

UTC Project Information

Project Title	Feasibility of Early Damage Detection Using Surface Mounted Sensors on Existing Pavements
University	Michigan State University
Principal Investigators	Nizar Lajnef, Ph.D. Karim Chatti, Ph.D.
PI Contact Information	Assistant Professor Department of Civil and Environmental Engineering 3546 Engineering Building, East Lansing, MI 48824 lajnefni@egr.msu.edu
Funding Source(s) and Amounts Provided (by each agency or organization)	\$128,792 USDOT \$31,003 MSU
Total Project Cost	\$159,795
Agency ID or Contract Number	DTRT13-G-UTC44
Start and End Dates	October 1, 2014 to September 30, 2016
Brief Description of Research Project	<p>Previously developed work by Michigan State University (MSU) led to the development of an innovative sensing system for continuous health monitoring of pavement structures. The developed sensor is capable of detecting damage accumulation in pavement structures under actual traffic and environmental load history. The first sensor package prototypes were built so that they have a similar shape to existing systems (H-shape), and can be installed using existing procedures that were previously used by State Highway Agencies (SHAs). Further enhancements that are currently being investigated include miniaturizing the sensor to a size of the same order of a coarse aggregate particle. While the development of the new sensor constitutes a major achievement towards the future implementation of self-powered autonomous sensor networks for the continuous health monitoring of in-service pavements, there are still a multitude of hurdles to overcome before the acceptance into practice by SHAs. Furthermore, new pavement construction projects are negligible when compared to the extent of the exiting pavement network. It is thus more critical for SHAs to adopt monitoring techniques that can be adapted to existing pavements.</p>

This research will investigate the feasibility of surface

mounting installation procedures on existing pavements without major interference with regular maintenance activities. In addition, this work will examine the formatting and integration of the generated data with the existing pavement management and preservation systems. This integration is critical for a successful adaption of any developed technology.

Describe Implementation of Research Outcomes (or why not implemented)

N/A

Place Any Photos Here

Impacts/Benefits of Implementation (actual, not anticipated)

Successful proof-of-concept for the proposed installation procedures could dramatically transform the economics of pavement preservation/management and ultimately improve the serviceability of pavements. The system will consist of a network of low cost sensors easily installed on existing pavements. Each sensor node is self-powered and capable of continuously monitoring and storing the dynamic strain response levels. The strain data is stored on-board the small-scale sensor electronics. The data from all the sensors are periodically uploaded wirelessly to a central database. The sensor can be read through standard radio-frequency (RF) transmission using a RF reader that is either manually operated or mounted on a moving vehicle. The roads can be frequently monitored to detect changes in structural integrity that may not only indicate a potential for future crack/distress manifestation, but also allow for more accurate scheduling of preservation actions.

The investigators recognize that any existing technology will have to go through major improvements before its wide acceptance. The improvements proposed in this project will constitute a step forward toward eliminating several key hurdles.

Web Links

- Reports
- Project website

www.chpp.egr.msu.edu