Sensor-Enriched Sustainable Infrastructure System

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Abstract

Civil infrastructure, in both its construction and maintenance, represents the largest societal investment in this country, outside of the health care industry. Despite being the lifeline of US commerce, civil infrastructure has scarcely benefited from the latest sensor technological advances. Our future should focus on harnessing these technologies to enhance the robustness, longevity and economic viability of this vast, societal investment, in light of inherent uncertainties and their exposure to service and even extreme loadings.

A variety of urban infrastructure should take advantages of these technologies including Bridges, Buildings, Tunnels, Waterways, and Utility Networks. The goal is to implement these technologies in existing structures, as well as incorporating them into new paradigms for infrastructure design to enhance the life cycle of the vast existing infrastructure system.

One of the principal means of insuring the robustness and longevity of infrastructure is to strategically deploy smart sensors in them. Therefore, the objective is to develop novel, durable, smart sensors that are especially applicable to urban infrastructure and the facilities to validate their reliability and long-term functionality. In some cases, this implies the development of new sensing elements themselves, while in other cases involves innovative packaging and use of existing sensor technologies. In either case, a parallel focus will be the integration and networking of these smart sensing elements for reliable data acquisition, transmission, and fusion, within a decision-making framework targeting efficient management and maintenance of infrastructure systems.

Bibliography

Ming Wang is a Professor of Civil and Environmental Engineering at the Northeastern University. He was formerly a full professor in the Department of Civil and Materials Engineering at the University of Illinois at Chicago (UIC) and before that at the University of New Mexico (UNM). Before that, he taught as a visiting professor in the Departments of Civil Engineering at Princeton University and at

Northwestern University. His research has had a large influence on the health monitoring of civil infrastructures and the development of new sensor technologies for civil infrastructure applications. In addition, his research is having a strong international influence on futuristic monitoring technologies for large structural systems. His improvements of the electro-magnetic (EM) sensor to directly measure the stresses of large steel cables for cable-stayed bridges have gained much attention. Practical applications have been done in the United States, China, Japan, Europe, and in Taiwan. He has published more than 200 papers in various journals, conference proceedings, chapters, and edited books. Dr. Wang was also awarded a United States patent (number 5,254,857) on the “Fast Scanning Electron Microscope” in 1993. He has also filed several disclosures and patents on EM sensor technologies currently under worldwide use.