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Energy Harvesting for Wireless Sensors by Using Piezoelectric Transducers

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Wireless sensor technology, which integrates transducers, measurement electronics and wireless communication, has become increasingly vital in structural health monitoring (SHM) applications. Compared to traditional wired systems, wireless solutions reduce the installation time and costs and are not subjected to breakage caused by harsh weather conditions or other extreme events. Because of the low installation costs, wireless sensor networks allow the deployment of a big number of wireless sensor nodes on the structures. Moreover, the nodes can be placed on particularly critical components of the structure difficult to reach by wires. In most of the cases the power supply are conventional batteries, which could be a problem because of their finite life span. Furthermore, in the case of wireless sensor nodes located on structures, it is often advantageous to embed them, which makes an access impossible. Therefore, if a method of obtaining the untapped energy surrounding these sensors was implemented, significant life could be added to the power supply. Various approaches to energy harvesting and energy storage are discussed and limitations associated with the current technology are addressed. In this paper we first discuss the research that has been performed in the area of energy harvesting for wireless sensor technologies by using the ambient vibration energy. In many cases the energy produced by the ambient vibrations is far too small to directly power a wireless sensor node. Therefore, in a second step we discuss the development process for an electronic energy harvesting circuit optimized for piezoelectric transducers. In the last part of this paper an experiment with different piezoelectric transducers and their applicability for energy harvesting applications on vibrating structures will be discussed.

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Ключевые слова:

Содержание

Abstract

Introduction

Electronic circuit for energy harvesting of ambient vibration energy

Validation of the developed energy harvesting circuit