Wireless RF Passive Strain Sensor

Published date: May 26, 2013

Technology description

A new type of strain sensor suitable for wirelessly monitoring the mechanical deformation in tension, compression or bending using radio frequency based interrogation.

Background

Strain sensing is one of the most critical aspects of structural health monitoring and non-destructive evaluation. Strain sensors that can measure considerable strains over large areas of structures are needed. Traditional resistive metal foil strain gauge sensors, though low-cost and easy to install, have limitations such the need for a physical connection between the sensing element and the interrogation unit. Fiber-optic-based sensors have also received considerable attention since they are very compact and can provide very high resolution. However, they have inherent problems such as fragility and susceptibility to damage. In both these types of strain sensors, the physical connection between the sensor and the interrogation unit is also prone to corrosion and fracture. In addition, wireless monitoring of strains in the absence of a clear line of sight and/or physical connection to the structure of interest is impossible using conventional resistive or capacitive strain gauges. Conventional strain gauges often have active elements that deform when a load is applied. The performance of these strain sensors tend to deteriorate/drift over time since the fatigue life and properties of the metallic element determines the ultimate performance.

Technology

This invention is a new type of strain sensor suitable for wirelessly monitoring the mechanical deformation in tension, compression or bending using radio frequency based interrogation. It is a multi-layer structured wireless strain sensor that operates based on relative deformation of metallic sensing elements with potential for remote interrogation and substantial improvement of long-term performance.

Market Potential

The global market for non-destructive testing was estimated at $1.1 billion in 2008 with a growth rate of 3.2% over the period of 2008 to 2013 (Source: Frost & Sullivan). The end-user segments for the non-

destructive testing equipment market include: oil and gas, aerospace and military/defense, power generation, along with transportation (roadway, railway, and shipping), chemical and petrochemical industries and educational institutions.
The overall global market for visual inspection equipment reached $245.9 million in 2008. Of this, 15.5% of this revenue was generated through monitoring government institutions, the transportation industry, and educational institutions. Thus, the total market for this end-user segment, using visual inspection equipment, such as fiber optic technology was $38 million in 2008.
Dr. Ramaswamy Nagarajan is Assistant Professor in Department of Plastic Engineering at UMass, Lowell. His area of expertise are Biocatalysis, sustainable & greener routes to advanced materials (electronic, photo-responsive polymers, molecularly integrated hybrid nanomaterials, materials for energy conversion/storage), elastomers, thermal and morphological characterization of materials, roll to roll manufacture of flexible electronic products.

Application area

Structural Health Monitoring
o Bridges
o Buildings
o Roadways

Advantages

Competitive Advantages

Cost-Effective
Lightweight
Easy to install
Efficient
Does not require clear line of sight
Non-destructive evaluation

Institution

University of Massachusetts, Lowell

Inventors

Ramaswamy Nagarajan

联系我们

叶先生

电 话：021-65679356

手 机：13414935137

邮 箱：yeyingsheng@zf-ym.com