Scientists get a grip on grasping

By Kristen Minogue
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It turns out that opposable thumbs aren't critical for getting a good grip. Neither are fingers. Scientists have created a robotic hand that can do such things as serve drinks and draw pictures even though it has no digits.

Fingers and thumbs work perfectly well for humans, says Eric Brown, a physicist at the University of Chicago. But on a robot they can be clumsy. The fingers slip. They grip too hard and break whatever they're trying to hold. And sometimes they don't grasp it all. Then there are the complexities of manipulating 20-odd joints with a computer.

So Brown and his colleagues took a different tack. Their robotic hand, which they describe in a paper published online by the Proceedings of the National Academy of Sciences, is a thin rubber sack filled with coffee grains or small glass spheres. When this hand comes in contact with an object, a small pipe sucks air from the sack, causing it to contract and mold to the object's shape. The contraction is small - a mere 1 percent change in volume - but that was enough to grab most objects the researchers tested. "It's very simple to control," notes Brown. "You don't have all these joints."

The hand works best on hard, dry, geometrically complex objects such as screwdrivers and toy jacks. It has more trouble with flat objects such as plastic disks and porous objects such as cotton balls. It also can't grip anything bigger than half its size: The biggest items the team picked up were one-gallon jugs of water. But the hand's true strength, according to John Amend, a Cornell University engineering student and a co-author of the paper, is its versatility. Aside from the limitations noted above, he says, as long as the gripper can grasp about a quarter of the object's surface, it can pick up just about any shape.

Scientists have been searching for a universal gripper for decades, and the idea of using a deflatable sack instead of fingers is not new, says Yale University physicist Corey O'Hern, who was not part of the study. But this is the first time the idea has been tested and quantified in so much detail. Compared with robotic fingers, he says, "this seems like a much better way to go."

O'Hern suggests solving the porous-object problem by making the sack stickier. But the
Scientists get a grip on grasping problem there, he adds, is that letting go would be hard.

Amputees could benefit most from the technology, says Brown. Having a moldable hand that could hold a fork or swipe a credit card could drastically improve the quality of life for the tens of thousands of patients in the United States who have lost an arm. And without the need to manipulate eight fingers and two thumbs, he says, a gripper of this sort would be much easier to operate than many of the prosthetic hands currently on the market.

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