Design, Test and Control of a Magnetorheological Universal Gripper for Use On-Orbit

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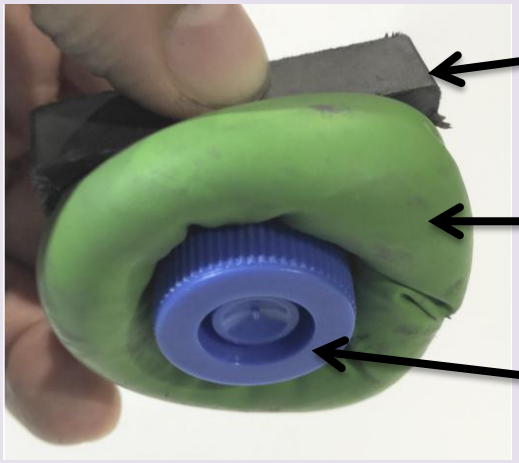
Research Objectives:

1. Experimentally evaluate the effectiveness of the proposed MR gripper as a function of device characteristics
2. Create and validate a model of the dynamics of the gripper during insertion to define the operational envelope.
3. Calculate the mass, power and volume requirements for the device.



Proof-of-Concept Magnetorheological (MR) Gripper Overcomes Gravity to Lift Target

Approach:

- Experimentally characterize device grip strength for a variety of MR fluid characteristics using INSTRON materials test system.
- Numerically model MR fluid-membrane-object interaction using Discrete-Element-Method-type code.
- Validate model with experimental data and predict performance in use case.

Potential Impact:

- Transport tools and devices on ISS
- Use multiple to grapple uncooperative satellites or debris
- **Simple: No moving parts ➔ reliable**
- **Versatile: No *a priori* knowledge of target shape required**