TIP Project Brief – 080024/9H9011

Civil Infrastructure
Development of Rapid, Reliable, and Economical Methods for Inspection and Monitoring of Highway Bridges

Develop a pair of complementary sensor networks for bridge inspection, including an active, self-powered system for continuous monitoring for cracks or defects in fracture critical bridges and a passive system for monitoring corrosion in reinforced concrete bridge decks.

Sponsor: University of Texas at Austin
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- Project Performance Period: 2/1/2009 - 1/31/2014
- Total project (est.): $6,842 K
- Requested TIP funds: $3,421 K

The joint research venture led by the University of Texas at Austin and including National Instruments Corporation (Austin, Texas) and Wiss, Janney, Elstner Associates, Inc., (Northbrook, Ill.) plans to develop two related wireless network systems that together address a critical issue for bridge safety, the monitoring of cracks or defects and corrosion in key structural components. One will be a network of low-power, wireless sensors designed to continuously monitor fracture-critical bridges—those susceptible to collapse from the failure of a single critical component—over a 10-year service life. The sensor nodes will be powered by one of several possible "energy harvesting" techniques that derive power from solar or wind energy or vibrations in the bridge structure, making them independent of the electric power grid. The nodes will be capable of supporting multiple sensors and will have sufficient computing power to process raw sensor data, detect important events and send notifications off-site when a threshold level of damage occurs. A second network of passive sensors will be designed to detect early signs of corrosion in reinforced concrete bridge decks. These sensors will be read using a wireless connection during regular bridge inspections. The robust sensors are inexpensive to produce, require no power source other than the wireless signal, and could easily be dispersed throughout the entire structure during construction and will function for the lifetime of the bridge. The proposed research involves several major challenges that require TIP support, particularly the extremely long target service life of the sensors and data acquisition systems. The research in this proposal will not only transform the inspection practices used for highway bridges today, but also will dramatically advance the state of the art in wireless sensing technology.

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Active Project Members

- National Instruments Corporation (Austin, TX)
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- University of Texas at Austin (Austin, TX)
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- Wiss, Janney, Elstner Associates, Inc. (Northbrook, IL)
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