The Ohio Department of Transportation
Office of Research & Development
Executive Summary Report

Smart Sensor for Autonomous noise Monitoring (SSAM)

Start Date: 1 February 2008

Duration: 16 months

Completion Date: 30 June 2009

Report Date: 23 June 2009

State Job Number: 134370

Report Number: FHWA/OH-2009/6

Funding: $115,728

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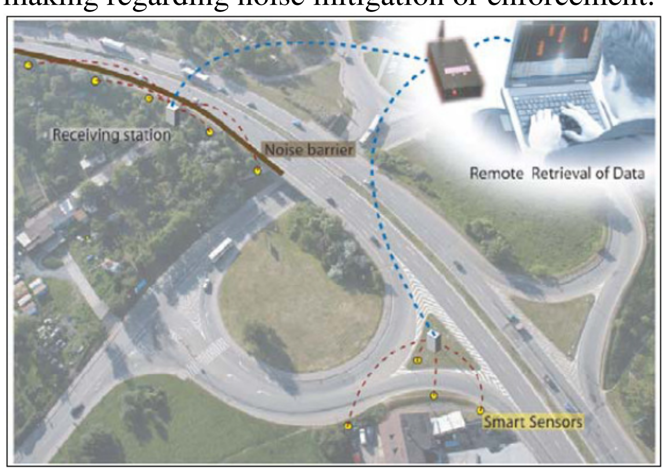
Problem

The typical methods of assessing highway traffic noise include wayside and near-field measurements. A significant disadvantage of existing measurement techniques is that they cannot be used to conduct noise measurements at multiple locations or over extended time periods due to cost and logistical considerations. In addition, the existing methods typical require a high level of expertise to post-process the resulting data and display it in a useful form.

There is a need for new technologies that will facilitate cost-effective noise measurement and monitoring in multiple scenarios and at multiple locations over extended periods of time. Ideally, this technology should provide simple set up, wireless data transfer, and rapid automated data analysis. Such technology will allow transportation agencies to gain a deeper understanding of noise sources and propagation and will aid their decision making regarding noise mitigation or enforcement.



Objectives

The objective of the work reported here was to design, fabricate and test a set of prototype SSAM devices and successfully demonstrate their use and advantages as compared to existing methods of traffic noise monitoring. While the technology has numerous potential applications, particular attention has been paid to specific traffic noise tests of interest to Ohio Department of Transportation, including traffic noise barrier insertion loss.

Description

This project involved the development of a cost-effective sensor for long-range wireless, autonomous traffic noise monitoring. The device is called the Smart Sensor For Autonomous noise Monitoring (SSAM). The project tasks included:

- fabrication of ten SSAM sensor units for ODOT use,
- development of noise analysis software,
- laboratory testing of the SSAM hardware and software,
- field testing of the SSAM system including noise barrier insertion loss measurements.

The SSAM system measures and reports noise levels periodically to a base station up to 1.2 miles away. The data reported includes flat-weighted and A-weighted sound pressure levels, as well as octave band levels (22 to 5657 Hz).

Conclusions & Recommendations

This project has transitioned SSAM from concept through demonstration of a working prototype system for multipoint wireless noise monitoring. The prototype SSAM system and training materials are available to ODOT staff for their use in future noise monitoring projects.

The compact size, ease of use, and low cost of the SSAM sensors offer a unique benefit to traffic noise monitoring. For example, tens or even hundreds of SSAMs could be distributed along many miles of roadway for continuous, long-term monitoring. The resulting technology would provide reduced overall noise test costs and a great increase in data gathering and automated analysis. The added information can provide improved understanding of highway noise sources, airport noise sources, and their variation as a function of location, time-of-day, day-of-week, weather conditions, and other parameters that effect traffic noise levels.

Implementation Potential

Use of SSAM in future transportation noise studies is encouraged in order to

- gain exposure and acceptance in the transportation community,
- identify needed improvements or desired features,
- establish a substantial data base of SSAM measurements validated against simultaneous standard noise methods.

By advocating the use of SSAM and incorporating the use of SSAM in future noise studies, the technology can transition from prototype to a mature, accepted system with well established performance characteristics. Once this transition is made, the substantial cost-effectiveness of the technology can be realized as automated noise monitoring and testing becomes the accepted norm.