



D. Mascarenas, D. Hush, J. Theiler, C. Farrar

The Application of Compressed Sensing to Detecting Damage in Structures

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One of the principal challenges facing the structural health monitoring (SHM) community is taking large, heterogeneous sets of data collected from sensors, and extracting information that allows the estimation of the remaining service life of a structure. Another important challenge is to collect relevant data from a structure in a manner that is cost effective, and respects the size, weight, cost, energy consumption, and bandwidth limitations placed on the system. In this work we explore the suitability of compressed sensing to address both challenges.

In this work a digital version of a compressed sensor is implemented on-board a microcontroller similar to those used in embedded SHM sensor nodes. The sensor node is tested in a surrogate SHM application requiring acceleration measurements. Currently the prototype compressed sensor is capable of collecting compressed coefficients from measurements and sending them to an off-board processor for reconstruction using L1 norm minimization. A compressed version of the matched filter known as the smashed filter, has also been implemented on-board the sensor node, and its suitability for detecting structural damage will be discussed.

Ключевые слова:

Содержание.

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