Design and Control of Soft Surgical Robots

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Flexible and soft medical robots offer capabilities beyond those of conventional rigid-link robots due to their ability to traverse confined spaces and conform to highly curved paths. They also offer potential for improved safety due to their inherent compliance. In this talk, I will present several new robot designs for various surgical applications. In particular, I will discuss our work on two different continuum robots – soft, growing robots that achieve locomotion by material extending from their tip, and concentric tube robots. I will also discuss new approaches for sensing, haptic feedback, and human-in-the-loop control that are aimed at improving the performance of these flexible surgical robots.

Speaker Bio:

Morimoto's research focuses on the design and control of flexible and soft robots for unstructured, unknown environments. She aims to develop safer, more dexterous robots and intuitive human-in-the-loop control interfaces that enable access, exploration, and manipulation, especially for medical applications. She has developed a workflow for the design, fabrication, and deployment of personalized continuum surgical robots, based on preoperative medical images of the particular patient. This workflow included the creation of a virtual-reality interface for the surgeon to design the personalized robot, as well as the development of a modular actuation system for controlling the finalized continuum robot via teleoperation. Another area of interest is in haptic device development, particularly for education.