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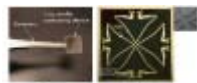
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Micromanipulator makes its debut

21 February 2007

Researchers in the US have invented a new gripping device that can manipulate micro-sized objects using multiple, coordinated "fingers". The device, which works in a similar way to how humans manipulate centimetre-sized objects, is better than existing micro-tweezers that can only open and close to grasp an object. The design of the "micromanipulator station" could also be improved to allow for nanoscale manipulations in the future.

Manipulating tiny objects is very important in assembling and characterizing micro- and nanoscale objects, as well as studying biological cells and tissue. At present, most devices for doing this are microelectromechanical "tweezers" that consist of two "legs" typically joined at one end. These instruments are limited because they can only open and close to grasp an object without being able to move it from one place to another. To accomplish the latter task, the tweezers would need to be mounted on other positioning stages capable of twisting and rotating, which would make the system bulky and cumbersome.

[The station](#)[The prototype](#)

Now, Laxman Saggere and Sandeep Krishnan of the University of Illinois in Chicago have come up with a novel solution to this problem. Their micromanipulator system contains multiple, coordinated fingers that can grasp and move objects from one location to another in a limited, defined boundary on a flat surface. The researchers can actuate each finger independently and precisely control the motion of a fingertip on the order of a few nanometres. The device contains four symmetrically placed fingers, but this number could be increased in the future to enhance the manipulator's dexterity, as well as enlarge the area in which an object can be moved, say the duo.

Saggere and Krishnan made their device using conventional micromachining techniques: "An important aspect of the device geometry is that it is a monolithic structure with various parts connected through flexible members," explains Saggere. "Hence the entire structure can be microfabricated at once on a chip without the need for assembling any of the parts separately."

[Experimental setup](#)

Saggere and Krishnan say the new device could find use in the micro-factories of the future. "The combined functionality of grasping and

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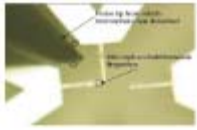
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positioning make the device ideal for aligning and assembling randomly placed microscale and, eventually, nanoscale objects," Saggere told *nanotechweb.org*. "The device could also be used to manipulate biological cells for applications such as cellular patterning."

The team now plans to improve its proof-of-concept device. This will include interfacing it with appropriate control systems to perform the manipulations; improving the fingertip design for nanoscale applications (for instance, by attaching carbon nanotubes to the tips); and extending the design concept so the instrument can work in 3D and not just on flat surfaces.

The researchers reported their results in *J. Micromech. Microeng.*.

About the author

Belle Dumé is acting editor of *nanotechweb.org*

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