Docket #: S19-023

Method and Apparatus for Evaluating Electrostatic or Nonlinear Devices

Researchers at Stanford have developed methods for evaluating the position of a micro-electromechanical system (MEMS) device in terms of phase and/or amplitude characteristics. This work enables measuring the characteristics of a MEMS device (e.g., an electrostatic microactuator) to yield information related to how the device would behave under certain operating conditions. Previous approaches have been limited in their ability to assess specific components - for example, examining each of the MEMS-type elements (e.g., independently) in terms of motion, position, or capacitance. The new methods have been shown to individually measure capacitance or motional changes in a MEMS device via a common signal electrode. In some implementations, frequency division multiplexing and quadrature signal processing techniques are used to facilitate measuring individual portions of a MEMS device. Filter banks may be included to provide real-time analysis of phase and amplitude of fundamental frequency and distortion products. Such approaches support the testing/measuring of individual electrodes within MEMS devices.

Stage of Development
The frequency division multiplex method has been built and proved to work.

Applications

- MEMS measurement systems for multi-dimensional devices.
- LIDAR (especially automotive)
- Optical communications
- Microscope scanning or shuttering
- Miniature dual-axis confocal micro-endoscopes
- Laser scanning microscope systems
- Beam scanning microscopes- 3D Lissajous scanning
- X-ray shuttering

Advantages

- Allows each element (e.g., electrodes) of a MEMS device to be measured independently
- Previous approaches have been limited in their ability to assess specific components
- Could help improve efficacies and efficiencies of MEMS implementations for a variety of applications

Patents

- Published Application: 20190241427
- Published Application: 20220089432
- Issued: 11,192,779 (USA)
- Issued: 12,459,809 (USA)

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