A High Degree of Freedom, Lightweight, Multi-Finger Robotic End-Effector

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ABSTRACT

Researchers at the University of California, Davis have developed a technology that introduces a highly adaptable, lightweight robotic end effector designed for complex manipulation tasks in automation.

FULL DESCRIPTION

The technology encompasses a robotic end effector apparatus equipped with a palm assembly featuring five fingers, each with multiple independently controlled phalangeal joint assemblies. These assemblies are driven by linear actuators actuated by motors positioned within the phalangeal cavities, offering a high degree of dexterity and adaptability for various tasks. Additionally, the end effector includes a wrist assembly that enhances its flexibility and application range, making it suitable for intricate assembly tasks that require human-like dexterity.

APPLICATIONS

- Automated assembly lines requiring dexterous manipulation.
- Custom product manufacturing with high variability in tasks.
- Research and development in robotics and automation technologies.
- Industries requiring high precision and adaptability, such as electronics and automotive manufacturing.

FEATURES/BENEFITS

- Provides a high degree of freedom with multiple independently controlled phalangeal joints.
- Lightweight design is compatible with a wide range of robotic arms.
- Effectively handles tasks designed for human workers with anthropomorphic features.
- Self-locking capability for enhanced precision and stability in manipulation.
- Integrated wrist assembly for increased flexibility and range of motion.
- Reduces technical complexity and limited adaptability in assembly automation.
- Overcomes limitations of current robotic grippers in performing complex manipulation tasks.
- Addresses economic and practical constraints in adapting automation for small batches or custom products.

PATENT STATUS

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OTHER INFORMATION

KEYWORDS

actuator assembly, automation, dexterity, end effector, linear actuator, motor, phalangeal joint assemblies, robotic arm, robotic gripper, robotics

CATEGORIZED AS

- **Engineering**
  - Engineering
  - Other
  - Robotics and Automation

RELATED CASES

2025-515-0

Patent Pending

RELATED MATERIALS

- Basheer, Al & Chang, Justin & Chen, Yuyang & Kim, David & Soltani, Iman. (2025). Krysalis Hand: A Lightweight, High-Payload, 18-DoF Anthropomorphic End-Effector for Robotic Learning and Dexterous Manipulation. 10.48550/arXiv.2504.12967. - 04/17/2025

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