A Pneumatic Artificial Muscle with Tunable Force-Displacement Relation

Track Code: 2022-BLUM-69849

Categories:
- Biomedical Engineering
- Mechanical Engineering

Keywords:
- Artificial Muscle
- Biomedical Engineering
- Displacement Control
- Fluidic (Pneumatic) Actuator
- Force Control
- Servo Actuator

Researchers at Purdue University have developed a fluid-driven, tunable artificial muscle, akin to a variable transmission for soft actuators. The artificial muscle may be used in robots to better-control their movement, expanding their fields of use. The muscle may also find applications in pneumatically powered industrial equipment. Previously developed pneumatic artificial muscles (PAMs) allow limited control over the force-displacement relation. These PAMs may only be able to transition between "compliant" and "stiff" states. By varying its geometry, the Purdue-developed PAM is less movement-limited. This PAM can be tuned to exert a continuum of forces and move a continuum of displacements, allowing for fine-tuning via a feedback-enabled adjustable air chamber geometry.

Technology Validation: By varying the width of the pneumatic muscle and the length of the folded portion, the researchers created a design space of the force-strain relation of their PAM. The researchers have also demonstrated feedback control of the PAM length under loading using geometry change.

Advantages
-”†–v†Ç’×GVæ &ÆP
-” ÖVæ &ÆR Fò F–`ferent materials of construction
-”fVVF& 6²Ö6öçG&öÆÆV@
-”6ö× Æ– çB Ö FW&– Ç2 f÷" 6 fR ðwer transfer

Applications
-” 'F–`icial muscle for robots and pneumatically-powered industrial equipment
-•6ögB &ö&÷F–70

People:

- Blumenschein, Laura (Project leader)
- Wang, Sicheng

Intellectual Property:

Application Date: May 22, 2023
Type: Utility Patent
Country of Filing: United States
Patent Number: (None)
Issue Date: (None)

Application Date: May 22, 2022
Type: Provisional-Patent
Country of Filing: United States
Patent Number: (None)
Issue Date: (None)

Contact OTC:

Purdue Office of Technology Commercialization
The Convergence Center
101 Foundry Drive, Suite 2500
West Lafayette, IN 47906

Phone: (765) 588-3475
Fax: (765) 463-3486
Email: otcip@prf.org