NRI: FND: COLLAB: A Foundational Approach to Muscle Actuators that Lowers Barriers to Muscle-Powered Robotics Research

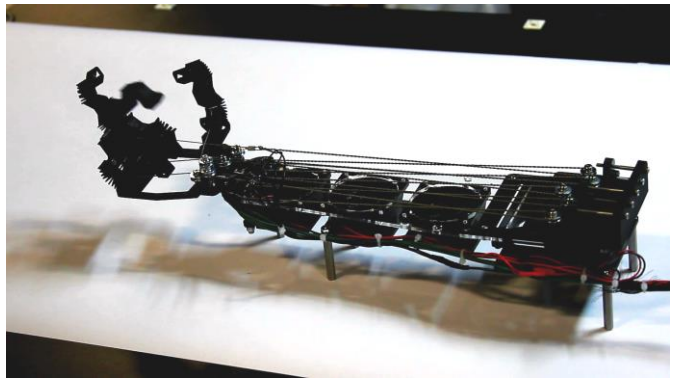
NSF Award #1830403 | Award Date: 09/01/2018 | Michael Yip (UC San Diego) and Robert Wood (Harvard University)

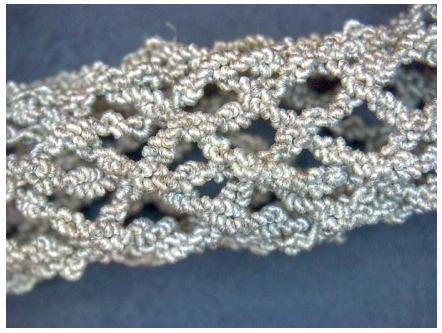
Challenge

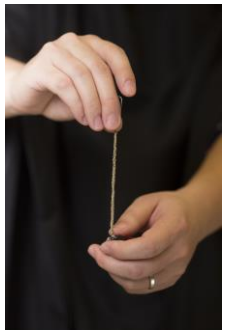
- Artificial muscle selection and design, modeling, and control is non-trivial
- Most methods require expert understanding of material physics

Solution

- Identify and unify **modeling**, **control**, and **data-driven design** strategies that can lower the barrier to entry for the large breadth of robot muscles







This project seeks to apply model-free techniques to controlling and designing artificial muscle actuators.

Scientific Impact

- A unifying framework of models, controllers, and design algorithms across multiple muscle types
- Demonstrations of new robot muscle technologies

Broader Impact

- Democratize artificial muscles for non-experts
- Educational effort involves creating an artificial muscle-powered machine toolkit for hands-on familiarization on multiple actuator technologies.

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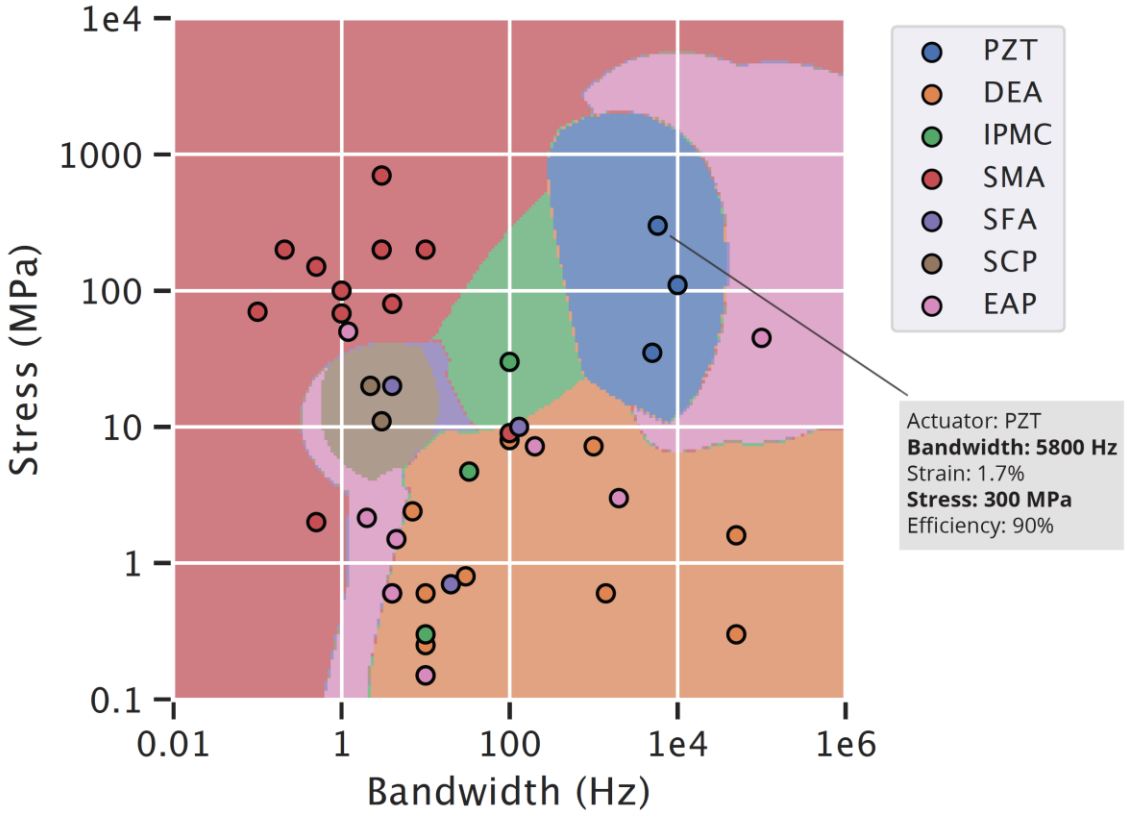

Example 1: Data-driven characterization

Example 2: high performance DEAs integrated within a valve controlling fluidic artificial muscles.