PURDUE INNOVATES | Office of Technology Commercialization

Adaptive Tactile-Responsive Robotic Gripper with Integrated Sensing

A robotic gripper with tactile-responsive palm and compliant sensor-enabled fingers that improves dexterity and handling reliability for industrial automation and service robotics.

Industrial automation and service robotics often struggle to manipulate varied and delicate objects due to limited tactile awareness in low-degree-of-freedom grippers. This technology introduces a conceptual architecture for a robotic gripper featuring a tactile-responsive palm paired with compliant, sensor-enabled fingers. Unlike conventional fingertip-only sensing solutions, this approach distributes perception and actuation across the palm-finger system to improve adaptability and contact-rich manipulation. Demonstrated through prototype-level evaluations, the system shows enhanced dexterity and stability across diverse tasks. The concept offers advantages for environments requiring reliable, informed grasping without increasing mechanical complexity. Manufacturers and robotics integrators can benefit from improved handling consistency and reduced need for highly specialized grippers.

Technology Validation

Validation was performed using a prototype gripper evaluated across standardized benchmarks and varied manipulation scenarios. Results demonstrated improved responsiveness and dexterity compared to typical low-DOF grippers, confirming the value of distributed tactile sensing.

Advantages

- Enhanced dexterity without increasing mechanical complexity

- Improved object handling reliability through multi-sensing fusion

- Supports adaptive, contact-rich manipulation

- Compatible with diverse robotic platforms

- Reduced need for highly customized end-effectors

Technology ID
2026-SHE-71472

Category
Robotics & Automation/Perception & Sensing
Robotics & Automation/Automation & Control
Artificial Intelligence & Machine Learning/AI-Integrated Imaging Systems & Industrial Vision and Inspection

Authors
Yu She
Yuhao Zhou

View online

Applications

- Industrial automation grippers requiring flexible object handling

- Agricultural and food-handling robotics

- Service robots interacting with varied objects

- Warehousing and logistics manipulators

TRL: 4

Intellectual Property:

Provisional-Gov. Funding, 2026-01-16, United States