

Special Issue on Smart and Resilient Transportation Infrastructure

Linbing Wang

Professor and Director of Center for Smart Infrastructure and Sensing Technology, Virginia Tech Transportation Institute, Virginia Tech, Blacksburg, VA 24060, USA

Email: wangl@vt.edu

This special issue presents a collection of papers submitted to the International Workshop on Smart and Resilient Transportation held April 16-17 at Virginia Tech, which was sponsored by the National Science Foundation.

Smart Infrastructure (SI) is the infrastructure composed of materials or structures that can sense the environmental or status changes and adapt to the changes for positive effects. It may simply consist of smart materials that can adapt to temperature changes or stress status, or a structure that includes smart sensors to help the structure to perform adaptations. SI technologies have resulted from the integration and deployment of innovative technologies developed from several NSF initiatives on sensing technology, information technology, high performance materials, cyber infrastructure, and computational science and engineering. SI has most recently emerged as an important initiative for National Institute of Standards and Technology (NIST), Federal Highway Administration (FHWA), Department of Defense (DoD), Department of Homeland Security (DHS), and Department of Energy (DoE).

The objectives of the workshop are to bring together about 35 active researchers in the areas of smart technologies, sensor development and deployment, computational simulation, and transportation infrastructure design, construction, operation and maintenance to 1) brain storm and present vision and perspectives for smart and resilient transportation infrastructure; 2) identify promising technologies and tools for smart transportation infrastructure; 3) identify barriers and research needs for developing smart transportation infrastructure; and 4) discuss potential national and international collaborations for a partnership among academic institutions, industries and governmental agencies. Theme topics identified include 1) Vision for Smart and Resilient Transportation Infrastructure; 2) Advanced Sensing Technology Applications in Transportation Infrastructure; 3) Smart Materials Applications in Transportation Infrastructure; and 4) Integration of Multi-sensor Data into Computational Simulations of Infrastructure Deterioration and Optimal Decision-making. Outstanding researchers in these areas have been identified and selected for delivering the theme topic speeches.

The eight papers in this special issue cover a wide spectrum of subjects along the four theme topics. They include topics on remote sensing; smart and self-powered wireless network system; flexible membrane techniques; Bragg Grating sensors; piezoelectric energy harvesting and thermal energy harvesting, which serve both power-supply and sensing functionality. The special issue also presents a paper on pavement distress analysis using a wavelet transform technique, and a review and perspective paper on pavement monitoring.