Research Project: ***SP009B4H***
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RESEARCH SUMMARY

TRAFFIC DATA COLLECTION AND ANONYMOUS VEHICLE DETECTION USING WIRELESS SENSOR NETWORKS

Problem

Most Intelligent Transportation System (ITS) applications require distributed acquisition of various traffic metrics such as traffic speed, volume, and density. The existing measurement technologies, such as inductive loops, infrared, microwave-Doppler/radar and video image detection, have the limitation of either having a high cost and need power supply, or lack of real-time communications between measurement points and the decision-making centers.

Objective

The objective of this study was to develop a proof of concept for wireless and energy self-sufficient traffic sensors that significantly increase data granularity for ITS applications.

Description

This project developed an inexpensive and scalable wireless sensor network architecture, which encompasses cost-effective wireless devices for real-time traffic measurement. The sensors use ultra-low power technologies and are extremely energy efficient. The sensors obtain their required energy from the existing energy in the environment, and, therefore, they do not need batteries or access to a main power source. In addition to traditional traffic parameters, these surface-mounted sensors can measure and report the temperature of their surroundings. The sensors are also capable of capturing a digital magnetic signature of vehicles within any required intervals. Five wireless traffic sensors and a roadside data collector were developed and thoroughly tested on a section of MD 200, the Inter County Connector (ICC).

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Results

Lane-by-lane data on this segment of the highway from the five deployed sensors was reported and archived on a server on the University of Maryland campus. The results indicated that the developed wireless vehicle sensing architecture can be adapted for a range of traffic management applications. The experiments conducted during the course of this project showed the reliability of the magnetic signatures data collection and the potential for travel time and Origin-Destination (OD) estimation. However, given energy limitations, further research is needed to develop ultra-efficient signal processing algorithms for signature-matching purposes. SHA can take advantage of this scalable technology to increase data granularity by increasing points of detection on the highway system at a relatively low cost. The sensor can also be used for work zone monitoring and data collection for performance measurement.

Report Information

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