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Large Deflection Micro/Nanopositioner with Multiple Degrees of Freedom

A new microrobotic manipulator uses piezoelectric actuation and integrated sensors for precise, self-calibrating nanoscale material handling in diverse operating environments without the need for traditional positioning stages.

The manipulation of micro- and nanosized materials is critical to the application of scanning probe microscopes, nanolithography, data storage, biological probing, and many others. The typical implementation for manipulating these small materials is to have a cantilever suspended above a piezoelectric positioning stage; the cantilever holds the scanning probe or other functional device while the stage positions the object. This setup has limited range, is expensive, and typically requires a laser-photodiode positioning system that limits the environments in which it can operate.

Researchers at Purdue University have designed a new microrobotic manipulator with improved range of motion and self-calibration. This manipulator replaces the fixed cantilever with a microscopic arm that is actuated by piezoelectric muscles. The arm has three degrees of freedom and has integrated sensors that allow it to sense its position and self-calibrate. No positioning stage or laser-photodiode positioning is needed, so the arm is able to operate on an object of any size, even in murky environments.

Advantages:

-Improved range of motion and self-calibration

-No positioning stage needed

Potential Applications:

-Robotics

-Research labs

TRL: 4

Technology ID
66269

Category
Robotics & Automation/Perception & Sensing
Robotics & Automation/Automation & Control
Materials Science & Nanotechnology/Nanomaterial Characterization & Imaging Tools

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