Smart Sensing Technology:
A New Paradigm for Structural Health Monitoring

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Abstract

The ability to continuously monitor the integrity of civil infrastructure in real-time offers the opportunity to reduce maintenance and inspection costs, while providing for increased safety to the public. Furthermore, after natural disasters, it is imperative that emergency facilities and evacuation routes, including bridges and highways, be assessed for safety. Addressing all of these issues is the objective of structural health monitoring (SHM).

Smart sensors densely distributed over structures can provide rich information for structural health monitoring using their sensing, computational, and wireless communication capabilities. Though smart sensor technology has seen substantial advances during recent years, implementation of smart sensors on full-scale structures has been limited; interdisciplinary efforts to address issues in sensors, networks, and application specific algorithms have only now begun to germinate. Following an overview of these issues, a new paradigm for structural health monitoring employing a network of smart sensors will be presented. Because of its ability to meet the demands of data intensive applications such as SHM, Intel's Imote2 is adopted for this research. The performance of the proposed SHM system is first evaluated through experimental studies employing a three-dimensional truss structure. Subsequently, full-scale implementation on a historic bridge in Mahomet, Illinois is conducted. The system is investigated from the sensing, network, and SHM algorithmic perspectives and shown to perform effectively.

Bibliography

B.F. Spencer, Jr. received his Ph.D. in theoretical and applied mechanics from the University of Illinois at Urbana-Champaign in 1985. He worked on the faculty at the University of Notre Dame for 17 years before returning to the University of Illinois at Urbana-Champaign, where he currently holds the

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