It’s far from easy to design a robot with one controllable joint, so imagine the difficulty of creating an artificial hand and its numerous knuckles. A team of researchers from the University of Chicago, Cornell University, iRobot Corp. and the Defense Advanced Research Projects Agency (DARPA) may have found a way around this challenge by devising a "universal gripper". The device uses an amorphous rubber bag filled with small particles that can mold and tighten around objects with the help of vacuum pressure.

Once the bag is pressed against an object, the gripper contracts and then hardens when a weak vacuum is applied. The bag-based gripper is more versatile than a robotic hand, able to pick up items as small as M&M’s, the researchers reported October 25 in Proceedings of the National Academy of Sciences (PNAS). Grappling problems occurred only when the gripper's bag could not extend far enough around an object’s sides. (The objective was to study gripping objects as opposed to manipulating them.)

"Such a gripper is universal in the sense that it conforms to arbitrary shapes and is passive in that all shape adaptation is performed autonomously by the contacting material and without sensory feedback," the researchers wrote in PNAS. This means the moldable gripper can function without needing sophisticated artificial intelligence software. Fingered robotic hands may be more suitable for manipulating objects but require "a central processor or brain for a multitude of decisions, many of which have to be made before the hand even touches the object, for example about how wide to spread the fingers apart," according to the researchers.

Image of universal gripper holding a shock absorber courtesy of researcher John Amend, School of Mechanical and Aerospace Engineering, Cornell University