Ultrasonic Levitation for Microwell Plates

This technology aims to bring sensitivity in robotic manipulation to general-use robots previously matched only by specialized surgical tools. Using ultrasonic waves, the contactless approach allows the picking up and moving of small, delicate objects only millimeters in size.

What is the Problem?

Even to this day, the ways in which robotics manipulate objects are ill-adapted for dealing with small and delicate objects smaller than a centimeter. With limited precision in gripping force and positioning, objects a few millimeters in size fall beyond the capability of modern general-purpose robots to hold and move without damage.

Objects of this size are important in fields ranging from medicine to semiconductors, as well as in basic research. While specialized robotics are available with this capability, the specialization extends to the point that they cannot be used beyond their specific purpose. There is an unmet need for a method allowing general purpose robots and robotic arms to handle small, delicate objects on the millimeter scale.

What is the Solution?

Sound waves are used to hold small objects in the air, created by two rings of ultrasonic transducers. The levitation achievable by this device is capable of picking up small polystyrene balls 1 to 2 millimeters in size, a type of sample too small and too delicate for a common gripping setup to pick up without damage. The form factor of the double ring is easily attachable to a general purpose robot without modification, allowing manipulation of small delicate objects such as flower petals, integrated circuits, or small insects for analysis.

What is the Competitive Advantage?

The major advantage of the technology is its general applicability, both in terms of setup and in usage. Because it is based on sound waves, it can pick up any kind of material (unlike magnetic levitation). In addition, the design allows mounting on any kind of general use robot, with strong enough force to resist samples being blown away by air flow during movement. As an added bonus, the non-contact holding method means that the sample can be observed from all angles without obstruction.

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Authors

Joshua Smith

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