Docket #: S22-023

Soft Variable Impedance Actuator Using Embedded Jamming Layer

The Follmer group has designed a soft jamming brake and artificial muscle (SJBAM) actuator for improved muscle static and dynamic response and expanded brake bandwidth. This patented design incorporates a jamming brake inside a pneumatic artificial muscle (PAM), with the brake and muscle sharing common end attachments while remaining independently pressure-controlled, allowing the SJBAM to store elastic energy like a PAM while also acting as a brake or clutch. Because the jamming layers are enclosed within the muscle, the SJBAM jams via positive pressure rather than vacuum, achieving greater pressure differentials and substantially expanded jamming bandwidth versus traditional vacuum-based devices. The result is an all-soft variable impedance actuator with simpler controls and superior braking/clutching abilities for applications in industrial robots and machinery, exoskeletons, haptic interfaces, prostheses, and automotive systems.

Stage of Development - Prototype

Applications

- Industrial robots and machinery
- Exoskeletons and protheses
- Haptic interfaces
- Automobiles

Advantages

- Enhanced brake bandwidth
- Increased muscle force production
- Faster dynamic response

Publications

- Do, B. H., Choi, I., & Follmer, S. (2022). An all-soft variable impedance actuator enabled by embedded layer jamming. *IEEE/ASME Transactions on Mechatronics, 27*(6), 5529-5540. doi: 10.1109/TMECH.2022.3183576.

Patents

- Published Application: 20230258204
- Published Application: 20240035494
- Issued: 12,577,968 (USA)

Innovators

- Brian Do
- Inrak Choi
- Sean Follmer

Licensing Contact

Michael Spaid

Technology Licensing Associate 2

Email