Methods of Self-Calibration for Coriolis Vibratory Gyroscopes

Tech ID: 27181 / UC Case 2014-612-0

BRIEF DESCRIPTION

The levels of long-term instabilities in bias and scale factor are key characteristics for the utilization of gyroscopes in many practical applications in navigation, positioning, and targeting systems. The inventors at UCI have developed two methods for gyroscope calibration: 1) Utilizing the mechanical quadrature error and 2) Utilizing the voltages of amplitude gain control (AGC) of the drive-mode. The new methods have been combined with feedback signals from a third technique, Side-Band Ratio (SBR) detection, to produce bias stability of 0.1 deg/hr after 300 seconds that is maintained for over 3 hours.

FULL DESCRIPTION

Silicon-based MEMS vibratory gyroscopes have applications in many fields, including navigation, positioning and targeting. The main barrier to utilization is the instability of bias and scale factor, which is mainly caused by thermal sensitivity of the physical gyroscope and associated electronics. The state of the art methods to reduce instabilities utilize the linear dependence of the gyroscope bias on the drive-mode resonant frequency. However, this approach only captures the thermal drift of the system's mechanical properties. The thermal sensitivity of the other system components, such as electronics gains, are unaccounted for.

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ADVANTAGES

§ Combination of 3 techniques

§ Addresses electronic gains as well as mechanical parameters

§ Bias stability maintained for >3 hrs

PATENT STATUS

Country	Type	Number	Dated	Case

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OTHER INFORMATION

CATEGORIZED AS

- » **Nanotechnology**
  - » Electronics
- » **Sensors & Instrumentation**
  - » Physical Measurement
  - » Position sensors
- » **Transportation**
  - » Aerospace
  - » Automotive

RELATED CASES

2014-612-0

United States Of America	Issued Patent	10,036,652	07/31/2018	2014-612

STATE OF DEVELOPMENT

The inventors have a working prototype system.

UCI Beall Applied Innovation

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