SMART SUCTION CUP FOR ADAPTIVE GRIPPING AND HAPTIC EXPLORATION

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PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20240157584	05/16/2024	2021-145

BRIEF DESCRIPTION

Vacuum grippers are widely used in industry to handle objects via suction pressure. Unicontact suction cups are commonly used for gripping because they are simple to operate and can handle a variety of items, including those that are delicate, large, or inaccessible to jaw grippers. However, suction cup grippers have challenges such as planning a contact location and inertial force-induced grasping failure.

To address these challenges, UC Berkeley researchers developed a tactile sensing technology for smart suction cups. This Berkeley sensing technology can detect suction contact and prevent suction cup grasp failures. It can perform tactile sensing of object properties such as roughness or porosity that might lead to grasping failures before they happen. If a grasp failure does happen, the technology gains additional information about why and how the failure occurred to prevent similar failures in future attempts. Sensing occurs quickly, such that robot behavior can remain fast while increasing performance, efficiency and reliability.

As compared with other robotic grasping sensing technologies, this smart suction cup technology is affordable, resilient and easy to service. The cup is manufactured using the same process as other suction cups, and electronics are simple and located away from the point-of-contact and protected from damage or hazardous exposure.

SUGGESTED USES

Applications of interest include any task where suction cups are a common gripping technology, such as

(1) pick-and-place,

(2) packing and unpacking,

(3) conveyor manipulation,

(4) package handling,

(5) warehouse applications,

(6) cluttered bin-picking,

(7) household applications, and

(8) service robotics.

The technology is scalable to different suction cup sizes or array configurations, and can be installed on any existing robotic arm manipulator designed for suction gripping applications.

ADVANTAGES

The benefits of this technology to these applications are,

(1) the ability to operate without an expensive wrist load cell on the robotic manipulator,

(2) real-time feedback control, responsiveness and flexibility for a versatile set of grasped objects,

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INVENTORS

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OTHER INFORMATION

KEYWORDS

Robotics, Suction Cup Grippers

CATEGORIZED AS

» **Computer**

» Hardware

» Other

» Software

» **Engineering**

» Robotics and Automation

RELATED CASES

2021-145-0

(3) resilience to and prevention of grasping errors, and

(4) optimization of robotic manipulator trajectories to increase operational speed without failures.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Self-Adapting Robotic Digits for Fragile Object Manipulation

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