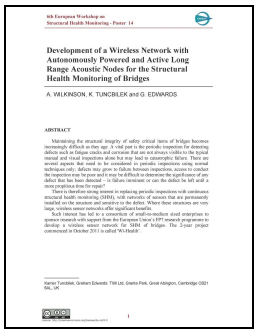

Код: 10792

A. Wilkinson, K. Tuncbilek, G. Edwards

Development of a Wireless Network with Autonomously Powered and Active Long Range Acoustic Nodes for the Structural Health Monitoring of Bridges

Дрезден, Германия, 2012 год

8 стр; формат: 23,5 x 16 см; библиографический список: 9 единиц

Maintaining the structural integrity of safety critical items of bridges becomes increasingly difficult as they age. A vital part is the periodic inspection for detecting defects such as fatigue cracks and corrosion that are not always visible to the typical manual and visual inspections alone but may lead to catastrophic failure. There are several aspects that need to be considered in periodic inspections using normal techniques only; defects may grow to failure between inspections, access to conduct the inspection may be poor and it may be difficult to determine the significance of any defect that has been detected - is failure imminent or can the defect be left until a more propitious time for repair?

There is therefore strong interest in replacing periodic inspections with continuous structural health monitoring (SHM), with networks of sensors that are permanently installed on the structure and sensitive to the defect. Where these structures are very large, wireless sensor networks offer significant benefits.

Such interest has led to a consortium of small-to-medium sized enterprises to sponsor research with support from the European Union's FP7 research programme to develop a wireless sensor network for SHM of bridges. The 2-year project commenced in October 2011 is called 'Wi-Health'.

The proposed sensor network will be multi-purpose. The acoustic emission (AE) that are a consequence of active defect growth will be detected by sensors in network nodes permanently installed at damage-prone areas of the bridge such as welds, plates and expansion joints. The AE will be used to activate ultrasonic guided wave (UGW) transducers at the same nodes that will insonify the source of the AE in such a way that UGW reflections can be used to determine the nature, size and exact location of the defect. This information is needed to assess the defect in terms of the structure's fitness for purpose. As data streams are very dense, they will have to be processed and reduced by an order of magnitude in a central processing unit (CPU) at the network node before being transmitted wirelessly. Innovative embedded software will be able to drive the structural health monitoring system for defect identification by incorporating the use of trend analysis and data processing.

This paper will describe how the project intends to approach the expected technical challenges throughout the development and by the time of its presentation may be able to offer some of its solutions.

Доклад. 6-я Европейская конференция по мониторингу технического состояния сооружений, 2012. Редакция Кристиана Боллера.

Ключевые слова:

Содержание