Ultra-Sensitive Low-Power Magnetometer

An apparatus and method for detecting magnetic objects at an acceptable standoff range

The U.S. Navy seeks to commercialize a suite of patents including U.S. Patents 7,009,392 (Method of estimating target signals by a dynamical fluxgate sensor) and 7,420,366 (Coupled nonlinear sensor system).

Background
Magnetometers are used to detect ferrous metallic objects, and are often applied in security, navigation, and law enforcement. Current magnetic sensors, such as superconducting quantum interference device (SQUID) sensors, require cryogenic cooling and are complex, cumbersome, and very expensive. In situations where it is impractical or impossible to establish a completely controlled perimeter, it becomes relatively easy for intruders to avoid detection. Distributed sensor fields are a common approach to solving this problem, but the high sensor density required often overwhelms the operator with background or false alarm data. The ideal sensor would be rugged and compact, easily transportable and deployable, and affordable.

The Technology
SSC Pacific has developed a magnetic sensor using newly discovered aspects of the physics of coupled nonlinear oscillator networks. This method overcomes many current limitations to deliver high-power efficiency and high sensitivity, at a lower cost and power than other magnetometers. The sensor is compact and lightweight with high resolution, and communicates with other sensors as part of a package. It also detects slowly moving static and magnetic signals, such as those produced by an intruder crossing a tripwire. The sensor has the potential to be useful in security applications when placed around a house or area to detect metal on intruders, or as a very sensitive compass that could be incorporated into a compact and deployable hand-held device.

Key Benefits
- Room-temperature magnetic sensor
- Reduced cost and onboard power requirements
- Compact and lightweight; sensor can be made even smaller for very short-range applications
- Easy to operate sensor in an array
- Sensor can be package with other sensors
- Coupled core version can classify magnetic signals according to frequency
- Current resolution of 500 pico-tesla (pT) for single core and 200pT for coupled core (resolution can be improved if using larger number)
- Sensor is configured to null out ambient static magnetic “clutter”

Development Status
- U.S. Patents issued: 7,009,392, 7,420,366, 7,528,606, 7,898,250
- Total R&D: $1.75M and 5 years
- DoD 5000 Series Technical Readiness Level 7: System prototype demonstration in an operational environment.
- Test data results available

For more information on technology transfer, please contact us at (619) 553–5118 or email ssc_pac_t2@navy.mil

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