Seminar

Department of Biomedical Engineering
香港城市大學
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E-Tattoos and E-Skins Bridging Humans and Robots

(organized by Prof Xinge Yu)

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Abstract

Many of us share a vision for the future that humans will be more like robots (i.e., digital, computational, cyber, expandable, etc.) whereas robots will be more like humans (i.e., soft, dexterous, intelligent, energy efficient, etc.). My group therefore focuses on soft electronics that can be integrated on humans or robots to facilitate their understanding and interaction. This talk will introduce my research on the mechanics, design, and manufacture of stretchable electronics. In particular, epidermal electronics, a.k.a. e-tattoos, represent a class of stretchable circuits, sensors, and stimulators that are ultrathin, ultrasoft, noninvasive but skin-conformable. My group has invented a dry and freeform "cut-and-paste" fabrication process for the rapid prototyping of multi-material, large-area, or modular e-tattoos capable of high-fidelity and ambulatory biometric sensing. While e-tattoos are for human wear, e-skins are for robot wear to emulate the functionalities and properties of human skins. Soft touch-sensitive e-skins have long been desired, but contamination of pressure responses by stretching has been a persistent challenge. My group recently developed a stretchable hybrid response pressure sensor (SHRPS) that solves this problem. SHRPS-integrated inflatable probes can be used for either accurate and gentle digital palpation or conformable and firm gripping. With e-tattoos digitizing the human body and e-skins mimicking human skin, we aim to bridge the gap between humans and robots for a symbiotic future.

Biography

Dr. Nanshu Lu is an Engineering Professor at the University of Texas at Austin holding the Cullen Trust for Higher Education Endowed Professorship in Engineering #4. She received her B.Eng. with honors from Tsinghua University, Beijing, her Ph.D. from Harvard University, and then Beckman Postdoctoral Fellowship at UIUC. Her research concerns the mechanics, materials, manufacture, and human or robot integration of soft electronics. She is a Clarivate (Web of Science) highly cited researcher and a Fellow of the American Society of Mechanical Engineers (ASME). She is on the Board of Directors of the Society of Engineering Science (SES). She is currently an Associate Editor of *Nano Letters*, *IEEE J-Flex*, and *Journal of Applied Mechanics*. She has been named 35 innovators under 35 by MIT Technology Review (TR 35) and iCANX/ACS Nano Inaugural Rising Star. She has received US NSF CAREER Award, US ONR and AFOSR Young Investigator Awards, 3M non-tenured faculty award, and the ASME Thomas J.R. Hughes Young Investigator Award. For more information, please visit Dr. Lu's research group webpage at https://sites.utexas.edu/nanshulu/ and follow her on Twitter: @nanshulu.