Statement No. 15

Arkansas Department of Transportation

Transportation Research Committee

RESEARCH PROBLEM STATEMENT

DATE: 09/15/2017 | **PROJECT AREA:** Maintenance

TITLE: An expedite investigation of Arkansas Highway bridges using a novel wireless ultrasonic structural health monitoring technique

PROBLEM STATEMENT:

A novel wireless ultrasonic structural health monitoring technique is proposed. The proposed system is capable of identifying newly formed cracks in steel and reinforced concrete bridges and precisely identify their locations, size and extent.

The proposed technique will depend on mounting certain sensors permanently on the Skelton of the bridge at certain locations and connect them wirelessly at the time of the inspection. Wireless ultrasonic signals are then emitted and the received signals are analyzed using the proposed protocol. This could help reduce the inspection time, reduce labor, remove traffic interruption, and ensure the safety of the inspectors. The inspectors will be working from a far distance compared to the current inspections, where the inspectors have to be physically on the bridge.

OBJECTIVES:

- Develop a wireless system that is capable of remotely monitoring the cracks locations, size, and extent
- Develop an algorithm to control and monitor the system
- Build a prototype of the proposed structural health monitoring system
- Develop procedures and guidelines on using the proposed structural health monitoring system and interpreting the measured signals in a systematic approach

FORM OF RESEARCH IMPLEMENTATION:

With more than 13,000 bridges in the state of Arkansas and 62 of them are classified as heavy bridges, the heavy bridge maintenance division of Arkansas department of transportation plays an important role in inspecting and insuring the safety of these bridges. An inspection of one of these bridges can take from one to three weeks and requires such specialized equipment as an Ultrasonic Flaw Detector to inspect fracture critical bridge elements according to the division's website. The use of this proposed structural health monitoring system will help reduce the inspection time, reduce labor, remove traffic interruption, and ensure the safety of the inspectors. The inspectors will be working from a far distance compared to the current inspections, where the inspectors have to be physically on the bridge.

Estimated Project Duration: 24 **months**

PREPARED BY: Tarek Ragab

AGENCY: Arkansas State University

PHONE: (716) 444-1190 **REVIEWER:** Davin Webb

Standing Subcommittee Ranking	Advisory Council Ranking	Statement Combined with Statement Number(s)
9 / 9	26 / 44	