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A Nonlinear Mass Sensor based on Electronic Feedback

New sensor technology uses nonlinear electronic feedback to create low-cost, robust, and highly tunable bifurcation-based sensors for chemical, trace vapor, and biological agent detection.

Most resonant mass, chemical, and biological sensors operate on linear sensing principles, wherein chemomechanically-induced changes in frequency are used to trigger a detection event. These sensors have found utility in laboratory settings, but have faltered in real-world transition due to the need for significant accompanying electronics and their fixed detection sensitivities. In prior art, researchers developed a so-called bifurcation-based sensor, which exploits nonlinear behaviors to overcome the aforementioned limitation. However, such systems required very particular system designs at the micro- or nanoscale, which proved prohibitive in some applications.

Researchers at Purdue University have developed a new nonlinear sensor design that utilizes nonlinear electronic feedback to convert very simple sensor elements into functional bifurcation-based sensors. This new technology could also be utilized for MEMS/NEMS-based signal processing and physical sensing.

Advantages:

-Significant cost reduction

-Improves robustness, reliability, and enhanced tunability of the sensors

Potential Applications:

-Chemical sensing

-Trace vapor explosives sensing

-Biological agent sensing

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