

# 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

## CONTACT

Andrew M. Van Court  
[amvancourt@ucdavis.edu](mailto:amvancourt@ucdavis.edu)  
 tel: .



## INVENTORS

- ▶ Basheer, Al Arsh
- ▶ Soltani Bozchalooi, Iman

## 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

## ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ A Multimodal Distributed Sensing Device
- ▶ Non-Invasive AI-Based Retinal Inflammation Detection and Severity Estimation Using OCT B-Scans
- ▶ A Morphing Wing Sailplane-multicopter UAV

**University of California, Davis**

**Technology Transfer Office**

1 Shields Avenue, Mrak Hall 4th Floor,  
Davis, CA 95616

Tel:

530.754.8649

[techtransfer@ucdavis.edu](mailto:techtransfer@ucdavis.edu)

<https://research.ucdavis.edu/technology-transfer/>

Fax:

530.754.7620

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