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Smart concrete pavement system for integrated performance and traffic monitoring

Concrete has become more and more popular in road constructions due to the facts that concrete lasts longer and its environmental friendliness. The United States has 160,955 miles of roads, including the interstate highway system. Lots of roads within the US are suffering various distress problems. To assess the road conditions and track the traffic, multiple facilities are required simultaneously. For instance, vehicle-based image techniques are available for pavements' mechanical behavior detection such as cracks, high-speed vehicle-based profilers are used upon request for the road ride quality evaluation, and inductive loops or strain sensors are deployed inside pavements for traffic data collection. Having multiple facilities and systems for the road conditions and traffic information monitoring raises the cost for the assessment and complicates the process. In this presentation, a concept of smart concrete pavement system will be discussed for integrated road condition and traffic monitoring to have the concrete pavement performing multiple functions using in-pavement strain-based sensors, which will phenomenally simplify the road condition and traffic monitoring. This system is expected to simultaneously assess and measure the pavement's structural health condition, the road's ride quality, the weighing and classification of vehicles passing with a high speed on the road. Such a superior system requires an innovative sensor system, which has been installed and validated in Minnesota's Cold Weather Road Research Facility (MnROAD) operated by MnDOT. The system was approved to be effective for monitoring the health conditions of the pavements, the traffic counts, ride quality evaluation, and weigh-in-motion measurements, and vehicle identification. The smart concrete pavement system is promising to use the existing concrete pavement system for multiple purposes, which gains a considerable efficiency increase as well as a potentially significant cost reduction for the intelligent transportation system.

Biography

Ying Huang obtained her PhD from Missouri University of Science and Technology in 2012. She joined the Department of Civil and Environmental Engineering at North Dakota State University as a faculty till now. She possesses two US approved and pending patents, published over 70 high-quality peer-reviewed publications that include one book chapter, 30 journals, and 40 conference papers, which were cited 360 times with an i10-index of 9. She has more than 10 invited presentations and 20 international and national presentations. She is also an associate editor and editorial board member for five international journals, committee member for five distinguishing professional society such as ASCE Structural Condition Assessment and Rehabilitation of Buildings Committee, ASTM Fiber Optic Practices Committee, and SPIE Sensors and Smart Structures Technologies Committee. She is a grant reviewer for NSF CMMI Program, US DOT PHMSA R&D Program, National Research Foundation (NRF) of Singapore R&D, and Energy Market Authority of Singapore R&D. She is a peer reviewer for more than 40 international journals and conferences. She had won the 2015 NDSU Ozbun Economic Development Award, 2016 NDSU Forward Leap Research Award, 2017 NDSU College of Engineering Researcher of the Year and 2017 NDSU Centennial Award.

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