002) High bandwidth nano-positioner: a robust control approach. Review of Scientific Instruments 73(9):3232–3241

Biography

Srinivasa M Salapaka received the BTech Degree in Mechanical Engineering from the Indian Institute of Technology in 1995, MS and the PhD Degrees in Mechanical Engineering from the University of California at Santa Barbara, USA in 1997 and 2002, respectively. During 2002–2004, he was a Postdoctoral Associate in the Laboratory for Information and Decision Systems, Massachusetts Institute of Technology, Cambridge, USA. Since January 2004, he has been a Faculty Member in Mechanical Science and Engineering at the University of Illinois, Urbana-Champaign. He was the recipient of NSF CAREER award in 2005. He is an ASME Fellow since 2015. He was a Plenary Speaker at 2018 International Conference in Nonlinear Problems in Aviation and Aerospace. The areas of his current research interest include controls for nanoscale instrumentation, scanning probe microscopy, Brownian ratchets, X-ray microscopy, combinatorial optimization, data mining, analysis of numerical/dynamic-systems, and control of power systems.

salapaka@illinois.edu