Electroactive polymer key to durable, affordable full-screen Braille displays

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(PhysOrg.com) -- A team of North Carolina State University researchers are one step closer to creating a workable, affordable full-screen Braille computer display that would allow the blind to scan Web pages in much the same way that sighted people do.

The team, composed of textile, electrical and computer engineers, had previously introduced a design that could translate both words and images into tactile displays. They wanted to test different materials for use in the actuators, which move the pins that create the Braille dots, to ensure that the raised dots would support the weight of readers' fingers and enable them to scroll through the material quickly.

Textile engineer Dr. Tushar Ghosh developed an actuator based on silicone tubes, and found that this material resulted in lighter-weight, less expensive devices that still performed as expected.

"Conventional refreshable Braille displays usually incorporate ceramics, or hard materials, in order to do the work of moving the pins up and down to create letters," says Ghosh. "But they are heavy, difficult to work with and expensive. Electroactive polymer-based silicone tubes are lightweight, flexible, can be processed easily and are inexpensive to manufacture."

"The result is a device that brings us closer to durable, lightweight and affordable full-screen refreshable Braille displays," Ghosh says.

The research, which was funded by the U.S. Dept. of Education, appears in *Sensors and Actuators A*.

The paper was co-authored by NC State electrical and computer engineers Dr. Paul Franzon, Dr. Neil Di Spigna, Dr. Peichun Yang and graduate students P. Chakraborti, and H.A. Karahan Toprakci.

More information: "A Compact Dielectric Elastomer Tubular Actuator for Refreshable Braille Displays", Authors: P. Chakraborti, H.A. Karahan Toprakci, P. Yang, N. Di Spigna, P. Franzon, T. Ghosh, North Carolina State University, Published: Online in *Sensors and Actuators A*.

Abstract
Electroactive polymer actuators stimulated by appropriate levels of electric field are particularly attractive for human-assist devices such as Braille. The development of a full page refreshable Braille display is very important for the integration of the visually-impaired into the new era of communication. In this paper, development of a compact dielectric elastomer actuator suitable for Braille application is reported. The actuators are fabricated from commercially available silicone tubes. The tube has been rendered mechanically anisotropic through asymmetric levels of applied pretension in circumferential and axial directions in order to direct the actuation strain in the axial direction of the actuator. Key performance parameters, such as displacement, force, and response time of the actuator are investigated. The test results demonstrate the potential of the compact, lightweight, and low cost dielectric elastomer as actuators for a refreshable full page Braille display.

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