NRI:INT:COLLAB: Soft Active Contact Pads with Tunable Stiffness and Adhesion for Customizable Robotic Grasping

CMMI 1830362 • Poster 74 • September 4, 2018 – August 31, 2021

PI Carmel Majidi • Carnegie Mellon University
Co-PI Kevin Turner • University of Pennsylvania
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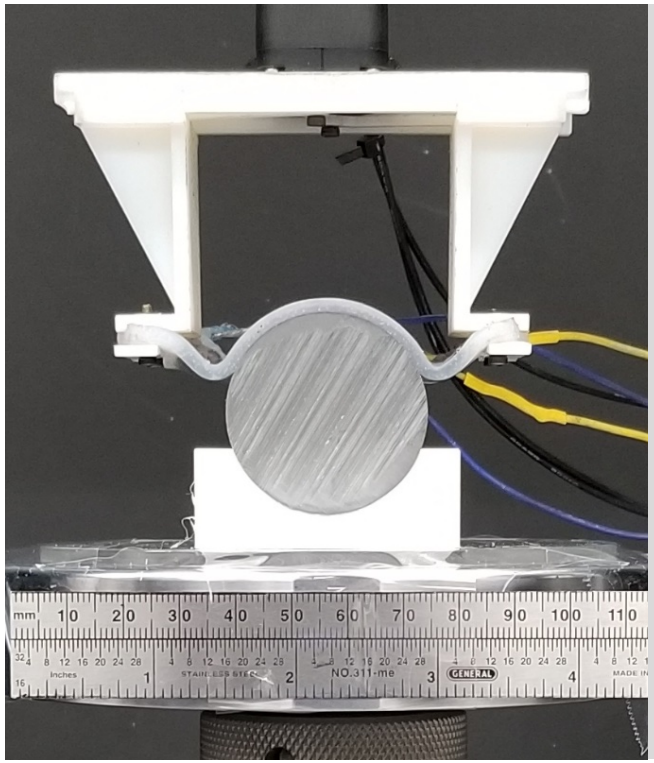
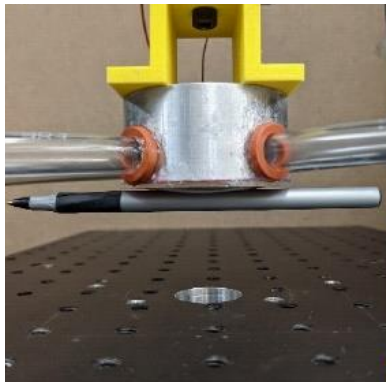


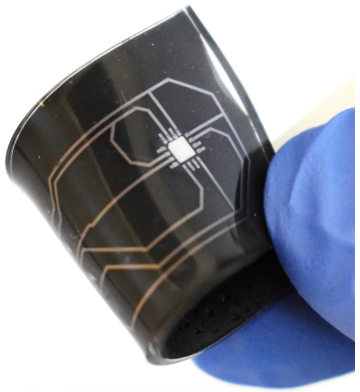
Challenge

- Universal & Customizable Robot Grasping
- Match the versatility of natural grippers in handling a wide variety of objects.

Solutions

- Polymer composites that dynamically change modulus and adhesion in response to electrical stimulation
- Soft robotic end effectors for grasping and manipulation
- Sensing stickers for measuring interfacial forces





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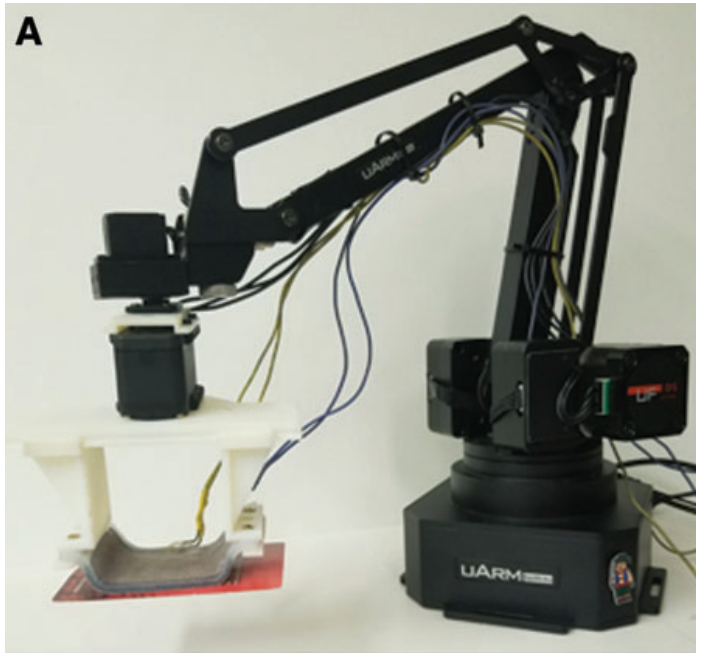

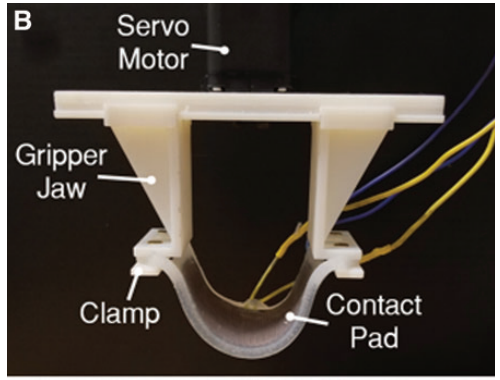

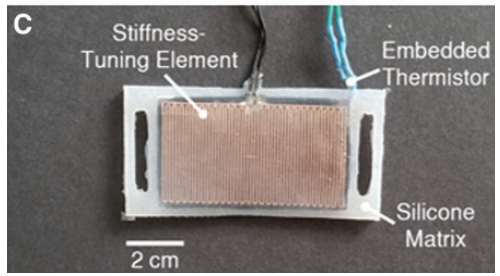

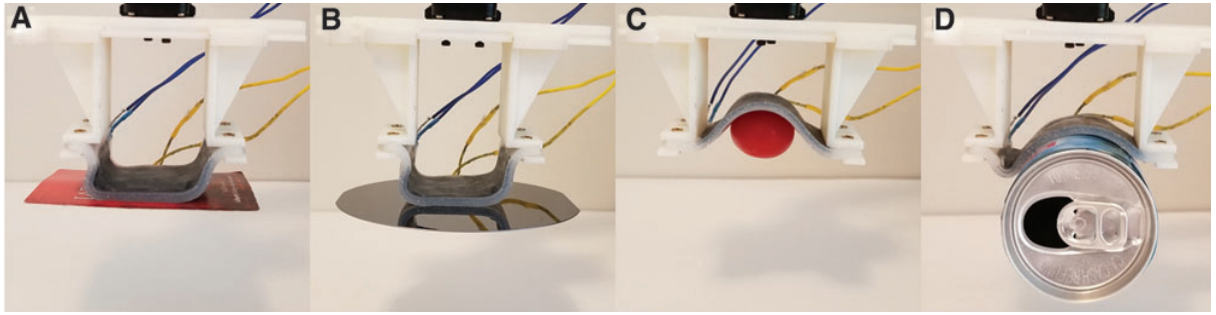

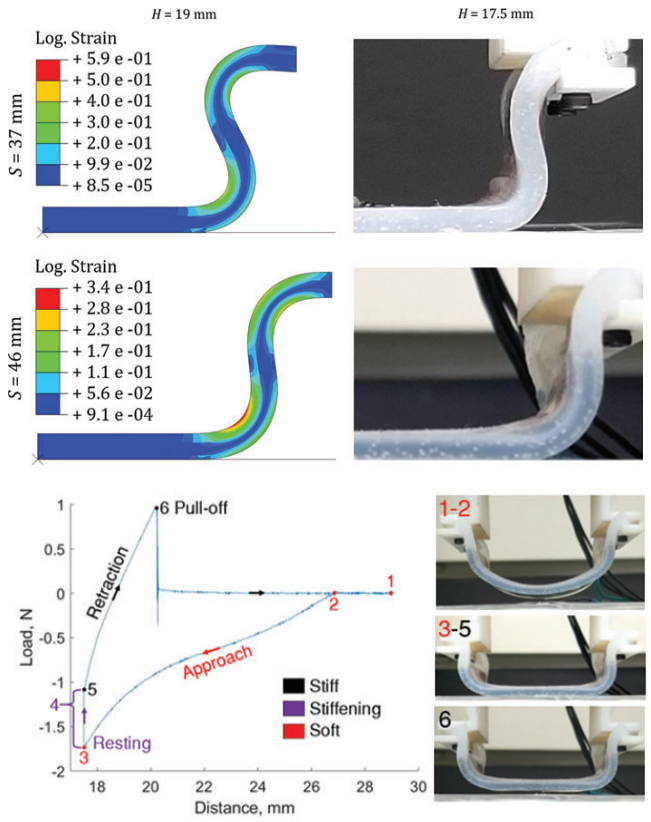

Grasping

Coulson, R., Stabile, C.J., Turner, K.T. and Majidi, C., "Versatile Soft Robot Gripper Enabled by Stiffness and Adhesion Tuning via Thermoplastic Composite," *Soft Robotics* in press (2021).

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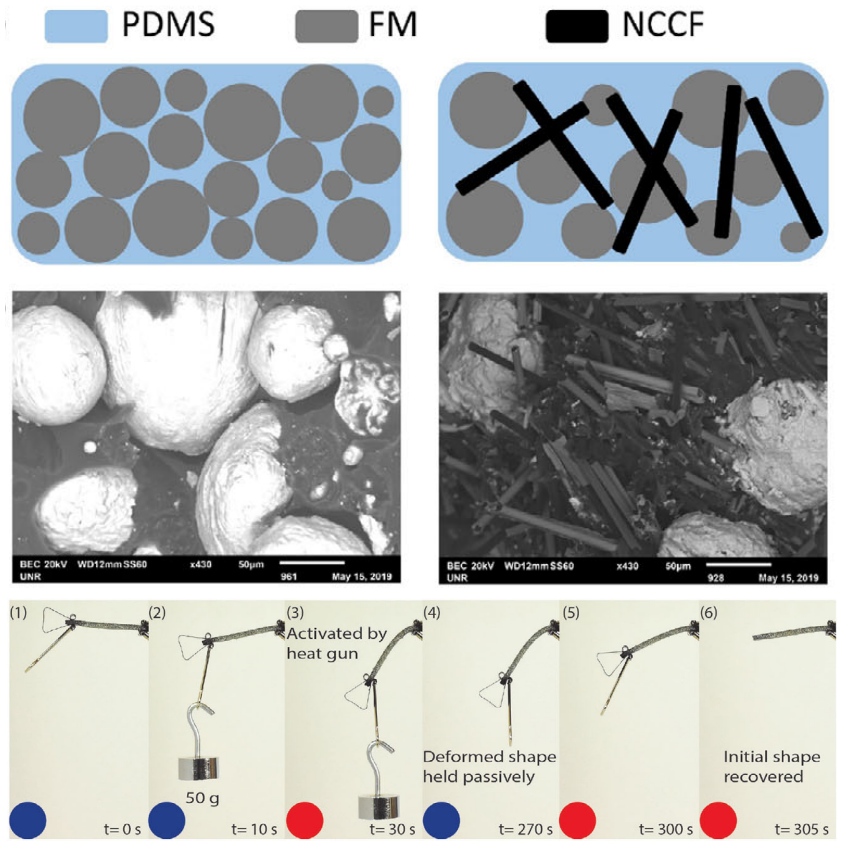

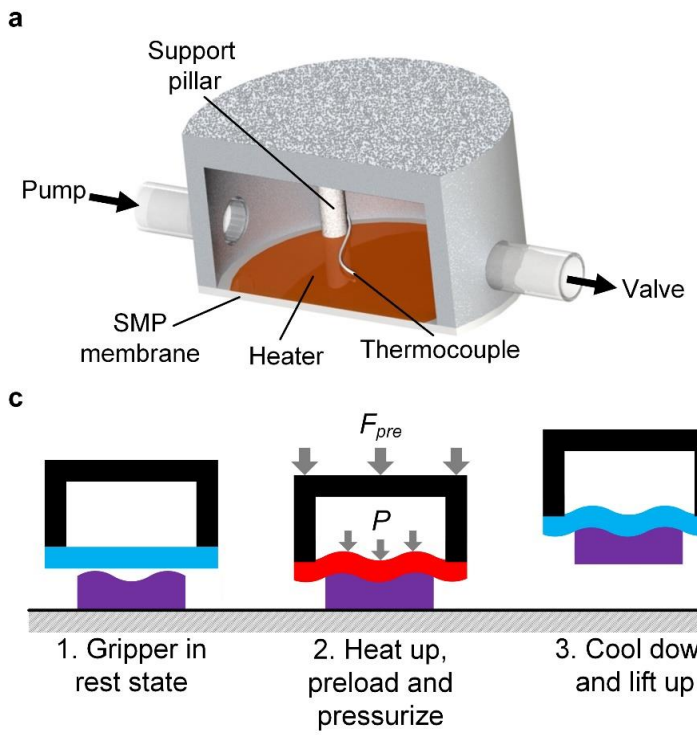

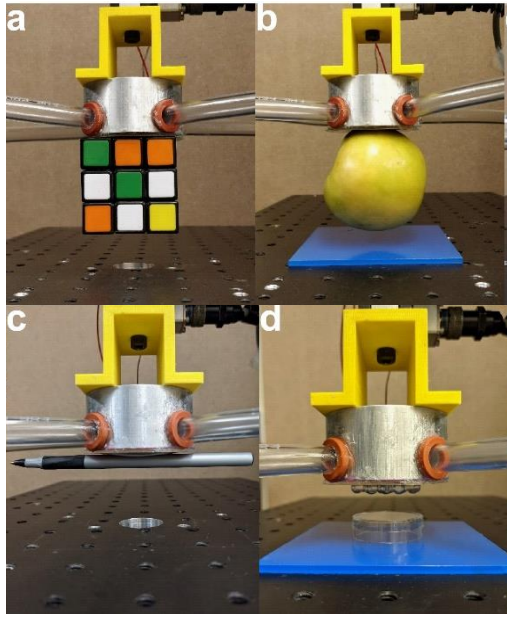

Mohammadi Nasab, A., Sharifi, S., Chen, S., Jiao, Y. and Shan, W., "Robust Three-Component Elastomer–Particle–Fiber Composites with Tunable Properties for Soft Robotics," *Advanced Intelligent Systems*, p.2000166 (2020).

Aoyi Luo, Sumukh Shankar Pande, Kevin T. Turner, "Versatile adhesion-based gripping via a tunable stiffness membrane," manuscript in preparation (2021).

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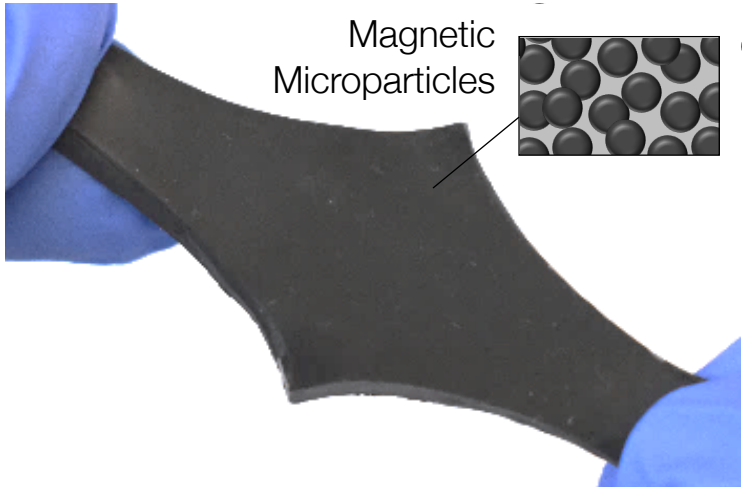
Localization and Force-Feedback with Passive Soft Magnets for Robotic Manipulation

Tess Hellebrekers, Kevin Zhang, Manuela Veloso, Oliver Kroemer, Carmel Majidi

Carnegie Mellon University



Hellebrekers, T., Zhang, K., Veloso, M., Kroemer, O. and Majidi, C., "Localization and Force-Feedback with Soft Magnetic Stickers for Precise Robot Manipulation," *IEEE/RSJ IROS* 2020

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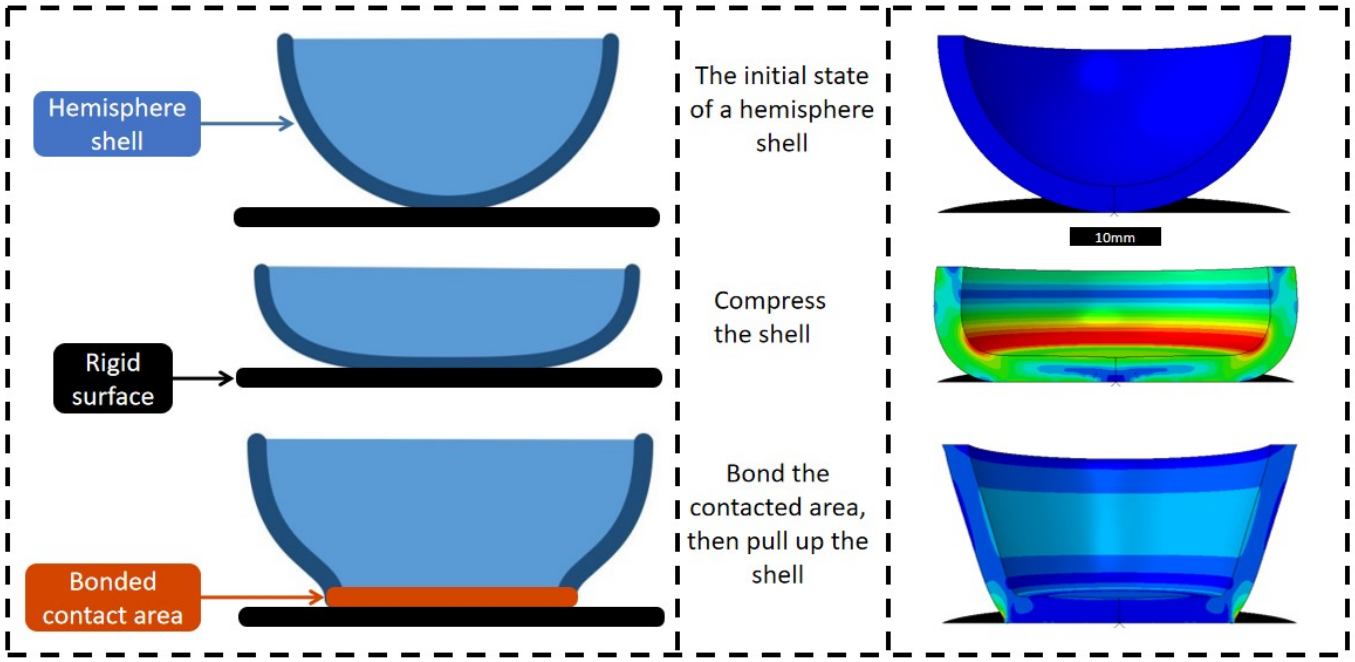

Chenxu Zhao and Wanliang Shan

Ryan Coulson, Chao Li, Carmel Majidi, Nancy Pollard, “The Elliott and Connolly Benchmark: A Test for Evaluating the In-Hand Dexterity of Robot Hands,” manuscript under review (2021).