

A Compliant Mechanism Based Variable Stiffness Robotic Grasper IITM Technology Available For Licensing

Problem Statement

- Grasping objects is an essential function of robotic systems and the **end effectors design** is one of the most important aspects of a **robotic manipulator**.
- Operating Robots require end effectors equipped with an **ability** to sense the objects **deformability**, and then accordingly control the force exerted on the object **to ensure an optimal grasp**.
- The method available have certain **drawbacks** like external power pack for operation in fluid-based systems, slow response for change of stiffness in shape memory materials and low melting point alloys, low range of stiffness variation and continuous power requirements to maintain stiffness for rheological fluids.
- Hence there is a need to improvise the **conventional mechanism of robotic grasper**.

Technology Category/ Market

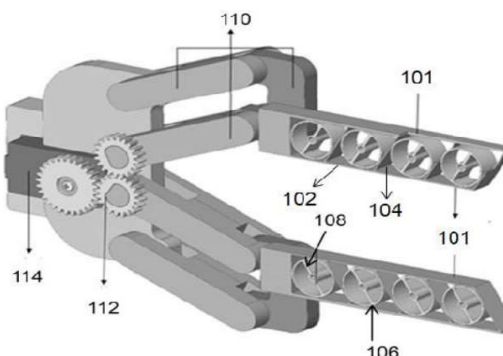
Technology: Robotics, Automation, Machines Manufacturing

Applications: Robotic Grasper, structural morphing, Variable stiffness, Industrial robots, automation, safety robots, transportations.

Market: The global **robotic gripper** market was valued at **US\$ 1.6 B in 2022** and is projected to total **US\$ 2.8 B by 2028** expanding at a CAGR of **9.8%** from 2021 to 2028.

Technology

- The present patent relates a **variable stiffness robotic grasper assembly** based on **structural modulation of compliant structure**.
- The robotic grasper **assembly (FIG. 1** illustrates the overview of the apparatus, according to an embodiment of present subject matter) comprises:



Variable stiffness jaws,

A parallelogram-based four-bar linkage coupled to jaws,

A motor for operating the jaws

A gear arrangement for transmitting the torque from the motor to the jaws through the four-bar linkage to open and close the jaws.

- Further, the apparatus comprising one or more **proximity sensors adapted to detect a potential contact**.
- Wherein the rotors are configured to be rotated to present a surface of reduced stiffness in response to sensor inputs corresponding to potential contact in a collaborative environment.

Key Features / Value Proposition

- Compact construction.**
- Requires **low power** for **actuation**.
- No power** needed to **maintain stiffness**.
- Can do **form closure & force closure** of the grasped object and is capable to perform **internal & external grasps**.
- Ability to **change stiffness** even while grasping an object
- Can be **scaled up or down** to any size depending on the application.
- Applicable in **surgical tool tip, apple picking grasper, material handling**.

Intellectual Property

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TRL (Technology Readiness Level)

TRL- **3/4** Proof of concept ready Stage

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