Ground coffee helps robots get a grip - October 25, 2010

Most robotic hands are modelled on human or animal hands and use digits to grasp objects, but artificial fingers are a complicated business. Before a hand can pick up an object, the fingers must position themselves correctly and judge the force required to grasp the object correctly. This involves a multitude of different sensors and is computationally intensive, requiring a central processor to do the job the brain would do for a human or animal hand.

But now a collaboration led by Eric Brown of the University of Chicago, which also includes Cornell University and US firm iRobot, has come up with a simple solution to the complexities of robotic hands. They have ditched the fingers altogether, replacing them with a rubber bag full of granular material - the ‘hand’ or gripper in the video above is full of ground coffee.

The gripper is placed over objects, deforming around them. The air in the bag containing the granules is then removed by suction, causing the granules to pack tightly together - known as jamming - and the hand to grip on to the object. No computation is required, although at present a researcher must decide when to evacuate the air, and the gripper is able to lift a diverse selection of objects, from a car’s shock absorber to a raw egg. The hand is even capable of lifting and pouring a glass of water, or of picking up a pen and using it to draw.

Although the study, published in this week's Proceedings of the National Academy of Sciences, is not the first time the idea has been suggested, it is the first time that the physics behind such a grabber has been characterised, and the first time such a sophisticated prototype has been constructed.

It grips through a combination of friction, suction and interlocking - the material deforms around protrusions on the object and then grips them tight when the air is removed.

Heinrich Jaeger of the University of Chicago, who took part in the study, says the gripper represents a practical use for the science of jamming. “It's a very general concept that is immensely scalable - window glass is a jammed liquid. We've actually translated that concept into a potential application.”

Jaeger suggests the gripper could be part of a robot sent in to burning buildings or other dangerous situations.

Posted by Joseph Milton on October 25, 2010
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