Mechanics of soft living actuators

Ritu Raman*[1]

[1]Department of Mechanical Engineering [Massachusetts Institute of Technology] – United States

Abstract

Human beings and other biological creatures navigate unpredictable and dynamic environments by combining compliant mechanical actuators (skeletal muscle) with neural control and sensory feedback. Abiotic actuators, by contrast, have yet to match their biological counterparts in their ability to autonomously sense and adapt their form and function to changing environments. We have shown that engineered skeletal muscle actuators, controlled by neuronal networks, can generate force and power functional behaviors such as walking and pumping in a range of untethered robots. These muscle-powered robots are dynamically responsive to mechanical stimuli and are capable of complex functional behaviors like exercise-mediated strengthening and healing in response to damage. Our lab uses engineered tissues as a platform to understand neuromuscular architecture and function in physiological and pathological states, restore mobility after disease and damage, and power soft robots. This talk will cover the advantages, challenges, and future directions of understanding and manipulating biological actuators.

*Speaker