# Linear bristle actuators for robotics

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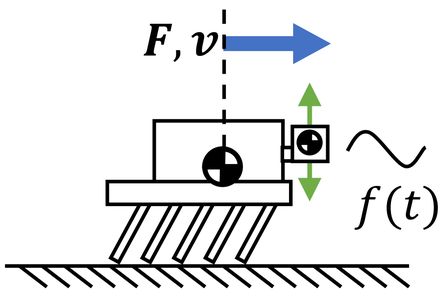
## MOTIVATION
Why I care about actuators

- Behind every good **robot** is a good **actuator**
- Robot designs are largely determined by actuator technology
- New actuators enable new robots and new applications

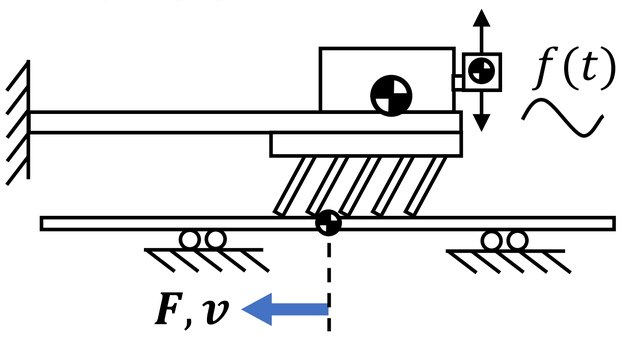
## DESIGN OBJECTIVES
What makes these unique

- Low passive mechanical impedence; **backdrivable**
  → Accessible dynamics
- Adaptable to diverse robot morphologies; **scalable**
  → Dimensions
  → Performance

## WORKING PRINCIPLE



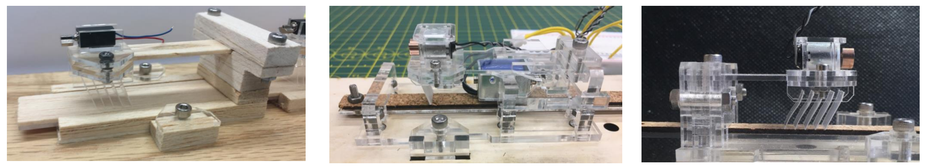

**Bristle bots**
- Ground is stationary
- Vibrating mass moves forward



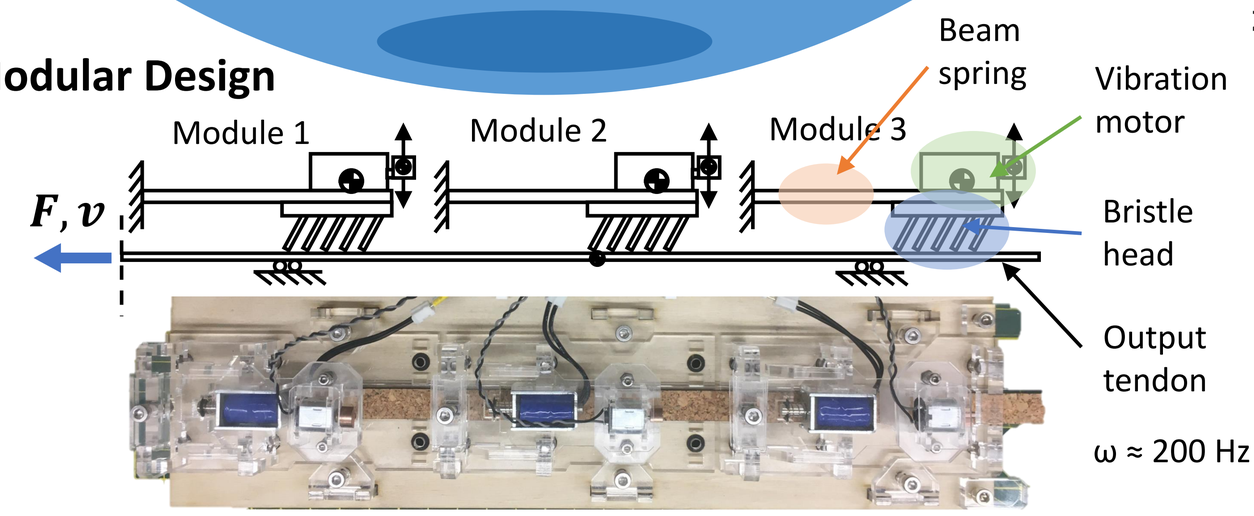

**Bristle actuators**
- Vibrating mass is stationary
- "Ground" moves forward

**Inverted "bristle bots"** make simple, scalable, bioinspired linear robot **actuators**

V2 Fixed | V2 solenoid clutched | V3 Fixed

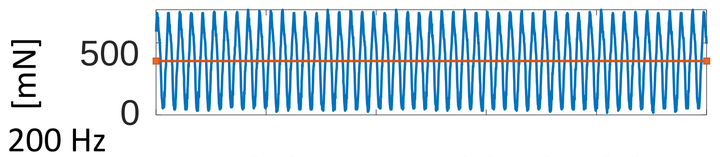


## Modular Design



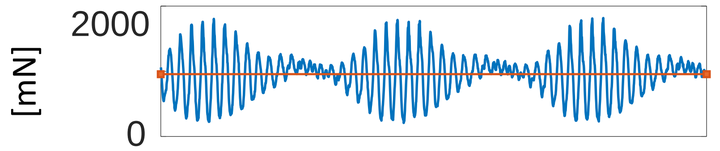

## PRELIMINARY RESULTS

### Single module blocked force

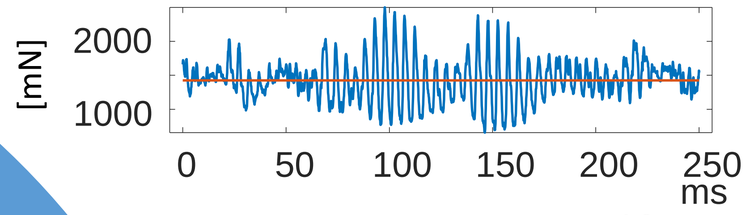



ω ≈ 200 Hz
1220 RPM

### 2-module series blocked force



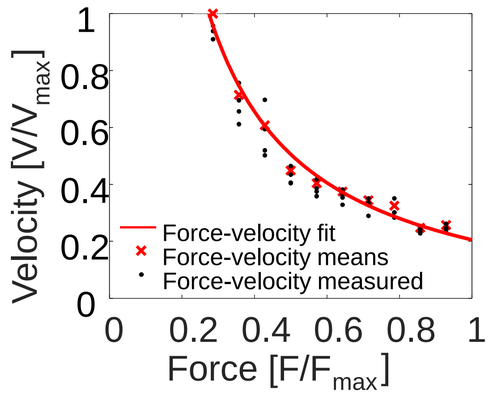

### 3-module series blocked force



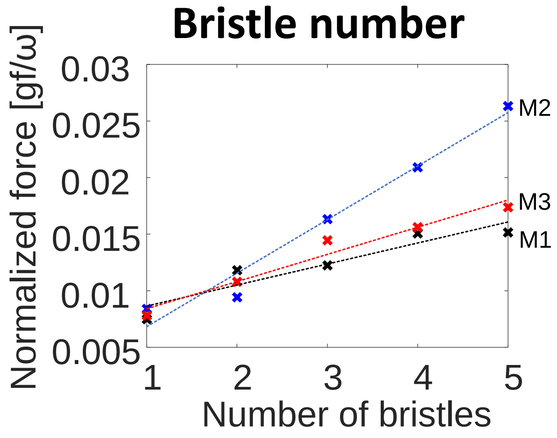

### Mean blocked force

| | |
|---|---|
| Single module: | 492 mN |
| 2-module series: | 446 mN |
| 3-module series: | 964 mN |

### Force-velocity




### Bristle number




### Mechanics of muscle