CENTER FOR TRANSPORTATION INFRASTRUCTURE AND SAFETY

A Pilot Study on Diagnostic Sensor Networks for Structure Health Monitoring

by

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NUTC R303

A National University Transportation Center at Missouri University of Science and Technology

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16. Abstract
The proposal was submitted in an effort to obtain some preliminary results on using sensor networks for real-time structure health monitoring. The proposed work has twofold: to develop and validate an elective algorithm for the diagnosis of coupled cyber-physical systems in the event of faults, and to monitor and assess the structural condition of bridges in real-time with sensor networks. Through the first year's investigation, we have learned that the second part of the proposed work actually requires new measuring methodology. As a result, research in this direction has extended to the following year, and a new project entitled "Data Acquisition, Detection and Estimation for Structural Health Monitoring" has started.

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Project Report
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Summary of Activities

The proposal was submitted in an effort to obtain some preliminary results on using sensor networks for real-time structure health monitoring. The proposed work has twofold: to develop and validate an effective algorithm for the diagnosis of coupled cyber-physical systems in the event of faults, and to monitor and assess the structural condition of bridges in real-time with sensor networks. Through the first year's investigation, we have learned that the second part of the proposed work actually requires new measuring methodology. As a result, research in this direction has extended to the following year, and a new project entitled "Data Acquisition, Detection and Estimation for Structural Health Monitoring" has started.

The first part focusses on a fault detection and localization algorithm. In the first year, we have attempted two approaches to hack it. The first approach uses a statistical anomaly detection method, and the second approach uses a combinatorial algorithm for fault matching. On the experimental validation aspect, we have created some synthetic data for the validation of the algorithms. Experimental validation on a real bridge will be our future work in the next a couple of years.

Fo more details of the research methods and findings for fault detection and localization, please contact Dr. Cheng at chengm@mst.edu to request a copy of the full report.