SELF-ADAPTING ROBOTIC DIGITS FOR FRAGILE OBJECT MANIPULATION

Tech ID: 34615 / UC Case 2026-108-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

Developing robotic hands that can safely and effectively grasp a wide variety of objects remains a significant challenge, often requiring heavy motors and complex sensor arrays. Researchers at UC Berkeley have developed an underactuated dual-finger mechanism that features a unique force-triggered carpometacarpal (CMC) joint articulation. By utilizing underactuation—where a single motor drives multiple degrees of freedom—the design achieves high dexterity with minimal mechanical complexity. The CMC joint is engineered to respond passively to contact forces, allowing the fingers to wrap around objects of varying shapes and sizes automatically. This innovation enables a natural, compliant grip that mimics human hand mechanics, providing a lightweight and cost-effective solution for advanced manipulation.

SUGGESTED USES

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Robotic Prosthetics: Providing amputees with lightweight, intuitive hands that can grasp everyday items using simplified control inputs.

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Logistics and Warehousing: Equipping pick-and-place robots with versatile grippers capable of handling fragile or irregularly shaped packages without damage.

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Surgical Robotics: Implementing compliant fingers in minimally invasive tools to allow for the delicate manipulation of sensitive biological tissues.

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Service and Domestic Robotics: Developing household robots that can interact safely with varied objects, such as glassware, fruits, or soft textiles.

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Remote Space Exploration: Utilizing robust and energy-efficient end effectors for planetary rovers or satellite repair missions where motor weight is restricted.

ADVANTAGES

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Mechanical Simplicity: Reduces the total number of motors and controllers required, leading to a lighter, more reliable, and easier-to-maintain device.

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Inherent Compliance: The force-triggered mechanism allows the digits to adapt naturally to an object's geometry without the need for complex software algorithms.

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INVENTORS

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OTHER INFORMATION

CATEGORIZED AS

» **Computer**

» Hardware

» **Engineering**

» Engineering

» Robotics and Automation

» **Sensors & Instrumentation**

» Medical

» Physical Measurement

RELATED CASES

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Enhanced Grip Stability: The triggered CMC joint increases the contact area between the finger and the object, ensuring a more secure and stable grasp.

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Reduced Power Consumption: Minimizes the energy required for active joint management, making it ideal for battery-powered or mobile applications.

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Improved Safety: The passive, force-responsive design reduces the risk of applying excessive pressure, protecting both the robot and the objects it handles.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Smart Suction Cup for Adaptive Gripping and Haptic Exploration

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