Artificial 'muscles' may pump up touch-screen typing

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Any high schooler sneaking a text message in class can confirm that fingering the right buttons on a cell phone is a cinch, even if it's hidden in your pocket. But how about on a glass touch screen?

By next year, these might feel like QWERTY keyboards, too.

A Sunnyvale, Calif., company called Artificial Muscle says its thin plastic "muscle" can push a glass screen ever so slightly, nudging back on a texting finger to create the sensation of typing on a real keyboard.

If the tactile feedback is realistic enough, the technology could add momentum behind touch-screen devices in a market where keyboard phones like the BlackBerry are struggling to keep customers from switching.

Here's how the muscle works: When you tap a phone lined with artificial muscle under the glass, an electric zap commands the muscle to flatten by a couple tenths of a millimeter, or about the thickness of a business card. With an inaudible "click," the glass pushes back like a physical keyboard does. However, the entire screen moves, not just the spot that's touched.

"Touch screens have taken away the sense of touch," said Artificial Muscle co-founder Marcus Rosenthal. Most of his friends have BlackBerrys because they can type faster, but if touch screens felt like keyboards, he thinks they'd switch.

Even if the technology improves the touch experience, some analysts doubt that die-hard keypad users will want to switch.

"The touch screen won't be perfect," said Chris Jones, principal analyst at Canalys, predicting that typos will still be commonplace. "This technology may make competitors a bit sexier, but BlackBerrys are still maintaining a large part of the U.S. market."

A contract factory is already ramping up to produce 1 million of these muscles, or plastic actuators, per month by summer's end, according to Rosenthal. He said an electronics entertainment product would be released by Christmas, and at least two cell phone companies plan releases for 2011, though he declined to identify them.

The synthetic muscle was dreamed up nearly two decades ago in a basement lab at SRI in Menlo Park, which engineered more than 100 devices utilizing the muscle, including snakelike reconnaissance robots that slither and electric-powered masks that curl into grins. Inventors fashioned Braille touch pads, using the muscle to elevate dots.

The artificial muscle's home at SRI was just a chocolate river away from being as fantastic as Willy Wonka's factory. The military funded plenty of projects with the muscle, like military hiking boots that power a battery with each step and reconstructive eyelid surgery for wounded veterans who could no longer blink.

The muscle joined a family of materials with the special ability to stretch when pulsed with electric current, as well as the reverse talent of turning motion into electricity.

For the past century, these materials were typically brittle materials like ceramic or crystal. A cigarette lighter works by squeezing such a crystal, called a piezoelectric, to produce a spark. Autofocusing cameras have tiny piezoelectric motors, powered with a battery, to nudge the lens forward and back.

Because the artificial muscle is plastic, it's slightly cheaper than its piezoelectric competitors, as well as more flexible and less fragile.

Of all the devices using the muscle that SRI

churned out, few were economically promising.

Artificial Muscle spun off from the research institution in 2004, and it's been developing the muscle for mobile medical pumps as well as touch-screen devices. Earlier this month, the company was acquired by Bayer MaterialScience.

Gaming will be a hot application of the muscle, says Rosenthal. In an iPhone dice app the engineers installed on a demo phone, the user rolls six dice and with each click and bump, the phone vibrates. The phone also replicates the feeling of dice shaking in a cup.

Artificial muscles in a computer mouse could help you "feel" the kickback of a gun in a shooting game, or the jolt when tackled in a John Madden football game. If you're hiding with an enemy on your tail, a mouse can mimic the pumping of your player's heartbeat.

The muscle may someday even harvest energy from the ocean. An electricity-generating buoy using the muscle was tested in the Santa Cruz harbor last year and worked, but its materials were too expensive for commercial application.

With each churning wave, a cylinder connected to artificial muscle pumps up and down, turning the motion into electricity. Connect a grid of these buoys, and you could generate enough energy to desalinate ocean water on the shore.

"Wave power generation might be our largest product in five to 10 years," Rosenthal said.