Improved Design for Bi-Material, Thermo MEMS Sensors and Actuators.
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Abstract
The market potential of MEMS-based sensors and actuators is enormous. However, many potential applications of these devices have physical and geometric constraints that are problematic for existing bi-material, cantilever designs. To address this problem, researchers at the University of California at Berkeley have devised a clever new design for bi-material, thermo-activated, MEMS sensors and actuators.

In contrast, to cantilever-based designs, this Berkeley structure only deflects in the vertical direction with no change in angle at its end points. These characteristics enable multiple modules of a bi-material to be connected in a series and satisfy boundary conditions at the connection points between each module. The resulting series of bi-material modules can be fabricated in a variety of patterns to meet specific physical and geometric constraints of the sensor/actuator device -- this is particularly useful in the design of dense sensor/actuator arrays with fixed-size pixels.

Furthermore, each bi-material module that is incorporated into the structure contributes to its aggregate sensitivity and performance, thereby enabling this design to offer greater sensitivity and performance in comparison to conventional bi-material structures. The new design can be fabricated using conventional IC processes such as PECVD and E-beam metal evaporation.

The improved features of this bi-material structure are conducive to variety of applications including infrared and heat-activated optical sensors and actuators.

Applications
• Dense arrays of actuators and sensors with fixed-size pixels
• Infrared and heat-activated optical sensors and actuators

Features/Benefits
• Modularized layouts that can address physical and geometric design constraints
• Greater thermo-mechanical sensitivity and overall performance

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