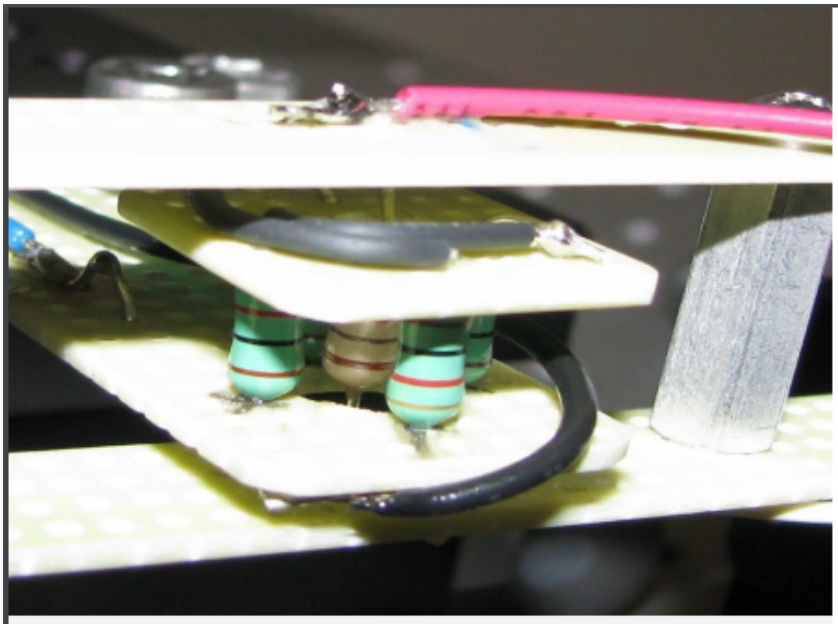


National Aeronautics and Space Administration

Sensors

Inductive Non-Contact Position Sensor

Highly accurate sensor for motion control

The Inductive Non-Contact Position Sensor is a highly accurate sensor for motion control applications. The sensor was designed to monitor the precise movements of an optical inspection system that measured defects in Space Shuttle windows. The technology has been prototyped and successfully field-tested with the Shuttle window inspection system. Its small size, low cost, wide range, and accuracy give it a distinct advantage over other types of sensors used for similar applications.

BENEFITS

- High accuracy - Accuracy to 400 nm and resolution of 3 nm/square root hertz
- Small size - Total volume of less than cubic inch
- Low cost - Uses low-cost, off-the-shelf components
- Simple to implement and use - Highly linear measurements may be computed using an inexpensive microcontroller
- Wide operational range - Total operating range of 200 microns
- High signal-to-noise ratio - Can be operated in noisy environments

APPLICATIONS

- Precision Motion Control
  -Optical Switches
  -Hard Drive Control
  -Semiconductor Lithography
  -Semiconductor Metrology
  -Robotic Movement
  -Medical Diagnostics
- MEMS Accelerometer
- Torsion Rod Measurement
- Vibration Monitoring

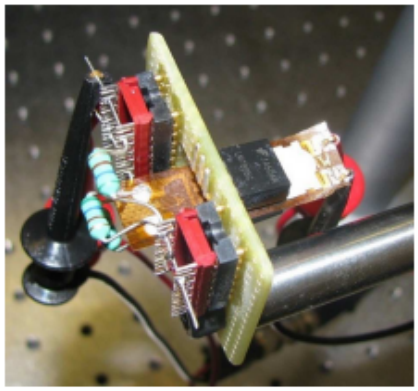
technology solution

THE TECHNOLOGY

Position sensors are used in a range of applications, and there are a number of types tailored to the needs of the applications. Current non-contact inductive sensors are inexpensive but are not precise. Other sensor types, including eddy current sensors, capacitive sensors, and optical/laser position sensors, have high precision, but are larger, more expensive, and require complex algorithms to operate.

Compared to other position sensors, this technology is precise, small, inexpensive, and provides absolute position. It can measure accuracy of position down to 400 nanometers over a total range of 200 microns. The sensor uses inexpensive, off-the-shelf components and has a total volume of less than cubic inch. A highly linear output makes computation easy by using a low-cost microcontroller. The high signal-to-noise ratio allows the sensor to operate in noisy environments.

Although originally designed as a one-dimensional sensor, additional work performed in the laboratory improved the design to make it two-dimensional as well as providing the ability to function as a tip/tilt sensor. The additional work also extended the linear operating region substantially, from about +/- 30 degrees to about +/- 70 degrees. The sensor design can be enlarged to accommodate a larger range of motion; however, enlarging the design may result in a loss of resolution.



Tip/Tilt Sensor Prototype

PUBLICATIONS

Patent No: 9,151,639; 8,947,074; 9,170,086

Patent Pending