UNTETHERED ROBOTICS

Ant-sized bristle-bots shake things up

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Credit: Allison Carter

Directing untethered, microscale robots often relies on external sources such as a magnetic field, which makes it difficult to address individual robots, limiting their functionality. Bristle-bots, which consist of a rigid main body and several bristle 'legs', convert vibrational energy to locomotion based on the orientation of the bristles to a surface. DeaGyu Kim and colleagues at the Georgia Institute of Technology have now developed 3D-printed micro-bristle-bots that can be designed with small variations in their resonant frequencies, allowing individual robots to be controlled.

The bristle-bots' polymer bases and legs were printed using two-photon lithography, and a piezoelectric layer of lead zirconate titanate (PZT) was attached. The resulting robot had dimensions of 2 mm × 1.87 mm × 0.8 mm and weighed only 5 mg. When the bristle-bots were excited at their resonant frequency of 6.3 kHz it produced directed motion, with speeds of up to four body-lengths per second. However, if the vibrational energy input is too high it can cause undesired jumping and flipping of the ultra-light robot.

Matthew Parker

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