Title: Localization and Control of Growing Robots in Medical Applications

Abstract: Soft, growing robots achieve locomotion by material extending from their tip. They are inherently compliant and can safely navigate through tight turns and highly constrained environments that prove challenging for traditional robots. Despite the potential of these robots, there remain a number of challenges to practical implementation, particularly related to shape estimation and control, that must be addressed. In this talk, we present a low-cost, wireless, permanent magnet-based method for localizing the tip of these robots. A permanent magnet is placed at the robot tip, and an array of magneto-inductive sensors is used to measure the change in magnetic field as the robot moves through its workspace. We develop an approach to localization that combines analytical and machine learning techniques and show that it outperforms existing methods. In addition, we explore the potential to use this localization method for closed-loop control of a steerable growing robot.

Bio: Tania K. Morimoto is an Assistant Professor in the Department of Mechanical and Aerospace Engineering and in the Department of Surgery at the University of California, San Diego. She received the B.S. degree from Massachusetts Institute of Technology, Cambridge, MA, and the M.S. and Ph.D. degrees from Stanford University, Stanford, CA, all in mechanical engineering. Her research lab focuses on the design and control of flexible continuum robots for increased dexterity and accessibility in uncertain environments, particularly for minimally invasive surgical interventions. They are also working to address the challenges of designing human-in-the-loop interfaces for controlling these flexible and soft robots, including the integration of haptic feedback to improve surgical outcomes.