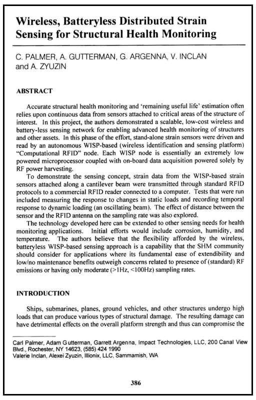
Wireless, Batteryless Distributed Strain Sensing for Structural Health Monitoring

C. PALMER, A. GUTTERMAN, G. ARGENNA, V. INCLAN and A. ZYUZIN

ABSTRACT

Accurate structural health monitoring and 'remaining useful life' estimation often relies upon continuous data from sensors attached to critical areas of the structure of interest. In this project, the authors demonstrated a scalable, low-cost wireless and battery-less sensing network for enabling advanced health monitoring of structures and other assets. In this phase of the effort, stand-alone strain sensors were driven and read by an autonomous WISP-based (wireless identification and sensing platform) "Computational RFID" node. Each WISP node is essentially an extremely low powered microprocessor coupled with on-board data acquisition powered solely by RF power harvesting.

To demonstrate the sensing concept, strain data from the WISP-based strain sensors attached along a cantilever beam were transmitted through standard RFID protocols to a commercial RFID reader connected to a computer. Tests that were run included measuring the response to changes in static loads and recording temporal response to dynamic loading (an oscillating beam). The effect of distance between the sensor and the RFID antenna on the sampling rate was also explored.

The technology developed here can be extended to other sensing needs for health monitoring applications. Initial efforts would include corrosion, humidity, and temperature. The authors believe that the flexibility afforded by the wireless, batteryless WISP-based sensing approach is a capability that the SHM community should consider for applications where its fundamental ease of extendibility and low/no maintenance benefits outweigh concerns related to presence of (standard) RF emissions or having only moderate (>1Hz, <100Hz) sampling rates.

INTRODUCTION

Ships, submarines, planes, ground vehicles, and other structures undergo high loads that can produce various types of structural damage. The resulting damage can have detrimental effects on the overall platform strength and thus can compromise the

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Ключевые слова:

Содержание.