Harvard researchers develop new kind of soft robotic gripper

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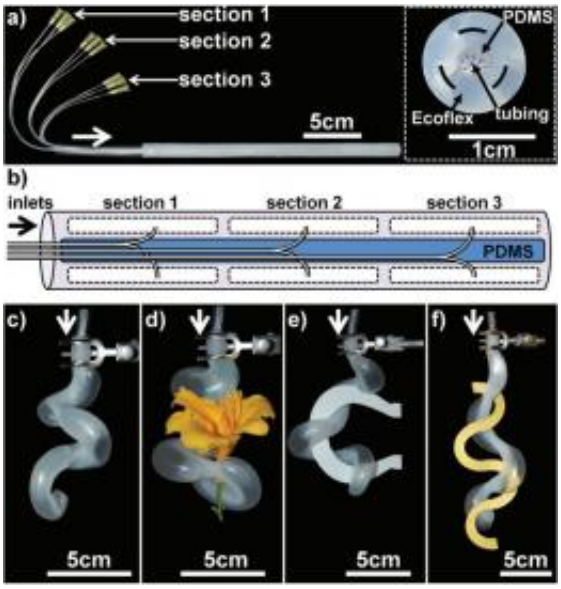

3D tentacles with multiple sections. Credit: Advanced Materials.
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(Phys.org)—Because traditional robot hands or grippers were first created to assist in production type enterprises, e.g. to help build cars, etc., they have not been very good at working with soft materials. For that reason, over the past couple of years, robot engineers have been working to come up with new ways to give robot hands the ability to manipulate small and/or fragile objects. Now a team from Harvard working with the Department of Energy and DARPA has come up with a tentacle type gripper that is sensitive enough to lift a flower without

crushing it. They have had their paper describing their results published in the journal *Advanced Materials.*

Most robot hands work in ways similar to the human hand, they have appendages that make use of joints to close around an object and then clamp down it with enough pressure to allow for picking things up and setting them down. Newer soft bodied robot hands take their cue from soft bodied animals like snakes and in this case, octopi, which grasp objects by covering them with a single soft appendage and squeezing. The result is a gripper the research teams calls a tentacle, which like the octopus, is able to wrap around (or be wrapped around) an object's different parts, spreading the pressure exerted against it in a very gentile way.

The tentacle is a single plastic flexible tube with several channels inside that can each be pumped full of air, causing the pressure needed to hold on to an object. But because each channel is pressurized independently of the others, the tentacle can also be caused to curl in a directed fashion, allowing for wrapping, then squeezing. By adding just enough air pressure for the object to be lifted, the tentacle can be made to provide a very gentle lift. And because its abilities are based on air pressure, the tentacle can also be reduced in size when not in use, something that could come in handy for work in tight spaces.

The multiple channel approach allows for the tentacle to curl in three dimensions, whereas others up till now could only curl in one direction. To add even more functionality, the team has tried affixing a very small camera to the end of the tentacle, a syringe and even a suction cup to allow the tentacle to latch onto objects or hold them in different ways.

More information: Robotic Tentacles with Three-Dimensional Mobility Based on Flexible Elastomers, *Advanced Materials.* Article first published online: 7 SEP 2012. DOI: 10.1002/adma.201203002 (Full text

PDF)

Abstract
Soft robotic tentacles that move in three dimensions upon pressurization are fabricated by composing flexible elastomers with different tensile strengths using soft lithographic molding. These actuators are able to grip complex shapes and manipulate delicate objects. Embedding functional components into these actuators (for example, a needle for delivering fluid, a video camera, and a suction cup) extends their capabilities.