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SOFT TRANSLATABLE ADVANCED ROBOT FOR IN-SPACE HANDLING (STARFISH)

**Abstract**

With the advent of on orbit servicing, the ability to build larger, launchable, structures in space presents not only unique opportunities, but challenges as well. One of which is being able to constantly evaluate and supervise the spacecraft assembly process and inspect resulting non-linear assemblies of a slew of components e.g., mechanical, electronic, etc. Quality assurance of joints, assemblies, material quality, etc. is easily achieved terrestrially through robotic and human validation. Deployed spacecrafts in space would benefit greatly from a ubiquitous, highly compliant, and flexible system that would be able to conduct the same if not similar inspections. Soft robotics is certainly one of the more promising burgeoning avenues of robotics research and space operations. Soft robots developed as of now have exhibited their working functionality in water or on land, actuated pneumatically, using electroactive polymers, or cables. Most soft robotics research with regards to space applications is relatively scarce and inconclusive.

The University of Southern California's Space Engineering Research Center (SERC) is in the process of developing an actinomorphic-inspired robot merging soft materials, robotics, and electro or gecko-adhesion technology that is fully compliant and whose unique design allows it to walk, crawl, and round corners. The actuation method we've adopted requires the use of shape memory alloys. A combination of SMA wires (arranged bidirectionally), springs, conductive polymer hydrogels, and dielectric elastomers is being tested to procure the desired locomotion in zero-gravity environments and takes sensor input from the extreme environmental conditions in space.

Testing for onboard, possibly solar, powered systems, shape memory alloy actuators, and the validity of electro or gecko-adhesion tiles embedded within a soft substrate will be conducted at the SERC and the results of which will be presented in this paper.

My abstract is a new one and has not been submitted for 2021.